Epidemiology and care of female sexual dysfunction

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Abstract

Sexual dysfunction can have a negative impact on the well-being of an individual. For women, sexual dysfunction encompasses sexual interest / arousal disorder, female orgasmic disorder and genitopelvic pain / penetration disorder. Although sexual dysfunction has been identified as a significant public health problem, research on sexual dysfunction has primarily focused on men rather than women. Comprehensive epidemiological data on female sexual dysfunction and information on current levels of care are needed in order to better address women's sexual health. The purpose of this dissertation was three-fold: to provide a global estimate of the prevalence of female sexual dysfunction, to summarize the predictors of female sexual dysfunction, and to investigate the current barriers in terms of diagnosing and treating female sexual dysfunction.

Quantitative data on the prevalence of female sexual dysfunction (part I) and qualitative data on the predictors of female sexual dysfunction (part II) were collected by means of a systematic literature review. A regional survey of obstetricians and gynecologists (part III) was conducted to assess the current barriers to care for medical practitioners in the state of Bavaria, Germany.

Using data from 135 international, peer-reviewed publications, it was estimated that 41% of premenopausal women worldwide report some form of sexual dysfunction. While a wide variety of risk factors could be identified, exercise, sex education and marrying later were consistently shown to have a protective effect. Still, diagnosing and treating female sexual dysfunction remains challenging for medical practitioners. The greatest barriers mentioned by doctors were: too little time with patients, insufficient training in residency and too few sexual therapists in Germany.

The results of these three projects provide insight into the still highly under-researched field of women's sexual health. Although two out of five premenopausal women report some form of female sexual dysfunction, therapy options for women are limited. Furthermore, sexual dysfunction is associated with a number of age-related factors; thus, given Germany's aging population, medical professionals must be given the means, i.e. time, training and compensation, to adequately address sexual health in their daily practice. Finally, women's and men's sexual health are equally relevant; greater awareness and increased financial resources are needed in order to achieve a more balanced provision of care for women.

Referat

Sexuelle Funktionsstörungen können negative Auswirkungen auf die individuelle Lebensqualität haben. Sexuelle Funktionsstörungen bei Frauen umfassen Libidostörungen, Orgasmusstörungen und Schmerzen beim Koitus. Sexuelle Funktionsstörungen stellen ein signifikantes Public Health Problem dar. Der Fokus bisheriger Forschung lag v.a. auf Männern, nicht auf Frauen. Um die sexuelle Gesundheit von Frauen besser zu verstehen, sind umfangreiche epidemiologische Daten zu sexuellen Funktionsstörungen bei Frauen sowie Informationen zu derzeitigen Versorgungsmöglichkeiten nötig. Die drei Ziele dieser Dissertation sind: die Prävalenz von sexuellen Funktionsstörungen bei Frauen zu ermitteln, Einflussfaktoren auf sexuellen Funktionsstörungen zu identifizieren und Barrieren in der Versorgung von Frauen mit sexuellen Funktionsstörungen zu untersuchen.

Quantitative Daten zu Prävalenzen von sexuellen Funktionsstörungen bei Frauen unter 49 Jahren (Teil I) und qualitative Daten zu deren Einflussfaktoren (Teil II) wurden im Rahmen einer systematischen Literaturrecherche zusammengefasst. Eine regionale Befragung von Frauenärzten und -ärztinnen in Bayern (Teil III) wurde durchgeführt, um Barrieren der Versorgung zu evaluieren.

135 Publikationen zur Prävalenz von sexuellen Funktionsstörungen bei Frauen konnten identifiziert werden. 41% der Frauen unter 49 berichten mindestens eine sexuelle Funktionsstörung. Risikofaktoren waren vielfältig. Schutzfaktoren waren sportliche Aktivität, sexuelle Aufklärung und das Heiraten im höheren Alter. Diagnose und Behandlung sexueller Funktionsstörungen sind immer noch eine Herausforderung für Mediziner. Die Barrieren, die laut Medizinern am häufigsten vorkommen, sind: zu wenig Zeit mit Patientinnen, mangelnde Ausbildung, und zu wenige Sexualtherapeuten in Deutschland.

Diese Ergebnisse ermöglichen einen Einblick in der unterforschte Gebiet der sexuellen Gesundheit von Frauen. Zwei von fünf Frauen berichten sexuelle Funktionsstörungen, trotzdem bleiben die angewandten Therapien begrenzt. Sexuelle Funktionsstörungen bei Frauen sind mit dem Alter assoziiert. Vor dem Hintergrund einer alternden Bevölkerung müssen deutsche Ärzte und Ärztinnen ausreichend Unterstützung bekommen, d.h. mehr Zeit mit Patientinnen, gründliche Ausbildung und angemessene Vergütung, um Ihre Patientinnen mit sexuellen Funktionsstörungen besser zu versorgen. Sensibilisierung und verstärkte finanzielle Ressourcen sind notwendig, um die Versorgung von sexuellen Funktionsstörungen zu verbessern.

Proliferation of results

Publications

Prevalence and Predictors of Female Sexual Dysfunction:
A Protocol for a Systematic Review
McCool ME, Theurich MA, Apfelbacher C
Systematic Reviews, Jul 2014; 3: 75.

Diagnosing and Treating Female Sexual Dysfunction:
A Survey of the Perspectives of Obstetricians and Gynecologists
McCool ME, Apfelbacher C, Brandstetter S, Mottl M, Loss J
Sexual Health, Apr 2016; 13: 3, 234-240.

Prevalence of Female Sexual Dysfunction among Premenopausal Women:
A Systematic Review and Meta-analysis of Observational Studies
McCool ME, Zuelke A, Theurich MA, Knuettel H, Ricci C, Apfelbacher C
Sexual Medicine Reviews, Jul 2016; 4: 3, 197-212.

Predictors of Female Sexual Dysfunction:
A Systematic Review and Qualitative Analysis
McCool ME, Theurich MA, Zuelke A, Knuettel H, Apfelbacher C
Under review at the Journal of Social Science and Medicine (Aug 2016)

Conferences and presentation opportunities

Oral presentation
"Deutsche Gesellschaft für Medizinische Soziologie" in September 2014, Greifswald

Invited speaker
"Bundesverband der Study Nurses/Studienassistenten in der Klinischen Forschung" in November 2014, Berlin

Oral presentation and poster

European Society for Sexual Medicine (ESSM) in February 2015, Copenhagen

Oral presentation

“Deutsche Gesellschaft für Sozialmedizin und Prävention“ in September 2015, Regensburg

Recognition

Grant for the Advancement of Women, University of Regensburg, November 2014

ESSM Award for Best Presentation on Female Sexual Dysfunction, Copenhagen, February 2015

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List of abbreviations

DSM	Diagnostic and Statistical Manual for Mental Disorders
FGM	Female Genital Mutilation
FSD	Female Sexual Dysfunction
FSFI	Female Sexual Function Index
GII	Gender Inequality Index
GSSAB	Global Study of Sexual Attitudes and Behaviors
HD	Human Development
ICD	International Classification of Diseases
KVB	Kassenärztliche Vereinigung Bayern
OB/GYN	Obstetrician or gynecologist
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PROPSERO	International Prospective Register of Systematic Reviews

1. Introduction

1.1. The science of sexual medicine

L'Onanisme, Dissertation sur les maladies produites par la masturbation (Onanism, Treatise on the diseases produced by masturbation) [1] would not appear to be an ideal starting point for sexual medicine. However, despite its fallacies in regards to health, this publication by the Swiss physician Simon Auguste David Tissot in 1758 brought about a "pathologization of sexual anatomy and sexual functions" as well as the preoccupation of medical doctors with issues of human sexuality [2]. German and Austrian physicians such as Conrad Eckhard (1822-1905), Richard Freiherr von Krafft-Ebing (1840-1902), Sigmund Freud (1856-1939) and Magnus Hirschfeld (1868-1935) made important initial contributions to the field of sexual medicine. Hirschfeld, often nicknamed "the Einstein of sex" [2], was responsible for founding the first journal for sexology, organizing the first international congress of sexology in 1921, establishing the first institute and thereby academic specialty in sexology, and also creating the first gay rights organization (*Wissenschaftliche-Humanitäre Komitee*). Henry Havelock Ellis (1859-1939), although not a physician, was an avid supporter of sexual liberation, women's rights and sexual education. His books on human sexual biology, behavior and attitudes challenged Victorian taboos and encouraged open dialogue about sex. In the early 1900s, many European sexologists immigrated to the US to continue their work in sexual medicine there. One of these was Ernst Gräfenberg, who studied the female anatomy extensively, specifically the female orgasm, and who developed the first intrauterine device (IUD) as a method of birth control [3]. His contributions in this field put his name in history and in the vagina, i.e. the Gräfenberg spot or G-spot. Alfred Charles Kinsey (1894-1956) is considered "the pioneer in the quantitative and epidemiologic study of human sexuality" [2]. Kinsey and his colleagues interviewed 18,000 US Americans about their sex lives and published these results in two books: *Sexual Behavior in the Human Male* and *Sexual Behavior in the Human Female* [4]. Spurred on by Kinsey, sex researchers William Masters and Virginia Johnson carried on the passion to better understand human sexuality and sexual response through both interventional and observational studies [2]. They also developed a model for sex therapy to address psychogenic sexual disorders. Austrian-born sex therapist Helen Singer Kaplan (1929-1995), building on the work from Masters and Johnson, proposed various psychological approaches in interpreting and treating sexual disorders which are still used today [5, 6]. Furthermore, she was the first to stress sexual desire

as a separate and essential part of the sexual response model. Disorders in sexual desire, she claimed, were more difficult to treat than orgasmic disorders and arousal disorders [4].

1.2. Female sexual dysfunction and its classifications

It was Kaplan who helped to develop of the first medical classifications for sexual dysfunction which appeared in the 3rd edition of the Diagnostic and Statistical Manual for Mental Disorders (DSM, published by the American Psychiatric Association) in 1980 [7]. Up until that point, the DSM had only addressed "sexual deviations" or paraphilias in terms of diagnoses of a sexual nature. The DSM-III established six categories for "psychosexual dysfunctions" in women: inhibited sexual desire, inhibited sexual excitement, inhibited (female) orgasm, functional dyspareunia, functional vaginismus, and atypical psychosexual dysfunction [8]. The DSM-IV, published in 1994, showed only minor changes compared to its predecessor [9]. Table 1 provides the definition and classification of female sexual dysfunction according to DSM-IV.

A further diagnostic manual which is primarily used in Europe is the International Classification of Diseases (ICD, published by the World Health Organization) [10]. The ICD 9 [11] and ICD 10 [12], released nearly simultaneously to the DSM-III and DSM-IV respectively, have shown a similar development in terms of definitions and classifications of female sexual dysfunction between 1980 and 2000.

In the late 1990s, experts in the field of female sexual dysfunction began to express their concerns that the ICD-10 and DSM-IV classifications were too focused on the psychological and somatic components of sexual response [13]. They claimed that, similar to male sexual dysfunction, it is possible for disorders to be entirely organic in origin – an aspect which they felt was not addressed in the classification systems. The meeting resulted in the 2001 Consensus Report which established yet another classification system for female sexual dysfunction. Critics of the Consensus Report stated that reducing sexual dysfunction to a purely biological etiology opens the door to pharmaceutical medicalization of sexuality [14]. This debate still continues in the field, both for female and male sexual dysfunction.

Table 2 compares the classification systems for female sexual dysfunction according to the ICD-10 (1992), DSM-IV (1994), the Consensus Report (2001) and DSM-V (2013). It is important to note that for nearly all sexual disorders – regardless of the classification system – a diagnosis of sexual dysfunction is only warranted when the sexual concerns are associated with significant personal distress. Further diagnostic criteria from the more recent DSM-V [15], published in 2013, require that the sexual concerns have persisted for at least 6 months and must occur 75-100% of the time.

Table 1 Definition and classification of female sexual dysfunctions according to DSM-IV [9]

Definition Disturbances in sexual desire and the psycho-physiologic changes that characterize the sexual response cycle and cause marked distress and interpersonal difficulty
Desire disorders Hypoactive sexual desire Persistently or recurrently deficient (or absent) sexual fantasies and desire for sexual activity. The judgment of deficiency or absence is made by the clinician, taking into account factors that affect sexual functioning, such as age and the context of the person's life. Sexual aversion disorder Persistent or recurrent extreme aversion to, and avoidance of, all (or almost all) genital sexual contact with a sexual partner **Arousal disorders** Female sexual arousal disorder Persistent or recurrent inability to attain, or maintain until completion of the sexual activity, an adequate lubrication-swelling response of sexual excitement **Orgasm disorders** Female orgasmic disorder Persistent or recurrent delay in, or absence of, orgasm following a normal sexual excitement phase. Women exhibit wide variability in the type or intensity of stimulation that triggers orgasm. The diagnosis of female orgasmic disorder should be based on the clinician's judgment that the women's orgasmic capacity is less than would be reasonable for her age, sexual experience, and the adequacy of sexual stimulation she receives. **Pain disorders** Dyspareunia Recurrent or persistent genital pain with sexual intercourse Vaginismus Recurrent or persistent involuntary spasm of the musculature of the outer third of the vagina that interferes with sexual intercourse. **Other sexual disorders** Sexual dysfunction due to a general medical condition Substance-induced sexual dysfunction Sexual dysfunction not otherwise specified
Specifiers for diagnosis 1. Lifelong type vs. acquired type 2. Generalized vs. situational type 3. Due to psychological factors vs. due to combined factors

Table 2 Classification of sexual disorders of women according to various systems

ICD-10 (1992) [12]	DSM-IV (1994) [9]	Consensus Report (2001) [13]	DSM-V (2013) [15]
– loss of sexual desire – sexual aversion – failure of genital response – orgasmic dysfunction – nonorganic vaginismus – nonorganic dyspareunia – excessive sexual drive – other sexual disorders	– hypoactive sexual desire – sexual aversion disorder – female sexual arousal disorder – female orgasmic disorder – dyspareunia – vaginismus – other sexual disorders	– hypoactive sexual desire – sexual aversion disorder – female sexual arousal disorder – female orgasmic disorder – dyspareunia – vaginismus – noncoital sexual pain	– sexual interest / arousal disorder – female orgasmic disorder – genitopelvic pain / penetration disorder – substance or medication-induced sexual dysfunction

1.3. Prevalence of female sexual dysfunction

The classification systems described above are not only designed to aid medical professionals in diagnosing female sexual dysfunction, but also to aid researchers in quantifying its distribution. Not until the DSM-III was published could researchers begin to systematically assess the prevalence of these disorders both in clinical and normative populations [16].

Research in the clinical setting has favored men over women, not only due to the design of clinical trials themselves which favor male participants, but also – in the case of sexual medicine – due to the accidental discovery of a successful treatment for erectile dysfunction in the 1990s [17]. Still, the year 2000 marked the start of a steady incline in the number of peer-reviewed publications on the topic of female sexual dysfunction [18, 19]. Publications on clinical research have underlined the complex etiology of sexual dysfunction. They have revealed that female sexual dysfunction may be a symptom of non-infectious diseases such as cancer, diabetes, cardiac disease, as well as depression [20-23]. Furthermore, they've shown that sexual dysfunction may be the side effect of certain prescription medications [23]. Clinical research has also focused heavily on pharmaceutical therapies which may reduce menopausal symptoms [24, 25]. However, sexual dysfunction is not only limited to clinical settings or to women going through menopause. It is an important health issue which affects younger women in general populations as well.

Several literature reviews have been performed in the past 30 years [16, 26, 27], yet none has been able to quantify the overall number of premenopausal women who report sexual dysfunction. In 1986 Sharon G. Nathan performed an epidemiological analysis of 22 population

studies using the classification system from the DSM-III [16]. These studies, ranging in date from 1929 to 1981, showed prevalence rates of 1-35% for inhibited desire (in women) and 5-15% for inhibited female orgasm. No estimate could be given for inhibited sexual excitement (or arousal) as none of the studies inquired about both adequate stimulation and the presence of lubrication problems. The sexual pain disorders, vaginismus and dyspareunia, had not been assessed in general populations up until that point.

In her analysis, Nathan not only struggled with limited epidemiological data but also a wide variety of tools which employed various cut-offs for defining dysfunction. Today, nearly 30 different measurement tools are available to assess the prevalence of female sexual dysfunction in normative populations [18]. Thus, a recurring theme in this field of research continues to be the standardization of assessment tools. Even in studies in which the same assessment tool is applied, researchers often use non-validated cut-offs or population-specific cut-offs, making comparisons across studies difficult. Prevalence rates in studies may also vary due to the reporting period and the duration of symptoms [28]. Not until the DSM-V (2013) did the diagnostic criteria for female sexual dysfunction attempt to specify the reporting period and duration of symptoms.

Nearly 20 years after Nathan, West et al. performed a similar epidemiological analysis and discovered a three-fold increase in the number of studies on the prevalence of female sexual dysfunction in general populations [26, 27]. They found rates of sexual dysfunction that ranged between 1-50% for desire disorders, 4-48% for arousal disorders, 3-50% for anorgasmia, and 1-75% for dyspareunia [27]. Like Nathan, West et al. were unable to provide an overall prevalence estimate for female sexual dysfunction, due to the varying definitions and classifications of dysfunction as well as the lack of standardized, valid assessment tools.

Thus, at the moment, there is no global estimate of the prevalence of female sexual dysfunction. Currently, the most frequently cited statistic for the prevalence of female dysfunction stems from a 1999 study published in the Journal of the American Medical Association [14, 29]. The prevalence rate of female sexual dysfunction was estimated to be 43% in a US population aged 18-59 [29]. However, in order to have a valid estimate of the global prevalence of a particular disease or disorder, a single study from a single population is not sufficient. Furthermore, considering that sexual dysfunction is age related [13], stratification according to age group and – particularly, in the case of women – according to reproductive cycle must be taken into account.

Studies on female sexual dysfunction are on the rise around the globe, but a comprehensive estimate of the global burden of this medical issue is currently not available.

1.4. Predictors of female sexual dysfunction

Sexual dysfunction has a biopsychosocial etiology, i.e. the origin of the dysfunction may stem from a biological or organic condition, a psychological condition and / or a social condition. At the level of the individual, doctors aim to determine the etiology of the dysfunction and treat it accordingly. At the level of the population, however, researchers aim to predict which factors might put one population at risk over another population. Identifying these predictors and their effect (whether protective or risk-inducing) may aid health professionals to better detect and potentially prevent sexual problems from arising.

Past literature reviews have identified a number of similar biological, psychological and social predictors of female sexual dysfunction across different populations. In a 1990 systematic review on sexual dysfunction in both men and women, age, education, socio-economic status, and marital status were found to have an influence on male and female sexual dysfunction [26]. West et al.'s 2004 systematic review on female sexual dysfunction uncovered further predictors such as physical health (both observed and perceived), psychological health, race / ethnicity, number of premarital partners, religion, sexual orientation, communication with partner and attitude towards sexuality [27].

Predictors of sexual dysfunction are numerous, and various approaches can be used to classify and assess them. The gold standard in epidemiological research is to identify the exact effect sizes of predictors, that is, the quantitative effect of a specific risk factor or protective factor in a population expressed as a measure of relative and / or attributable risk. Such quantitative analyses require a certain degree of homogeneity in the observed population, a certain degree of homogeneity in the measurement of the construct of interest and therefore often focus on a limited number of predictors. In this project, however, the aim was not to quantify the magnitude of the effect of a single predictor but to uncover the breadth of predictors in heterogeneous populations around the globe and to identify possible trends. In order to provide a more structured analysis of the multifaceted risk factors and protective factors in these populations, the predictors of female sexual dysfunction were examined using a sociological paradigm, specifically the paradigm of gender inequality.

Global studies in sexual medicine have shed light on the association between gender inequality and sexual function. Using a survey of 27 500 men and women in 29 countries, researchers

from the Global Study of Sexual Attitudes and Behaviors (GSSAB) identified common gender-based trends of sexual attitudes in behaviors across countries [30]. The participants' subjective responses on four components of sexual health (satisfaction with sexual functioning, physical pleasure, emotional pleasure, and importance of sex) revealed three clusters or so-called "sexual regimes." A gender-equal sexual regime was found in typically Western countries. One type of male-centered sexual regime was identified in a mixed, international group of countries, and another type of male-centered sexual regime was seen in Asian countries.

Satisfaction with sexual functioning was one component of the sexual well-being score. A closer look at the responses in each country revealed that women in gender-equal regimes rated their subjective sexual functioning at 64.4% - 91.1% [median 78.1%], while women in the mixed male-centered and the Asian male-centered regimes rated their functioning at 44.5% - 82.1% [median 56.7%] and 39.7% - 61.3% [median 45.5%], respectively. Similar trends in women's responses were also seen in the other three components of the sexual well-being score. It should be noted, though, that in all three clusters women had consistently lower scores in terms of their sexual well-being compared to men. However, differences were greater between men and women in the two male-centered regimes. These results underline the importance of examining sexual health outcomes in terms of the level of gender inequality in a society.

While it cannot be assumed that gender inequality is the cause of sexual dysfunction, applying this sociological paradigm provides a form of stratification of the extracted data and may help to distinguish trends in prevalence rates and predictors. Thus, part I of the project aimed to quantify the prevalence rates of female sexual dysfunction among premenopausal women, and part II aimed to qualify these estimates through analyzing the predictors of sexual dysfunction in the studied populations.

1.5. Care of female sexual dysfunction

Epidemiological data on the prevalence and the predictors of a particular illness contribute to our understanding of that illness within a population [16]. These data can ultimately provide the needed justification for changing or improving health services, training medical professionals accordingly and, in case of the detection of modifiable risk factors, developing of prevention strategies. Although female sexual dysfunction is considered to be highly prevalent [29], age-related [13] and symptomatic of other critical diseases [23], recent studies from the US, the UK and Germany have shown a number of barriers in diagnosing and treating female sexual

dysfunction in the out-patient setting. A 2009 study on female sexual dysfunction in urogynecological practices in the UK revealed that doctors were not able to care appropriately for patients with sexual dysfunction due to limited time, insecurities about how or what to ask, and lack of medical knowledge concerning therapy options [31]. Physicians in the US expressed similar barriers: limited time, absence of effective treatment options, reliance on patients to initiate the discussion, and lack of medical knowledge and comfort in addressing sexual dysfunction [32, 33]. In Germany specifically, further barriers to care exist. Patients who have been referred for sex therapy may not utilize these services [34]. This may be due to the long waiting times resulting from the dearth of qualified sexual therapists and psychologists in Germany [34, 35]. A 2009 study of German medical schools and residency programs found that sexual health is not thoroughly addressed [36]. If it is addressed, it is only in didactic form without any practical training. Thus, German doctors may not feel prepared to bring up this topic with their patients due to the lack of necessary training [34].

Sexual health is an important aspect of many women's lives – from adolescence to old age. Because of its effect on health and well-being, greater efforts should be made to diagnose and treat female sexual dysfunction. Yet in Germany, female sexual dysfunction remains one of the most under-diagnosed and under-treated medical conditions [37]. More research is needed to identify current barriers for medical practitioners and ultimately break them down.

2. Aims

The aims of the dissertation project "Epidemiology and care of female sexual dysfunction" were:

- to provide a global, meta-analytical estimate of the prevalence of female sexual dysfunction and its domains among premenopausal women (part I)
- to summarize the risk and protective factors related to female sexual dysfunction among premenopausal women in multiple countries, with a focus on gender inequality (part II)
- to investigate the current barriers for medical practitioners in Bavaria, Germany in terms of diagnosing and treating female sexual dysfunction (part III)

3. Methods

3.1. Study designs [1]

3.1.1. Meta-analysis of the prevalence of female sexual dysfunction (part I)

The systematic literature review aimed to provide an overview of the current epidemiological state of female sexual dysfunction. The publications identified through the systematic review would be the source for both a quantitative and qualitative analysis of prevalence and predictors, respectively. The methods for this systematic review were developed according to the recommendations from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statements [38]. This protocol was also registered with the International Prospective Register of Systematic Reviews (PROSPERO) under CRD42014009526 and is available in published form [39].

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 to the time frame January 1, 2000 until July 10, 2014. The search was performed by an experienced medical research librarian. All titles and abstracts were screened for their relevance. 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 on the basis of their title.

A standard form was designed and used to evaluate the full text publications for inclusion (appendix). Two investigators 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. In the case of multiple publications based on a single study, the most current and / or inclusive study was selected. A second hand search was performed, using the reference lists of all included articles.

Cross-sectional, cohort and case-control studies were eligible for this systematic review. Validation studies were not included, nor were reviews, reports or commentaries. Clinical

[1] In the framework of this thesis, parts of the methods of the systematic literature search have already been published in: Prevalence and Predictors of Female Sexual Dysfunction: A Protocol for a Systematic Review. Systematic Reviews, Jul 2014; 3: 75.

populations or populations of women who were surveyed due to a particular disease or illness were excluded. Studies which addressed female sexual dysfunction in infertile women or couples as well as studies which examined spouses / partners of men with erectile disorder were also excluded.

In order to be included, the study needed to report the prevalence of female sexual dysfunction or at least one domain of female sexual dysfunction according to the DSM-IV-TR (Diagnostic and Statistical Manual of Mental Disorders 4th edition, text revision), as this was the relevant manual at the time of the studies (2000-2014) [40]. The disorders in DSV-IV-TR are identical to DSM-IV: hypoactive sexual desire disorder, sexual aversion disorder, female sexual arousal disorder, female orgasmic disorder, and pain disorders [9, 40]. A further aspect of sexual dysfunction was included in this analysis as well: lubrication. 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 [40, 41]. However, since its publication in 2000, further evidence has been shown for differentiating between central or subjective arousal and peripheral or genital arousal i.e. lubrication [42, 43]. In their validated assessment tool, the Female Sexual Function Index or FSFI (2000), Rosen et al. already began to distinguish between measures of subjective arousal and measures of lubrication and assessed these aspects separately [44]. Contrary to the DSM-IV-TR, the FSFI, which is widely used in population studies around the world [45], used the term "sexual arousal" to refer to a woman's subjective arousal, while the term "lubrication" referred to the genital indices of a sexual response [44]. Due to variation in classification and in measurement tools across studies, the authors chose to include any study which reported "sexual arousal" and / or "lubrication."

Female sexual function has been shown to change over the course of the reproductive cycle [46]. West et al. stratified the results of their systematic literature search by reproductive cycle in order to determine if certain disorders or risk factors were associated with particular life cycles [27]. Rather than provide a superficial overview of sexual dysfunction in all reproductive cycles, the focus of this research was on one subset of women, namely non-pregnant, non-lactating premenopausal women in the general population. Any studies which primarily focused on menopausal, postmenopausal, pregnant or lactating women were excluded. Due to the fact that several epidemiological studies covered a broad age range of women, a numeric cut-off was used for the studies which 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) is estimated at 48.7 years [47, 48]. Thus, studies were in included

if a) all women surveyed were premenopausal, b) the age range of the participants was between menarche and 49 years or c) the data on women age 49 years and below could be extracted from the whole population.

Data collection

Data were extracted from the included studies using an electronic data extraction form created in Microsoft Access. The extraction form was pre-designed and pilot-tested. A pilot test was performed with 20 randomly selected publications on the prevalence of female sexual dysfunction. 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 co-authors were contacted personally. All authors were contacted in the month of 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, the data were examined and verified by a second reviewer. Discrepancies in data entry were documented, discussed and revised accordingly.

Classification of sexual disorders

In the data collection process, prevalence rates were extracted for female sexual dysfunction in general (e.g. fulfilling a cut-off 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 [40]. Previous authors of 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 [16, 26, 27]. While the inclusion of personal distress has been shown to yield lower prevalence rates of female sexual dysfunction in population studies [49-51], very few studies in the past included the criterion of personal distress in their assessment of the prevalence of sexual dysfunction [52]. In order 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 literature in the observed time frame, the author has chosen to use the term "sexual dysfunction" for this systematic review.

Methodological quality assessment

Methodological quality was assessed for all studies included the meta-analysis using a checklist from Prins et al [53]. Using the quality criteria, risk of bias was assessed in terms of 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 was examined for included each study. Each study was assessed independently by two investigators. In case of disagreement, consensus was reached through discussion with a senior researcher.

Outcomes

Included publications were presented in evidence tables. Each study was assessed separately by two reviewers for its quality and for potential risk of bias. Results were presented in figures. A meta-analytical estimate of prevalence rates was calculated for each domain of female sexual dysfunction, and a meta-regression was used to analyze factors of study design. A univariate analysis [54] was performed for all six outcomes (female sexual dysfunction and its five domains) as well as for the following factors: region of the world, type of sexual regime [30], 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 (GII) to determine if there was a relationship between the prevalence of female sexual dysfunction and the level of gender inequality in a country [55].

3.1.2. Qualitative analysis of the predictors of female sexual dysfunction (part II)

Because of its biopsychosocial etiology, there are a number of factors in the biological, psychological and social realm that are associated with female sexual dysfunction. A qualitative, rather than quantitative summary of the predictors was performed in order to illustrate the breadth of predictors and the populations of women worldwide who may be at risk. The data for the qualitative analysis were extracted from the publications identified through the systematic literature search (part I). Therefore, the methods from part I apply to part II, and the focus remains on premenopausal women.

Data collection and categorization of predictors

Significant risk and protective factors were extracted from the included publications. All significant predictors, regardless of the type of analysis (multivariate linear regression models or univariate comparisons), were extracted from the publications. Non-significant risk factors were also documented.

The predictors extracted from the publications were then stratified using two different schemes: 1) the type of sexual regime and 2) the level of gender inequality / human development. For both schemes, similar risk factors / protective factors were grouped together, e.g. the term "relationship dissatisfaction" was used to represent terms such as "dissatisfied in marriage" and "poor relationship with husband;" the term "partner" was used instead of "husband" or "spouse."

Stratification methods

The type of sexual regime was based on results from the Global Study of Sexual Attitudes and Behaviors (GSSAB) which surveyed 27 500 men and women in 29 countries [30]. Using the data from this survey, Laumann et al. identified three types of sexual regimes worldwide: a gender-equal regime, a male-centered regime, and an Asian sexual regime which is also considered male-centered. Respondents in these three regimes showed similar sexual attitudes and behaviors. The gender-equal sexual regime primarily consisted of Western / European nations (Austria, Belgium, France, Germany, Spain, Sweden, the United Kingdom, Mexico, Australia, Canada, New Zealand, South Africa, and the United States). The first male-centered sexual regime included mixed group of countries (Algeria, Egypt, Israel, Italy, Morocco, Turkey, Korea, Malaysia, the Philippines, and Singapore). The second male-centered sexual regime entailed only Asian countries (China, Indonesia, Japan, Taiwan, and Thailand).

The significant predictors extracted from the included publications were stratified according to type of sexual regime and presented in a Venn diagram or in narrative form.

Table 3 GSSAB sexual regimes according to Laumann et al.

Countries with a gender-equal sexual regime	**Countries with a male-centered sexual regime**	
	mixed	Asian
Austria, Belgium, France, Germany, Spain, Sweden, the United Kingdom, Mexico, Australia, Canada, New Zealand, South Africa, and the United States	Algeria, Egypt, Israel, Italy, Morocco, Turkey, Korea, Malaysia, the Philippines, and Singapore	China, Indonesia, Japan, Taiwan, and Thailand

For the level of gender inequality / human development, the Gender Inequality Index (GII), created by the United Nations Development Program, was used. The GII is based on current (ranging from 2010-2015) rates of maternal mortality, adolescent birth, women's secondary education, women's political involvement, and labor force participation [55]. Using these data, each country is given a GII value between 0 and 1: the higher the value, the greater the inequality. According to 2014 data, the three countries with lowest gender inequality are Slovenia (0.021), Switzerland (0.03) and Germany (0.046), while the three countries with the greatest inequality are Yemen (0.733), Niger (0.709), and Chad (0.707). A link to the GII can be found here: http://hdr.undp.org/en/content/table-4-gender-inequality-index. Based on the GII value, countries are sorted into quartiles with the following human development groups: very high human development, high human development, medium human development, and low human development. The significant risk factors found in the publications were stratified according to level of human development and illustrated in the form of word clouds. Due to a large number of highly-specific medical conditions addressed in these 135 publications, only the significant risk factors which were identified in at least two separate studies were included in the word cloud. This allowed for better comparison across the levels of human development. Furthermore, the word clouds were designed to be sensitive to the number of publications in which a certain risk factor had been identified, i.e. a risk factor which was identified in four publications would be presented in a larger font in the word cloud than a risk factor identified in only two publications.

3.1.3. Survey of medical professionals on the care of female sexual dysfunction (part III)

Beyond studying the epidemiology of female sexual dysfunction, the research project aimed to assess the level of care available to women with female sexual dysfunction. Obstetricians and gynecologists (OB/GYN) are the preferred point of contact for women who have sexual concerns [56].

Population

According to the German Medical Society, there are around 9000 practicing OB/GYNs in Germany. Due to financial constraints, a regional rather than national survey was performed. According to the Bavarian Association of Compulsory Health Insurance Physicians (Kassenärztliche Vereinigung Bayern, KVB), there are currently 1826 registered OB/GYNs in the state of Bavaria [57]. All publicly available postal addresses were extracted from the website of the KVB.

Questionnaire

A postal questionnaire was sent to all Bavarian OB/GYNs whose addresses could be found on the KVB website. The questionnaire included validated items from previous surveys of OB/GYNs as well as items related to behavior change, based on the Theoretical Domains Framework [31, 33, 58]. Items from the English questionnaires went through forward-backward translation. The questionnaire was first piloted-tested with a team of 10 German-speaking researchers in the field of medical sociology and psychology. It was then revised accordingly after a pilot-test with three German-speaking OB/GYNs and one general physician. Topics addressed in the questionnaire were: demographic information, estimated prevalence and populations at risk, communicating with patients about sexual function, referral patterns and treatment options, medical knowledge and training, and finally perceived barriers in caring for female sexual dysfunction. The German version of the questionnaire can be found in the appendix.

The questionnaire was sent out in November 2014 and could be returned anonymously via pre-paid envelope or fax. Participants could also complete the questionnaire online through a web-based survey program. To increase the response rate, reminders were sent in December 2014. Data collection concluded in February 2015. To ascertain if biases might exist among respondents, a non-response survey was also performed. Fifty percent of the population was randomly selected and sent a short non-response form. Replies could be sent in by fax.

3.2. Data management and statistical analyses

For the data extraction for part I, a pilot-tested extraction tool was developed using Microsoft Access. A screenshot of this extraction tool can be found in the appendix. SPSS 22 was used for the majority of statistics (IBM, Armonk, NY, USA). Meta-analyses were performed using the software MetaXL [59]. Meta-regressions were performed using STATA version 12.0 (StataCorp LP, College Station, TX, USA). Cochran Q and I^2 statistics were used to test for heterogeneity of

the studies [60]. Publication bias was examined using Begg's rank correlation test and Egger's correlation test [61, 62]. Sensitivity analyses were performed by dropping one study at a time. For the creation of word clouds in part II, an online word cloud generator was used [63]. For the survey of medical professionals in part III, associations between doctors' demographic background and 1) aspects of communicating with patients and 2) aspects of medical knowledge and training were assessed through stratified analyses, using χ^2 tests to measure significance of the association. In all parts of the project, a p-value of <0.05 was considered significant.

3.3. Ethics approval

Approval from an ethics committee was not required for any part of this project.

4. Results

4.1. Meta-analysis of prevalence rates of female sexual dysfunction (part I)

Aim

To provide a global, meta-analytical estimate of the prevalence of female sexual dysfunction and its domains among premenopausal women

Characteristics of studies

Of the 19 442 citations retrieved through electronic and other references searches, 10 150 duplicates were excluded, leaving 9292 titles and abstracts to be screened. On the basis of title and / or abstract, 8852 citations were excluded. The full texts of 440 publications were then evaluated. In the end 135 publications fulfilled all inclusion criteria [49-52, 64-194]. Figure 1 provides a PRISMA flow chart with reasons for exclusion. Sixty-seven authors were contacted for additional information for the meta-analysis; 37 out of 67 authors responded (55.2%) and / or supplied additional data. The smallest population size was 100; the largest was 84 644. The mean study size was 2420 participants; the median was 853 participants.

Table 4 shows general characteristics of included studies (n=135). Nearly all publications described cross-sectional studies. The number of premenopausal women in these studies was generally less than 2000 with only three very large studies with more than 10 000 premenopausal women. A third of studies took place in European countries, followed by the regions non-Europe West (USA, Canada, South Africa, New Zealand, and Australia) and Asia. Seventy studies (51.9%) used paper questionnaires to collect data on reported sexual dysfunction. The Female Sexual Function Index (FSFI) from Rosen was the most frequently used measurement tool (43 out of 135, 31.9%) [44]. Thirty-six percent of the studies used measurement tools with unclear validation or no validation at all.

Specific characteristics and prevalence rates for each study included the systematic review can be found in the appendix. Forty studies from the literature review could not be included in the meta-analysis due to insufficient data on participants and / or prevalence rates. Therefore, the meta-analysis entailed 95 studies, comprising 215 740 participants. The prevalence of female sexual dysfunction was reported in 53 studies. In terms of the domains, the prevalence of hypoactive sexual desire disorder was reported in 62 of the studies, sexual aversion disorder in five 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. Since the vast majority of studies did not include personal distress in their assessment of prevalence (89.5%, n=85), the authors henceforth used the prevalence rates of sexual dysfunction without personal distress.

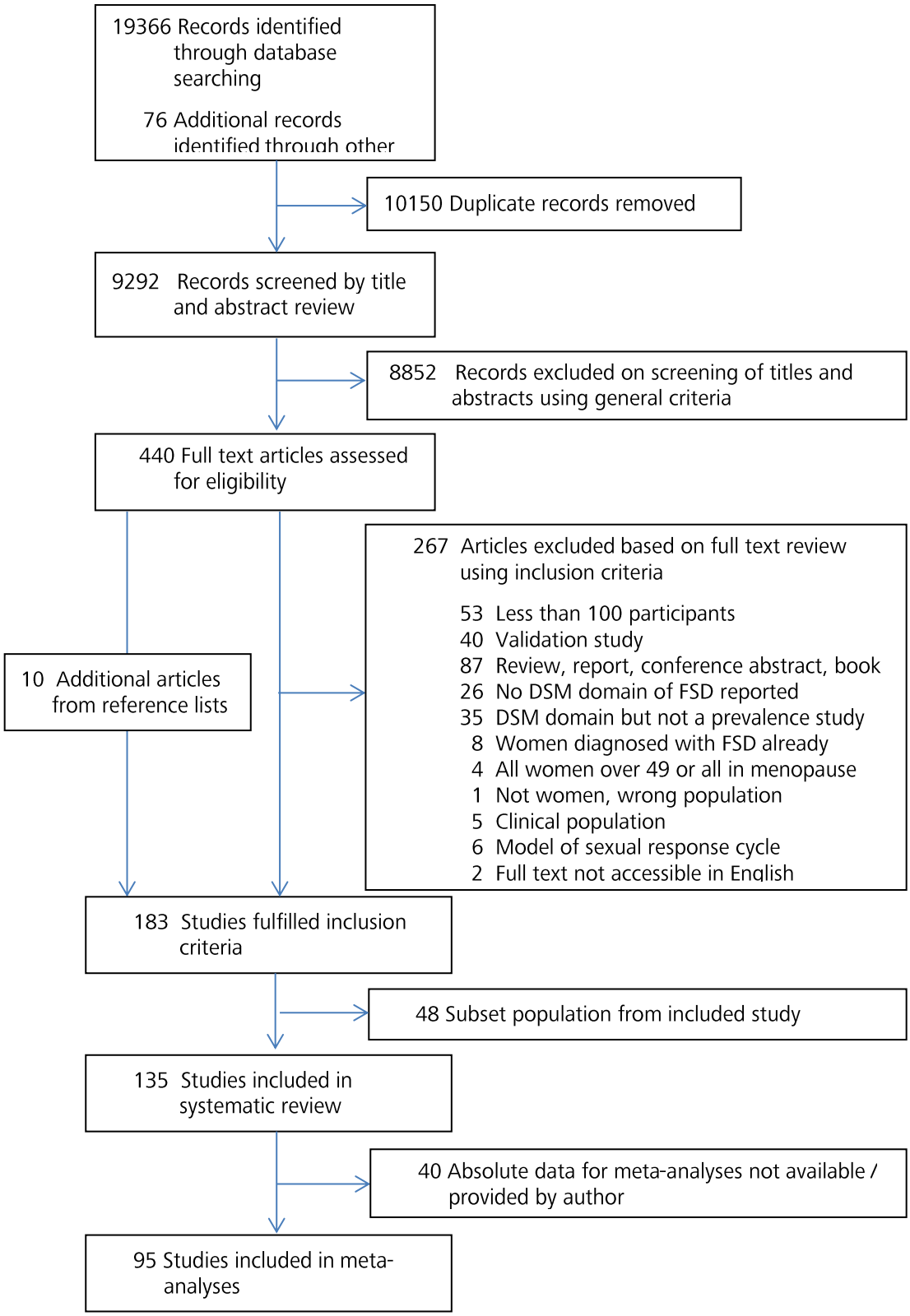

Figure 1 PRISMA flow chart showing number of citations retrieved from a systematic literature search in multiple databases

Table 4 General 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 [a]	
100-499	55 (47.4)
500-1999	44 (37.9)
2000-9999	14 (12.1)
10000-84644	3 (2.6)
Region	
Europe	45 (33.3)
non-Europe West [b]	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 / unclear	49 (36.3)
Sampling method	
convenience clinical [c]	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)

[a] n=116 studies, absolute numbers were missing for 19 studies
[b] USA, Canada, South Africa, New Zealand, Australia
[c] Women who were recruited in non-emergency, clinical settings such as OB/GYN waiting rooms

Study risk of bias

All studies included in the meta-analysis (n=95) were assessed for their methodological quality. The risk of bias for these studies is summarized in Figure 2. Studies identified as “high risk” did not provide sufficient information to make a conclusion or they did not fulfill the specific quality

criterion. Of the 95 studies, only 2 (2.1%) were judged as "low risk" on all risks of bias considered. Studies identified as "low risk" provided the necessary information to fulfill a specific quality criterion. The prevalence rates were judged as reproducible in 76.8% of the studies. In 37 studies (38.9%), the population observed was either randomly selected or considered representative of the larger population. Fifty-nine studies (62.1%) employed validated measurement tools, and 63 studies (66.3%) specified the reporting period of the measurement tool. Sixty-five studies (68.4%), however, had a low response rate or did not provide sufficient information about the population of non-responders.

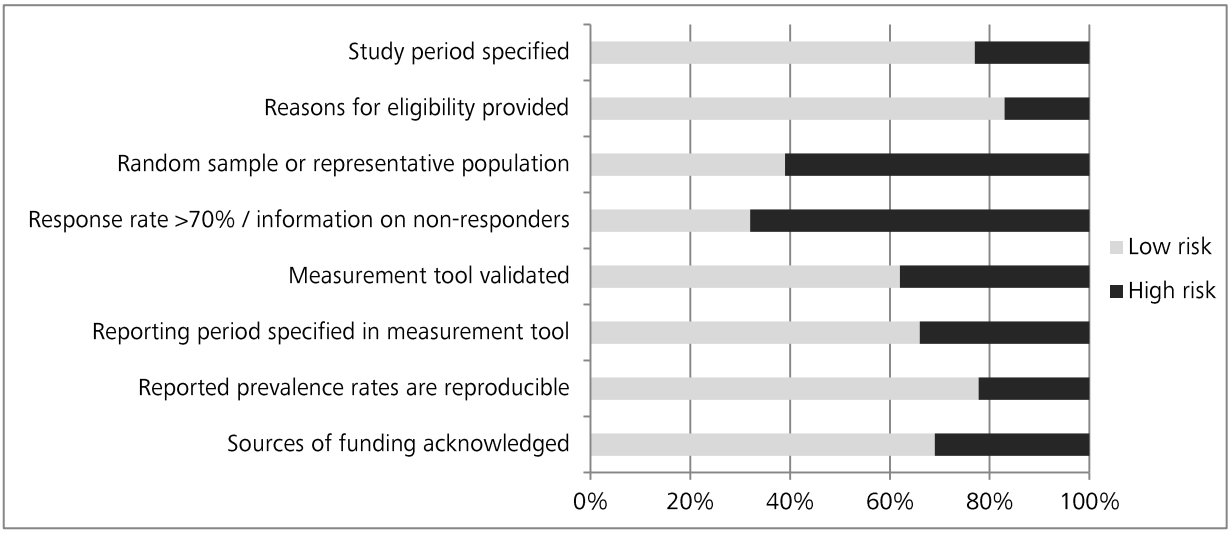

Figure 2 Risk of bias of included studies (n=95)

Meta-analysis and meta-regression

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

Table 4 reveals the meta-analytical prevalence rates for female sexual dysfunction and its domains. The prevalence of female sexual dysfunction among 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: 40.4% (95% CI: 33.3;47.0, I^2 = 99.1%). Prevalence estimates varied in the

specific domains of female sexual dysfunction (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 were able to reduce heterogeneity substantially ($I^2 \leq 50\%$) for any outcome.

Further subgroup analyses showed significantly higher prevalence rates of female sexual dysfunction in Africa and the lowest rates in Non-Europe West. Studies performed in countries with gender-equal sexual regimes had significantly lower rates of lubrication difficulties, orgasmic disorder and pain disorders. This is further supported by the correlation of prevalence rates with the Gender Inequality Index (GII) (Table 5). In all domains there was a positive correlation but particularly in female sexual dysfunction, orgasmic disorder and pain disorders, a significant, positive correlation could be established. Higher rates of sexual dysfunction were reported in studies which used interviews and questionnaires together to collect data. Both random sampling and sampling from convenience populations in out-patient settings (convenience clinical) revealed 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 was performed which tested the hypothesis that the widely used, validated FSFI might yield different results from other validated assessment tools and non-validated assessment tools. No clear trend was apparent through this analysis. In terms of reporting period, assessment tools which inquired about symptoms in the past month showed significantly lower prevalence rates while studies with reporting periods of 2-12 months revealed significantly higher rates. Studies which permitted only sexually active women to participate showed consistently higher prevalence rates of sexual dysfunction compared to studies which 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 Begg's rank correlation test and Egger's correlation test. Results from the sensitivity analysis revealed that there was no effect given by a single study.

Table 5 Prevalence estimates of female sexual dysfunction by factors of study design (n=95)

Factors	No. of studies	FSD % (95% CI)	Desire % (95% CI)	Arousal % (95% CI)	Lubrication % (95% CI)	Orgasm % (95% CI)	Pain % (95% CI)
Total (QE)	95[a]	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[a]	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 (stderr) p-value	93	1.56 (0.65) **P = 0.020**	0.40 (0.71) P = 0.577	1.55 (0.910) P = 0.094	0.96 (0.95) P = 0.320	1.42 (0.55) **P = 0.012**	1.93 (0.59) **P = 0.002**
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-Europe 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 male-centered	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)
mixed 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)	-

Factors	No. of studies	FSD % (95% CI)	Desire % (95% CI)	Arousal % (95% CI)	Lubrication % (95% CI)	Orgasm % (95% CI)	Pain % (95% CI)
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 / 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							
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 months	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 / 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)

CI = Confidence interval, FSD = Female sexual dysfunction, QE = Quality effects, RE = Random effects, GII = Gender Inequality Index, FSFI = Female Sexual Function Index; ‡ P <0.05. [a] Number of studies included in the analysis for each domain: FSD n=53, Desire n=62, Arousal n=39, Lubrication n=36, Orgasm n=53, Pain n=65

Conclusion

Female sexual dysfunction is a significant public health problem which affects two out of five premenopausal women around the globe. Heterogeneity is high in population studies on female sexual dysfunction. Study design can have a significant effect on the results of the study. Rates of sexual dysfunction are generally lower in countries with greater gender equality and in countries with gender-equal sexual regimes.

4.2. Qualitative analysis of predictors (part II)

Aim

To summarize the risk and protective factors related to female sexual dysfunction among premenopausal women in multiple countries, with a focus on gender inequality

Characteristics of studies

The systematic literature search resulted in 135 eligible studies from 41 countries. Of the 135 studies, 97 publications (72%) from 34 countries analyzed predictors of female sexual dysfunction in premenopausal populations. A complete listing of both significant and non-significant predictors for each publication can be found in the appendix. Ninety-four publications from 33 countries reported significant predictors and were the basis for the basis for the following qualitative analyses (see Table 5).

Stratification of predictors was performed using two schemes: the sexual regimes of the GSSAB and the GII human development quartiles. The GSSAB covered 29 countries; 38 publications could not be included in the GSSAB sexual regime analysis, because the country of study had not been investigated in the GSSAB. However, 56 publications could be categorized into the following types of sexual regimes: gender-equal (n=27), mixed male-centered (n=19), and Asian male-centered (n=10). The GII data covers all countries which were represented in this review. Two multinational studies (Shaeer [166] and Blumel et al. [82]) among the 94 publications surveyed women in countries with different GII quartiles, thus they could not be included in this analysis. Therefore, 92 studies were assigned to the four categories: very high human development (n=43), high human development (n=35), medium human development (n=11), and low human development (n=3).

Summary of significant predictors

Due to the heterogeneous populations and due to the fact that studies assessed different factors, a wide variety of predictors was identified. A summary of the significant predictors for female sexual dysfunction and each of its domains can be found in Table 6.

Significant risk factors which were consistent in all domains of female sexual dysfunction were: poor physical health, poor mental health, poor partner health, partner unemployment, low education of partner, stress, abortion, menopause, genitourinary problems, female genital mutilation, relationship dissatisfaction, sexual dysfunction of partner, sexual abuse, and being religious. Factors which consistently had a significant, protective effect across all domains were: older age at marriage, exercising, daily affection, intimate communication, having a positive body image, sex education and finding sex to be "important." For some factors, mixed results were reported in the studies, and a clear tendency (whether risk-inducing or protective) could not be found for: age, education, employment, parity, being in a relationship, frequency of sexual intercourse, race, alcohol consumption, smoking and masturbation.

Table 6 Summary of significant predictors for female sexual dysfunction and domains (n=94)

	Risk factor	Unclear effect	Protective factor
Female Sexual Dysfunction	**Demographic:** unemployment, unemployment of partner, low education of partner, low SES, illiteracy, economic hardship, restrictive upbringing, sharing a bedroom with family members. **Health and well-being:** poor physical health, poor perceived health, poor mental health, low life satisfaction, poor quality of life, poor social relationships, environment with limited opportunities, chronic illness, heart disease, obesity, physical disability in previous year, depression, anxiety, taking antidepressants, dieting, alcohol, smoking, sleeping problems, polypharmacy. **OBGYN:** high number of births, ever pregnant, use of IUD, cervical erosion, late debut menarche, abnormal menstrual pattern, female genital mutilation, guilt about abortions, difficult delivery, menopause, urinary incontinence, endometriosis, yeast infection, gynecological surgery, genitourinary problems, pelvic inflammatory disease, hysterectomy, STI. **Partner:** poor partner health, partner smokes, older partner, partner has SD, relationship dissatisfaction, arranged marriage, polygamous relationship, living separately from partner, long duration of relationship. **Sexual life:** dissatisfaction with sex life, no / too little foreplay, no genital contact without intercourse (past month), ≥10 lifetime sexual partners, negative attitude toward sex, difficulty talking to partner about sex, not competent at first intercourse, bisexual preferences, homosexual preferences, non-sensuality, sexual abuse, sexual harassment, rape, dissatisfaction with partner's penis size.	age, level of education (high / low), level of income (high / low), residence (rural / urban), masturbation, use of contraceptives, use of HRT, being in a relationship / marriage, parity (having children / not having children), race	older age at marriage, faithful partner, access to private health care, emotional intelligence, frequent communication with partner, intimate communication, only 1 current sexual partner, pregnancy in last year, steady relationship without cohabitation, higher frequency of intercourse, church attendance, sex education, "sex is important"
Desire Disorder	**Demographic:** unemployment of partner, low education of partner, low SES, being religious, urban living, having young children, sharing a bedroom with family. **Health and well-being:** poor physical health, poor mental health, low life satisfaction, chronic illness, breast cancer, heart disease, diabetes, thyroid problems, hypertension, depression, anxiety, post-traumatic stress disorder (PTSD), drug addiction, habitualized negative thinking about oneself, dissatisfaction about how housework is done. **OBGYN:** late debut menarche, abnormal menstrual pattern, STI, female genital mutilation, tubal ligation, cervical erosion, ever pregnant, fear of pregnancy, birth in past year, menopause, urinary incontinence, genitourinary problems, hysterectomy, hormonal contraceptives, low hormones, multiparity. **Partner:** partner has SD, relationship dissatisfaction, internal stress with partner, habitualized negative thinking about partner, being widowed, long duration of relationship, married more than once. **Sexual life:** non-sensuality, sexual abuse, childhood sexual abuse, no / too little foreplay, low foreplay enjoyment, low sexual satisfaction, unidirectional coital initiation.	age, level of education (high / low), level of income (high / low), employment (unemployed / full-time), masturbation, being in a relationship / marriage, race, frequency of intercourse	older age at marriage, moderate alcohol consumption, smoking, spontaneous sexual initiation, varied sexual repertoire, exercising, non-exclusive relationship, liberal attitudes towards sex, good communication with partner, intimate communication, early sexual debut, having >1 lifetime sexual partner, daily affection, currently pregnant, imbalance of commitment (woman more committed than man), sex education, "sex is important"

Arousal Disorder	**Demographic:** unemployment of partner, low education of partner, low SES, being religious. **Health and well-being:** poor physical health, poor mental health, chronic illness, arthritis, thyroid problems, irritable bowel, anxiety, depression, polypharmacy, physical abuse. **OBGYN:** urinary incontinence, genitourinary problems, menopause, hormonal contraceptives, fear of pregnancy. **Partner:** partner has SD, partner has low desire, relationship dissatisfaction, internal stress with partner, polygamous relationship, long duration of relationship. **Sexual life:** "sex is dirty," no / too little foreplay, low foreplay enjoyment, high acceptance for pornography, liberal sex values, unidirectional coital initiation.	age, level of education (high / low), employment (unemployed / full-time), being in a relationship / marriage, race	older age at marriage, divorced / widowed / separated, emotional intelligence, exercising, intimate communication, positive body image, higher frequency of intercourse, use of HRT, daily affection, "sex is important"
Lubrication Difficulties	**Demographic:** older age, unemployment, unemployment of partner, low education of partner, low SES, economic hardship, sharing a bedroom with family, manual laborer. **Health and well-being:** poor physical health, poor perceived health, poor mental health, chronic illness, anxiety, seeking medical help, physical abuse. **OBGYN:** abnormal menstrual pattern, late debut menarche, cervical erosion, infertility, urinary incontinence, STI, menopause. **Partner:** partner has SD, relationship dissatisfaction, long duration of relationship, partner is unattractive. **Sexual life:** masturbation, higher frequency of intercourse, "sex is dirty," knowledge of clitoris.	level of income (high / low), level of education (high / low), being in a relationship / marriage	older age at marriage, faithful partner, intimate communication, sex education, "sex is important"
Orgasm Disoder	**Demographic:** unemployment, unemployment of partner, low education of partner, urban living, sharing a bedroom with family, being religious, job insecurity, low SES, manual laborer. **Health and well-being:** poor physical health, poor mental health, chronic illness, smoking, alcohol, stress / anxiety, feelings of guilt, arthritis, thyroid problems, depression, critical life event, seeking medical help. **OBGYN:** late debut menarche, abnormal menstrual pattern, cervical erosion, STI, urinary incontinence, multiparity, abortion, fear of pregnancy, menopause. **Partner:** partner has SD, relationship dissatisfaction, partner is unattractive, polygamous relationship, married more than once, long duration of marriage. **Sexual life:** low foreplay enjoyment, masturbation, knowledge of clitoris, non-sensuality, "sex is a duty," anti-masculinity, sexual embarrassment, rape by partner, no / too little foreplay, never / unsure if ever had orgasm, unidirectional coital initiation, sexual dissatisfaction, absence of sexual pleasure, unsatisfied with thickness / size of partner's penis.	age, level of education (high / low), level of income (high / low), being in a relationship / marriage, race, frequency of intercourse	older age at marriage, faithful partner, exercising, good communication with partner, intimate communication, satisfactory relationship with partner, use of contraceptives, daily affection, being divorced, married less than 5 years, sex education, "sex is important"
Pain Disoder	**Demographic:** unemployment, working overtime, unemployment of partner, low education of partner, urban living, sharing a bedroom with family, being religious, low SES. **Health and well-being:** poor physical health, poor perceived health, poor mental health, chronic illness, lung disease, arthritis, lower back pain, anxiety, exhaustion, seeking medical help, colitis, heavy lifting, constipation. **OBGYN:** late debut menarche, abnormal menstrual pattern, menopause, abortion, infertility, ever pregnant, early (<15 years old) sexual debut, use of IUD, hormonal contraceptives, STI, chronic urinary tract infections, urinary incontinence, genitourinary problems, cervical erosion, pelvic organ prolapse, pelvic inflammation. **Partner:** partner smokes, relationship dissatisfaction, planning more children. **Sexual life:** masturbation, "sex is dirty," varied sexual practices, sexual dissatisfaction, non-sensuality.	age, level of education (high / low), level of income (high / low), being in a relationship / marriage, mode of delivery, parity (having children / not having children), race, frequency of intercourse	older age at marriage, at least 4 years of regular intercourse, positive body image, liberal attitudes towards sex, currently pregnant, sex education, "sex is important"

SD = sexual dysfunction, SES = socio-economic status, IUD = intrauterine device, HRT = hormone replacement therapy, STI = sexually transmitted infection

Significant predictors of female sexual dysfunction by type of sexual regime

The meta-analysis revealed differences in the prevalence estimates for female sexual dysfunction in various sexual regimes, justifying a closer look at the risk factors and protective factors. Figure 3 provides an overview of the significant risk factors for female sexual dysfunction, shared among women living in the three GSSAB sexual regimes (n=56 studies).

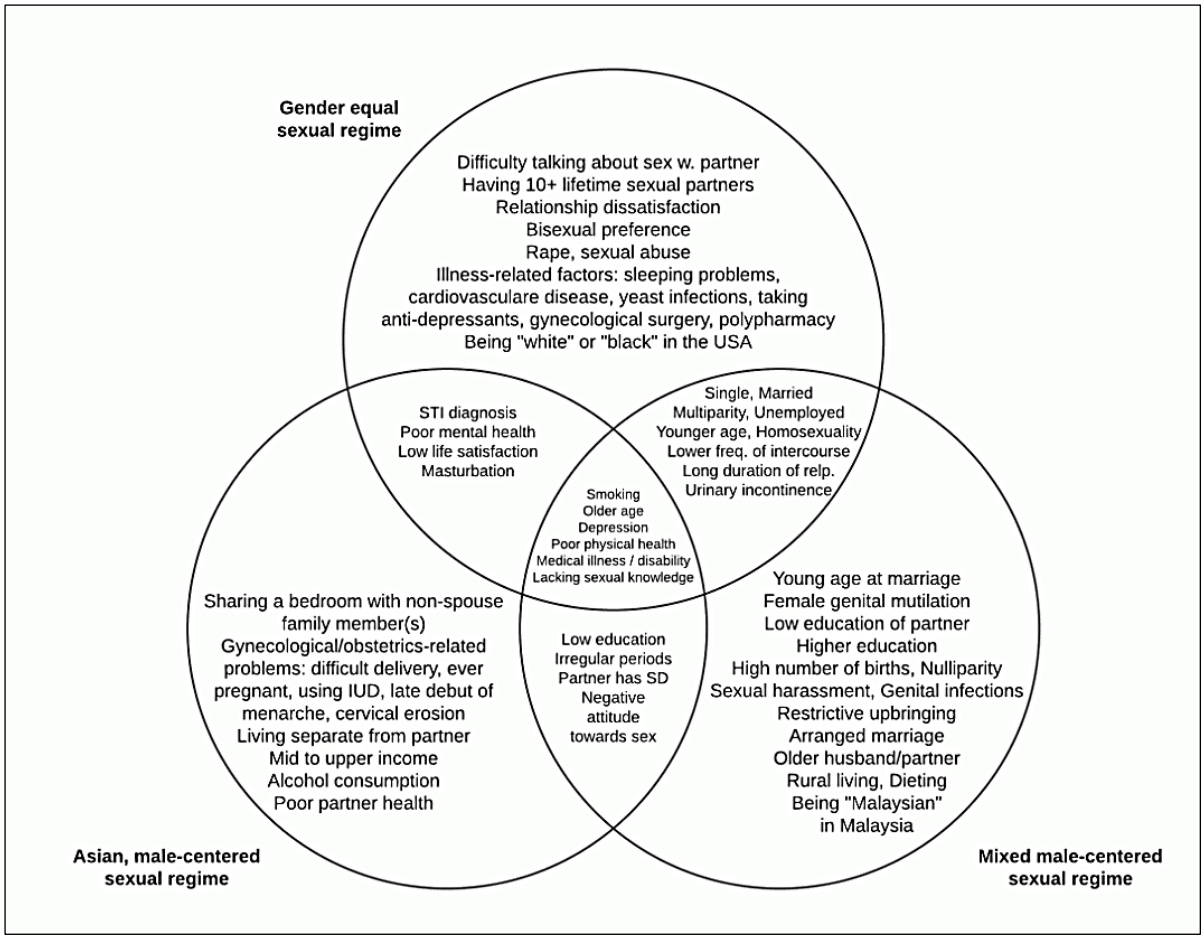

Figure 3 Venn diagram of the significant risk factors for female sexual dysfunction according to type of sexual regime (n=56)

Independent of the type of sexual regime, a lack of sexual knowledge, medical illness, poor physical health, older age, depression and smoking were found to be common significant risk factors for female sexual dysfunction. Some factors were however unique to the individual regimes. The studies performed in countries with gender-equal sexual regimes (n=27) reported risk factors which are associated a) with illnesses in Western lifestyle: cardiovascular disease, taking anti-depressants, sleeping problems, and polypharmacy or b) with sexual intimacy: difficulty talking with partner about sex, more than 10 sexual partners, relationship dissatisfaction, bisexual preference, and sexual abuse / rape. Studies performed in the mixed male-centered sexual regime (n=19) indicated risk factors primarily associated

with early partnership and reproduction: young age at marriage, older partner, arranged marriage, high number of births and nulliparity. Other risk factors unique to this regime were female genital mutilation, restrictive upbringing, rural living and dieting. Although there were not very many studies in Asian sexual regimes (n=10), there was a trend in partner-related factors: sharing bedroom with non-spouse family member, living separate from partner, and poor partner health. Two significant risk factors which surfaced in Asian studies were also mid to upper income as well as alcohol consumption.
Some of the significant protective factors noted in the various regimes included: higher frequency of intercourse (gender-equal and male-centered), use of contraceptives as well as sex education (male-centered), and frequent communication with partner (Asian).

Significant predictors in the domains of female sexual dysfunction by type of sexual regime
Prevalence rates for desire disorder were not significantly different in the three regimes, according to the results of the meta-analysis (Table 5). Prevalence estimates ranged between 22.1% and 36.0%. Risk factors for desire disorder were multitudinous but rather similar across all regimes (socio-economic difficulties, relationship difficulties, physical and mental health issues, etc.). The protective factors for desire disorders in the regimes were however quite unique. In gender-equal regimes, smoking and alcohol consumption had a protective effect, as well as spontaneous sexual initiation, masturbation, being in a non-exclusive relationship and having an imbalance of commitment in a relationship (woman more committed than man). For the mixed male-centered regime, alcohol consumption had a protective effect, as well as spontaneous sexual initiation, a varied sexual repertoire and sex education. Finally, for Asian male-centered sexual regimes, having a liberal attitude towards sex and being pregnant were protective factors for desire disorder.
Based on the results of the meta-analysis (Table 5), significantly higher rates of arousal disorder were found in both male-centered sexual regimes (27.4% Asian and 39.3% male-centered vs. 11.0% in gender-equal). Protective factors for arousal disorder in gender-equal regimes were: higher education, emotional intelligence, never married / widowed / divorced / separated, middle age (30-49), and using hormone replacement therapy. In contrast, being single was a risk factor for arousal disorder in the mixed male-centered regime and higher education was found to be a risk factor in Asian countries. Notably, having liberal sex values and a high acceptance for pornography were two further risk factors for arousal disorder in the Asian male-centered sexual regime.
Prevalence rates for lubrication difficulties were highest in the mixed male-centered sexual regime (37.2%, $p<0.05$) and lowest in gender-equal sexual regimes (13.5%, $p<0.05$) (Table 5). Older age was a risk factor in both aforementioned regimes; relationship dissatisfaction

was unique to the gender-equal sexual regime while being single was unique to the male-centered sexual regime. No protective factors for lubrication difficulties could be identified in the studies.

The prevalence of orgasmic disorder was significantly lower in gender-equal sexual regimes (16.8% vs. 31.6% mixed male-centered and 25.4% Asian male-centered), as shown in Table 5. Protective factors across all regimes are worth highlighting: age group 30-40 (gender-equal), finding sex important (gender-equal and Asian male-centered), using contraceptives and being unmarried (mixed male-centered). With orgasmic disorder, there were more risk factors associated with the partner in both gender-equal and Asian regimes: relationship dissatisfaction, being unsatisfied with size / thickness of partner's penis, low foreplay enjoyment, unidirectional coital initiation, no daily affection, unattractive partner, adulterous partner, and partner has sexual dysfunction. Other risk factors which were unique to the Asian male-centered sexual regime were masturbation in the past 12 months and knowledge of the clitoris.

Lastly, the prevalence rates of pain disorders were lowest in gender-equal sexual regimes and highest in mixed male-centered sexual regime (12.1% vs. 35.0%). Older age was found to be a risk factor and a protective factor for all three sexual regimes.

Significant risk factors of female sexual dysfunction by level of human development

The meta-regression (Table 5) revealed a significant correlation between the prevalence estimates for female sexual dysfunction and the GII scores (slope: 1.56 (SD 0.65), p = 0.020). Figure 4 provides an illustration of the variety and frequency of the significant risk factors for female sexual dysfunction, stratified by human development (HD) group (n=94 studies).

Figure 4 Word clouds of significant risk factors for female sexual dysfunction stratified by GII level of human development (n=94)

The risk factors illustrated in the word clouds have commonalities and differences. In very high, high and medium HD groups, menopause and older age were risk factors in the observed studies. Although this analysis focused on premenopausal women, some studies with broad age ranges also included women going through menopause. These risk factors were not apparent in studies in countries from the low HD group (Nigeria, Kenya, Uganda and Ethiopia). Contradictory risk factors were evident, e.g. low vs. high education. Risk factors related to sexual oppression were exposed through the stratification process. Homosexual and bisexual women are at a greater risk for sexual dysfunction in the very high HD group, while women who are in polygamous relationships and those who have gone through female genital mutilation are at risk in medium and low HD groups. Sexual abuse was a risk factor in both very high and low HD groups.
Risk factors in each domain of female sexual dysfunction were analyzed, but the findings did not provide further insight beyond that which had already been exposed through the analysis by sexual regime.

Significant protective factors of female sexual dysfunction by level of human development
Protective factors in studies conducted in countries with very high HD were (all domains): good overall health, higher education, positive body image, exercising, masturbating, moderate alcohol consumption, smoking, higher number of lifetime partners, church attendance, intimate communication, and the use of hormone replacement therapy. Studies conducted in countries with high HD revealed similar protective factors: good overall health, higher education, moderate alcohol consumption, and good communication with partner. Other significant protective factors in the high HD group were: using contraceptives, having sex education, finding sex to be "important," an older age at marriage, spontaneous rather than unidirectional sexual initiation, and a varied sexual repertoire. Studies in the medium and low HD groups yielded only a few significant, protective factors; these were higher income, having some education, and the use of hormone replacement therapy.

Conclusion
By stratifying prevalence rates and predictors of female sexual dysfunction by gender inequality scores and human development levels, patterns as well as research gaps could be identified. Risk factors of female sexual dysfunction vary considerably from country to country, but were generally related to physical and mental health. Factors which consistently had a significant, protective effect were: older age at marriage, exercising, good overall health, daily intimacy and relationship satisfaction, having a positive body image, sex education and finding sex to be "important."

4.3. Survey of medical professionals (part III)

Aim

To investigate the current barriers for medical practitioners in Bavaria, Germany in terms of diagnosing and treating female sexual dysfunction

Response rate and non-response survey

Using the Kassenärztliche Vereinigung Bayern (KVB) website, 1346 postal addresses of OB/GYNs could be extracted. According to a press representative from the KVB, the discrepancy between the number of registered doctors and the available addresses on the website is due to two factors: 1) not all 1826 doctors work in out-patient care and 2) many doctors who do work in out-patient care do not wish to have their contact information online. Therefore, a total of 1346 questionnaires were sent out by mail, followed by a reminder four weeks later. Fifty-five letters were returned without a forwarding address or alternative method to resend the questionnaire. Out of 1291 questionnaires, 235 were completed and returned, giving a response rate of 18%. These responses were received via post (89.3%), Internet (8.9%) and fax (1.7%).

For the non-response survey, 50% of all doctors in the mailing list were contacted again to inquire about reasons for their lack of participation. Although the original questionnaire was anonymous, 73 of the 235 doctors had freely provided contact information which immediately excluded them from being potential non-responders. Thus, from all remaining doctors in the mailing list (n=1219), 609 doctors were contacted for the non-response survey. The response rate for the non-response survey was 11.3% (69 / 609). According to Table 7, the primary reason for non-participation was due to a lack of time (53.6%, n=37).

Demographic information

Table 8 provides demographic information of the participating OB/GYNs and their practices. Thirty-nine percent of the OB/GYNs were male and 61% were female. The median age bracket of the sample was 51-60. Compared to recent statistics from the KVB, 43% of OB/GYNs in Bavaria are male and 57% female; their average age is 52.8 [57]. Highly significant gender differences could be identified in this sample. Male physicians were significantly older and had been working longer after completion of their residency than female physicians. More so than male physicians, female physicians had their practices in larger cities. The median number of patients for both male and female OB/GYNs was reported to be 1000 patients per quarter.

Table 7 Results of non-response survey (n=69)

Reasons for non-response [a]	Mentioned by doctors n (%)
I didn't have time / I forgot about it.	37 (54%)
I never saw the questionnaire / I can't remember having seen it.	19 (28%)
I don't feel competent in the field of sexual dysfunction.	5 (7%)
Questions considered inadequate	4 (6%)
My patients do not bring up the topic of sexual dysfunction.	2 (3%)
Sexual dysfunction does not belong to my field of work.	0 (0%)
Other specific reasons e.g. being retired	6 (9%)

[a] multiple responses possible

Table 8 Demographic factors of respondents according to gender (n=235)

Demographic factors[a]	Male n=90	Female n=143	p of gender difference
Age in years			
31-40	3	7	***
41-50	20	62	
51-60	36	63	
>60	31	11	
Post-residency work experience[b]			
≤10 years	5	26	***
11-20 years	32	73	
>20 years	53	43	
Population of practice location			
<20,000 people	28	46	***
20,000-100,000 people	32	41	
Over 100,000 people	30	56	

[a] N=2 did not indicate gender. [b]N=1 female respondent missing.
Chi-square test of gender difference: ***p<.001; **p<.01; *p<.05

Estimated prevalence and populations at risk

Half of the OB/GYNs estimated the prevalence of female sexual dysfunction to be 21-30% or more among their patients. Since the prevalence of disorders fluctuates with various reproductive cycles [27, 46], doctors were asked which disorders they observed in specific patient populations. Multiple disorders could be selected for each population (Figure 5). Doctors frequently observed desire disorder in postpartum women, women ages 26-49 and

women over 50. Over 85% of OB/GYNs observed lubrication difficulties in their patients over 50. According to doctors, orgasmic disorder was common among their patients under 25. Pain disorders were most often observed in women after birth and women over 50.

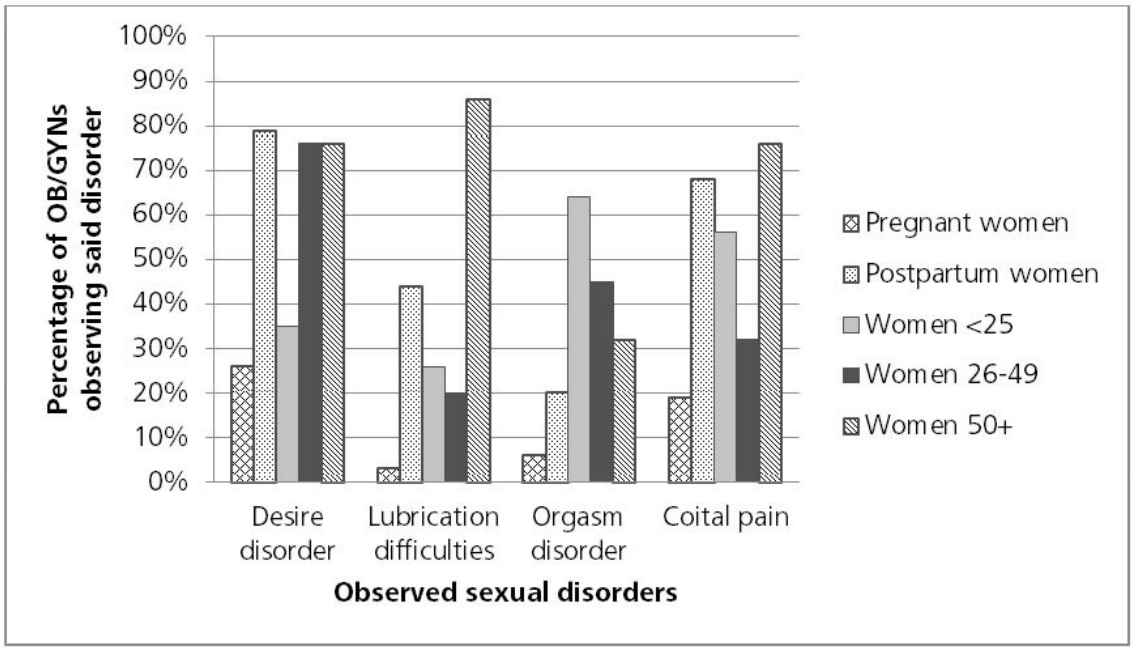

Figure 5 Observed sexual disorders in various patient groups, according to OB/GYNs (n=235)

Risk populations were also identified by doctors. Consistent with observed frequencies of disorders, 86% of OB/GYNs stated that they consider women over 50 to be at risk for sexual dysfunction, followed by postpartum women (74% of doctors). Women with psychological disorders and women with chronic illnesses were also viewed as risk populations (78% and 63% of doctors respectively). Socio-demographic factors were not perceived to be risk factors to the same degree as age, the postpartum period and mental or physical illness. Migration background, high body mass index and low education were considered risk factors by doctors, however to lesser degree (17%, 13% and 4% respectively).

Communicating with patients about sexual function

Three questions addressed communication about sexual function between patients and doctors: patients' reporting of sexual problems, doctors' initiative in addressing sexual dysfunction, doctors' subjective evaluation of their communication skills. More than half of doctors (57%, n=133) believe there is an under-reporting of sexual problems among patients. Sixteen percent of doctors (n=37) believe there is an over-reporting of sexual problems and 26% (n=60) believed reporting is equivalent to the prevalence of sexual problems among the patients. There were no significant differences between the perceived

reporting behaviors and the demographic background of the doctors (gender, age, work experience, city population).

Twenty-six percent of OB/GYNs stated that they typically rely on patients to initiate the topic of sexual complaints (n=60). About half of the doctors will breach the topic of sexual function or sexual satisfaction with patients in risk populations (53%, n=124). Twenty-one percent of doctors (n=50) address sexual function routinely with nearly all their patients. In the univariate analyses, there were highly significant differences in approaches to the topic of sexual dysfunction and the demographic background of the doctors. After stratifying according to gender, these differences were no longer significant. More female doctors take the initiative to speak to their patients routinely about sexual function than do male doctors (25% vs. 16%, $p<0.001$). For both male and female physicians, there is a tendency for doctors over 50 to be more passive i.e. rely on the patient to bring up the topic.

OB/GYNs generally viewed their communication skills concerning sexual function to be satisfactory, good, or very good (86%). There were no significant differences between the perceived communication skills and the demographic background of the doctors. However, further analyses showed that initiating a conversation about sexual function was significantly associated with perceived communication skills ($p=0.001$).

Referral patterns and treatment options

Referral rates to sex therapists, psychologists and family counseling providers e.g. Planned Parenthood were generally low. Based on median values, OB/GYNs referred 5% of their patients with sexual dysfunction to family counseling organizations; they referred 10% of their patients to sex therapists / psychologists. Nine doctors referred all of their cases to sex therapists / psychologists and one doctor referred all cases to family counseling organizations. Half (52%, n=122) of all OB/GYNs said that they personally treated at least 50% or more of their own patients who presented with sexual dysfunction. Of these, sixteen OB/GYNs stated that they never referred to other doctors or organizations but personally treated all of their own patients who presented with sexual dysfunction. Still, not all patients desire therapy for their sexual problems. In a space for open-ended answers, five doctors mentioned that, in their experience, 50-80% of women with sexual dysfunction did not wish to have any form of treatment.

Doctors who treated some or all of own patients applied a number of different therapies, depending on the disorder. The most common approaches included: psychosocial counseling (with and without partner), prescription of topical creams / gels, change of birth control method / medication, start / change / end of hormone replacement therapy, educational / practical tips, suggesting the use of dilators and / or dildos, and

recommendations for self-help via literature, videos or sex shops. Other approaches mentioned, although less frequently, were: physical therapy, hypnosis, exercise courses such as yoga or belly dancing, homeopathic medicine, as well as giving permission for self-exploration and removing any taboos related to sexuality. Eighty-five percent of doctors (n=201) however still feel that the availability of evidence-based therapy options is less than satisfactory or poor. In terms of treatment options specifically for desire disorder, 96% of OB/GYNs said that their patients have inquired about oral medication. Such inquiries came most frequently from women over 50 followed by women between the ages of 26-49.

Medical training and competence

Doctors were asked about the training during residency in terms of diagnosing and treating sexual dysfunction. Out of 227 replies to this question, 203 (89%) said that the training was less than satisfactory or poor. When asked about their own medical competence in handling sexual dysfunction, 35% described it as less than satisfactory or even poor, 39% as satisfactory, and 26% as good or very good. There were no significant differences between perceived medical competence and gender, work experience or city population. However, age proved to be significant (p=0.005). Forty percent of OB/GYNs over 60 years old considered their medical competence in handling sexual dysfunction to be good to very good. OB/GYNs' answers for the age groups 41–50 and 51–60 did not differ from one another were very similar, with 25% of doctors rating their medical competence as good or very good. However, of the younger OB/GYNs (ages 31-40) not a single one perceived his or her medical competence to be good or very good; 90% of younger OB/GYNs (ages 31–40) rated their medical competence in this field as only satisfactory and 10% as less than satisfactory or poor. A chi-squared test showed that a doctor's initiation of a conversation about sexual function was significantly associated with his or her perceived medical competence (p=0.008).

Perceived barriers to care

Three questions, soliciting multiple responses, addressed perceived barriers to care. Eighty-five percent of doctors (n=199) experienced challenges when diagnosing and treating female sexual dysfunction in the practice. The greatest barriers were the limited time that they have with each patient and the lack of financial compensation for sexual history taking and for therapy i.e. counseling.

Ninety-five percent of doctors (n=223) expressed difficulties when referring patients to sex therapists and psychologists. The main challenges were the long waiting times, due to the

low number of specialists, and the patient's reluctance to go to therapy. These results are shown in Table 9.

The final item on the questionnaire asked participants to select the three greatest barriers they experience when caring for female sexual dysfunction in an out-patient setting. As shown in Figure 6, OB/GYNs found these barriers to be the lack of sex therapists and psychologists (selected by 60% of doctors) followed by the lack of time to speak with patients about sexual health (56% of doctors), and finally the poor training in residency (47% of doctors). Fifteen percent of doctors (N=36) selected four or more answers and could therefore not be analyzed. However in this group, the same three barriers were marked most frequently.

Table 9 Various barriers to care experienced by OB/GYNs (n=235)

Barriers to care [a]	Mentioned by doctors N (%)
Barriers in diagnosing and treating sexual dysfunction in the practice	
Too little time with patient	147 (62.6)
No financial reimbursement for therapy	145 (61.7)
Unsure about therapy options	45 (19.1)
No screening method or questionnaire to facilitate diagnosis	32 (13.6)
Fear of getting too personal with patient	21 (8.9)
Barriers in the referral process	
Long waiting times	168 (71.5)
Patient's reluctance to go to therapy	140 (59.6)
Financial barriers for patient (out-of-pocket)	77 (32.8)
Therapists' / psychologists' lack of expertise	56 (23.8)
Too few therapists / psychologists	36 (15.3)
Partner's reluctance to go to therapy	5 (2.2)

[a] multiple responses possible

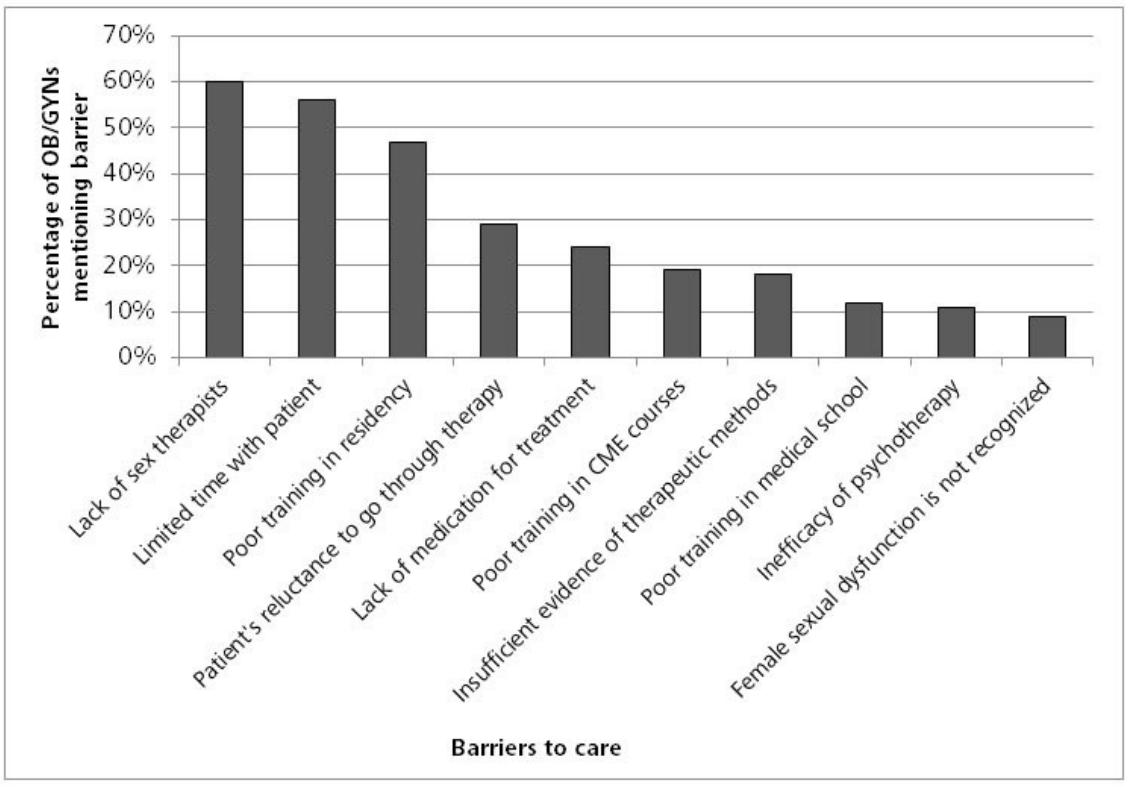

Figure 6 Barriers in diagnosing and treating female sexual dysfunction, as perceived by OB/GYNs in out-patient care (n=198)

Conclusion

German OB/GYNs in out-patient care are aware of the high rates of sexual dysfunction among their patients; they also realize that there is an under-reporting of sexual problems among German patients. At the same time, German OB/GYNs are confronted with significant barriers in terms of diagnosing and treating female sexual dysfunction in the out-patient setting: long waiting times for referrals to sexual therapists, too little time with patients, and insufficient training in residency.

5. Discussion

5.1. First-ever prevalence estimate

Prevalence rates and heterogeneity of studies [2]

In light of former systematic reviews, it is clear that epidemiological research in the field of female sexual dysfunction has increased substantially over the past few years [16, 26, 27, 195]. The systematic literature review (2000-2014) entailed 135 international studies, 95 of which were then included in the meta-analysis. This review far exceeds the previous systematic review from West et al. (1966-2004) which entailed 40 studies in general populations of women [27]. Considering that peer-reviewed publications on female sexual dysfunction only began to increase around 2001 [19], former systematic reviews were unable to 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 female sexual dysfunction and the individual domains, as previous systematic reviews were only able to provide broad ranges for the prevalence of female sexual dysfunction. 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 among premenopausal women ranges between 21-28%: hypoactive sexual desire disorder 28%, female sexual arousal disorder 23%, lubrication difficulties 21%, female orgasmic disorder 26%, and pain disorder(s) 21%. These results are in line with those of Laumann et al.'s frequently cited study which estimated that 43% of women ages 18 to 59 report sexual dysfunction [29]. The estimated prevalence rates for the various sexual disorders were also relatively close to the ranges determined by Laumann et al. for women ages 18 to 49: 30-32% lacked interest in sex, 18-21% had lubrication difficulties, 22-28% could not achieve orgasm, and 13-21% experienced pain during intercourse. When compared to West et al.'s ranges for the various disorders, the present estimates of this study were higher for desire disorder (28% vs. 10-20%) and pain disorder (21% vs. 10% for dyspareunia only) [27]. The prevalence rates therefore align with previous research but provide a much more precise and robust estimate.

Substantial heterogeneity in population studies, e.g. study design, classifications of disorder, assessment tools, reporting period, cut-offs, etc., hindered authors of former systematic

[2] In the framework of this thesis, parts of the discussion have already been published in: McCool et al. Prevalence of Female Sexual Dysfunction among Premenopausal Women: A Systematic Review and Meta-analysis of Observational Studies. Sexual Medicine Reviews, Jul 2016; 4: 3, 197-212.

reviews on female sexual dysfunction in establishing a prevalence estimate [16, 26, 27]. Meta-analyses provide a tool by which prevalence rates may be quantified, yet heterogeneity is in fact the main challenge in these types of analyses [196]. An I^2 greater than 95% is not uncommon in meta-analytical estimates of prevalence rates [196]. Subgroup analyses can provide possible explanations for the heterogeneous results, as well as weighing the studies according to their quality (quality effects model). Thus, in addition to using stratification by subgroups, quality effects and random effects methods, multiple tests for biases were performed including a risk of bias evaluation, correlation tests for publication bias, and sensitivity analyses. The methodological assessment indicates that a risk of bias may be present in several studies due to the non-representativeness of the populations. This 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 female sexual dysfunction, while lower rates of sexual dysfunction were found in the regions of Europe and 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 were often significantly lower than in Asian countries (China, Japan, and Thailand) and countries with mixed male-centered sexual regimes (Egypt, Italy, Morocco, Brazil, Malaysia, and Turkey) [30]. Particularly in male-dominated cultures, where sex may be viewed only as a method for procreation, women's sexual needs and pleasure are suppressed [128]. Extreme cases of this can be seen in African studies in which factors such as female genital mutilation (FGM), polygamy, and rape by partner were all significant risk factors for female sexual dysfunction [97, 103, 149]. High rates of female sexual dysfunction were also found in Asian countries, as seen in both subgroups "region" and "sexual regime." In these cultures, a different mechanism is at work. Women who do not conform to traditional female roles may experience greater difficulties [128]. 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 may lead to poor sexual functioning [91, 170]. A correlation could be seen between the Gender Inequality Index (GII) and prevalence rates, as shown in Table 5. For female sexual dysfunction, female orgasmic disorder and pain disorders, a significant positive correlation was found between increasing gender inequality scores (country scores between 0-1 with 1 being the greatest inequality) and increasing prevalence rates in a

country. This correlation was, however, not evident with hypoactive sexual desire disorder; in fact, prevalence rates of desire disorder were comparatively high in both gender-equal sexual regimes as well as in the regions Europe and Non-European West. In egalitarian societies such as these, correlates such as full-time employment and housework-imbalance with partner have shown to be predictors of low sexual interest / reduced sexual desire among women [165, 180]. While it is not possible to draw conclusions as to the causal association of gender (in)equality with sexual dysfunction, global studies have found that sexual functioning, emotional pleasure and physical pleasure are all rated higher in countries with greater gender equality; this holds true for women's sexual well-being and also for men's [30].

Study design was another major focus of this systematic review. Similarly to former systematic reviews, a large variety of assessment tools was used to measure female sexual dysfunction; 49 out of 135 (36%) had unclear validity. The validated FSFI from Rosen was the most frequently used assessment tool [44], yet even the studies using the FSFI applied various and / or non-validated cut-offs such as median values or the 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 confidence intervals. Thus, the large span in prevalence rates across studies may in part not reflect real differences, but may be due to the variety of tools and cut-offs which were used [197]. Furthermore, there was great variation in the reporting period. The FSFI asks about any symptoms in the past month, whereas other studies queried symptoms in the past three months, six months, 12 months or ever. Hayes has shown that even very minor differences in the reporting period have an impact on the prevalence rates [28]. Higher rates of sexual dysfunction were reported in studies which used interviews and questionnaires together to collect data. However, the nine out of the 16 studies in this subset were performed in the Middle East and Africa and had prevalence rates of female sexual dysfunction reaching as high as 76.2%.

Around two-thirds of studies in the meta-analysis required women to have been sexually active in the past year. Excluding women on the basis of sexual activity could create a bias in that these non-sexually active women may not engage in intercourse because of their sexual disorder [138]. Furthermore, some studies in Middle Eastern and African countries as well as India only allowed married women to participate. However, recent studies in these countries show that the restrictions surrounding marriage are loosening and women's sexual freedom is increasing [198-200]. Thus, studies only including married women may not clearly represent women's sexual health in the general population.

The final factor which was assessed in this meta-analysis was the impact of pharmaceutical funding on prevalence rates, as it has been shown that industry-sponsored research tends to yield pro-industry conclusions [201]. In 2003, as research on women's sexual health was beginning to gain momentum, Moynihan's article in The British Medical Journal "The making of a disease: female sexual dysfunction" accused pharmaceutical companies, as well as clinicians and researchers, of fabricating an illness [14]. However, the current analysis clearly revealed that studies with pharmaceutical funding had consistently lower prevalence rates than those not funded by pharmaceutical companies or those studies which did not report funding sources. The studies in this subset were primarily from Europe and Non-European West regions, which generally had lower – however not necessarily significantly lower – prevalence rates. Studies funded by pharmaceutical companies used validated questionnaires 70% of the time, as did those without pharmaceutical funding (funding not reported, 45% of the time). Pharmaceutically-funded studies employed 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 – both of which were significantly lower – studies funded by pharmaceutical companies achieved higher numbers of participants per study. Furthermore, these studies had higher study quality and fewer biases compared to studies without pharmaceutical funding / without reported funding. Thus, the results of this analysis suggest that the prevalence rates provided through studies with pharmaceutical funding may be more robust than those without pharmaceutical funding.

Limitations of the included publications

Although Spector and Carey urged researchers to find a common classification system for sexual dysfunction [26], classification of female sexual dysfunction remains problematic still today [13, 14, 202]. Basic terminology proved to be inconsistent across the publications. The terms sexual difficulties, sexual problems, sexual health issues, female sexual dysfunction symptoms and sexual disability were all used interchangeably with the term "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" [26].

Few publications in the current study assessed distress over sexual problems (10 out of 95 studies in the meta-analysis, 11 out of 135 in the literature review). Experts argue that sexually-related personal distress is a fundamental component of sexual disorders [13, 52]. Indeed, several studies have shown that the inclusion of personal distress yields lower prevalence rates of female sexual dysfunction in population studies [49-51]. Due to the scarcity of studies in this systematic review which assessed personal distress, the authors

were unable to 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 also be mentioned. Several authors indicated that the women in their studies (particularly in conservative cultures) may have been too shy to speak about sexual matters [91, 133, 153]. This may have resulted in an under-reporting of symptoms. On the other hand, over-reporting may have occurred in populations in which women are more open and more interested in talking about their sexuality [176]. Social acceptability may also affect responses. For example, in some Asian cultures, desiring sex as a woman is associated with infidelity [133]. In Western cultures however, sexual impulses are welcomed and the lack thereof is perceived as a dysfunction [203].

Limitations of the current study (part I)

The current systematic literature review provides an analysis of factors which, based on previous systematic reviews and secondary research, 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 current systematic review. The literature search was limited to English, lowering the amount of studies which might have possibly been included. The current review also only focused on women up to age 49; a review which included older women may have yielded different results, as sexual dysfunction has been shown to be age-related [204]. Finally, considering that 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.

5.2. Gender inequality in sexual health

Indication of imbalance

Through the increase in population-based studies around the globe, the number and variety of predictors have increased as well. This is the first systematic review to address significant predictors of female sexual dysfunction for each domain of sexual dysfunction. Due to the heterogeneous populations and the fact that studies assessed different domains of female sexual dysfunction, a wide variety of predictors could be identified among the 94 international studies. Factors which consistently had a significant, protective effect across all domains were: older age at marriage, exercising, good overall health, daily intimacy and

relationship satisfaction, having a positive body image, sex education and finding sex to be "important." Risk factors were frequently related to both physical and mental health of women. Other significant factors such as age, partnership, and parity showed mixed protective and risk effects in the populations and within the domains of sexual dysfunction.
Further stratification of these predictors was essential to this analysis. Because there were lower meta-analytical prevalence rates in gender equal sexual regimes and because of the correlation between high female sexual dysfunction rates and high gender inequality, the risk factors and protective factors were examined in terms of levels of gender inequality in order to better understand trends in predictors of female sexual dysfunction.

Stratification reveals research gap

Trends of predictors could be identified once the studies were stratified according to type of sexual regime (56 studies). In gender-equal sexual regimes (Western / European countries), risk factors tended to be related to chronic illness and mental health, as well as to quality of life factors. In the Asian male-centered sexual regime, risk factors were related to gynecological health but also to family and partner – more so than in the other two regimes. In the mixed male-centered sexual regimes (primarily Arab and African countries), risk factors including female genital mutilation, restrictive upbringing and high number of births point towards underlying challenges in women's rights and women's reproductive health.
Risk factors such as older age, poor health, and relationship dissatisfaction were found in all human development groups, regardless of the level of gender inequality (n=92). This stratification also revealed that far fewer studies can be found in countries with high to very high gender human development vs. those with medium to low human development (78 vs. 14). Studies from countries with low / medium human development accounted for less than 15% of all studies in this analysis, indicating a lack of research in these countries and limited knowledge concerning the predictors of female sexual dysfunction in these populations.

Risk factor or protective factor?

Former systematic reviews on sexual dysfunction primarily included studies from Western nations, i.e. the predictors of sexual dysfunction were based on gender-equal sexual regimes / countries with high development. With the growing number of studies in developing nations and Asian countries, it is evident that not all risk factors and protective factors are universal. In a large US study, education was identified as a protective factor against sexually distressing problems [167]. In studies from Iran and Jordan, young women who are educated and have gainful employment are less likely to show symptoms of sexual

dysfunction [64, 164, 182]. However, several studies from China have shown that young women who have higher education were more likely to report sexual dysfunction [128, 194, 205]. Through higher education, these women gain increased awareness of their sexual needs and rights, and such women tend to feel more disappointed with their marital and sexual relationships, which may lead to poor sexual functioning [91, 170]. Similarly, while increased frequency of sexual intercourse was found to have a protective effect in most cultures, some studies in traditional cultures showed that frequent sex might be demanded by the partner and is therefore a risk factor for sexual dysfunction in these women [128, 149].

Some predictors showed variation within the domains. For example, female sexual dysfunction has generally been shown to be age-related [13]. Older age tends to be a risk factor for all domains except for pain disorder(s), where it is shown to have a protective effect. Other studies showed a U-shaped prevalence of sexual dysfunction, with younger and older women being most affected [206]. Women in their 30s may show fewer symptoms of dysfunction as they learn more about their preferences and become more comfortable accepting and expressing their sexuality [186]. Similar variation in the effect (whether positive or negative) was found for employment, income, partnership status, and parity.

Laumann et al. established two different male-centered sexual regimes, because the Asian sexual regime had clear differences in attitudes and behaviors when compared to Middle Eastern or African countries. Risk factors such as high acceptance of pornography, masturbation, liberal sex values and knowledge of the clitoris were unique to Asian population studies. The authors explain that in these societies, such women are non-traditional. Women who do not conform to traditional female roles may experience greater difficulties with their male partners [128].

Challenges in preventing sexual dysfunction

Protective factors, regardless of population, regime, or level of development, were: sex education, exercise, older age at marriage, daily affection, intimate communication, having a positive body image, and finding sex to be “important.” Since several of these factors are modifiable, preventive measures could be taken to potentially avert the onset of female sexual dysfunction. However, these factors may be more complicated to address in some countries than in other countries, as they are closely entwined with culture.

Sex education has a significant protective effect [65, 127, 139], but sex education and reproductive health services in many countries tend to focus exclusively on married women,

as it is culturally unacceptable for single women to have sexual relations. The needs of young, unmarried, sexually-active women may therefore go unaddressed [207].

Similarly, while exercise may seem like a reasonably modifiable risk factor for female sexual dysfunction, mobility, e.g. exercising, traveling and moving about in public spaces, can be challenging for women living in countries with high gender inequality. An international study of 70 countries revealed that women's lack of autonomy and resources to move freely can result in mobility disability [208]. This means that women in countries with higher gender inequality may not be able to have healthy lifestyles, e.g. getting enough physical activity or traveling to the doctor to receive care.

Furthermore, male-dominated cultures, in which sexual behavior is oriented more towards reproduction, tend to suppress women's sexual needs and pleasure and to discount the relational meaning of sex [30, 128]. Current practices in these cultures such as arranged marriages, marriages at a young age, polygamy and female genital mutilation are associated with significantly higher levels of sexual dysfunction in women [72, 97, 101, 103, 149].

Finally, women in conservative cultures women may also be too timid to express their needs or feel that it is socially unacceptable to discuss sexual problems with their partner [91, 133, 153]. While lower rates of sexual dysfunction are found in women who share intimate communication with their partner [138], this may be easier in some cultures than in others.

Challenges in improving women's health are numerous. Gender inequality creates an additional barrier in terms of women's sexual and reproductive health. It is for this reason that the World Health Organization has made it one of its Millennium Development Goals to promote gender equality and empower women [207]. Research on gender inequality takes a considerable amount of time, as changes in cultural patterns do not take place overnight. However, health studies have confirmed the association between gender inequality and women's well-being. A recent ecological study from Stanford University on global HIV prevalence rates and the GII showed an overall positive correlation between the two variables ($r=0.525$, $p<0.001$) [209]. Furthermore, they were able to illustrate limited but compelling evidence that improvements in gender inequality can lead to the abatement of generalized HIV epidemics in countries with predominantly heterosexual transmission. Additionally, a study on reproductive health in 75 countries revealed that the empowerment of women was associated with the improvement of several health factors, including but not limited to fertility, maternal mortality, and low birth weight of the infant [210].

Limitations of the current study (part II)

The literature review aimed to collect all available data on the prevalence and predictors of female sexual dysfunction among premenopausal women, globally. While this literature

review and analysis on female sexual dysfunction covers studies from more countries than previous reviews, there were many countries which were not represented in this assessment (n=161). This lack of data may be due to the fact that the search was limited to the English language or due to a lack of published research on female sexual dysfunction in these countries.

Due to the study design, a causal association between female sexual dysfunction and the reported predictors cannot be demonstrated, nor can the findings be extrapolated to the individual level. Furthermore, a quantitative analysis would be necessary in order to determine the exact effect sizes of the risk / protective factors.

Finally, while this analysis summarizes a wealth of available data on significant predictors, it simultaneously reveals a dearth of research on women's sexual health. Factors which were not documented in this analysis are not irrelevant to sexual dysfunction, i.e. a factor which was not identified in a population / group / regime does not mean it is not pertinent to that population / group / regime. More in-depth research is needed, both quantitative and qualitative, in the field of women's sexual health – particularly in regions with male-centered sexual regimes and high gender inequality.

5.3. Treatment gap

Implications for the German health care system [3]

In this study, OB/GYNs observed a prevalence of female sexual dysfunction of 21-30% in their patients (median value), which is in line with reported prevalence rates in population studies of German women (23%) [81, 211]. This shows an improvement over previous surveys of OB/GYNs from the 1980s and 1990s in which doctors' estimates of prevalence were far below the reported prevalence rates in a population [212-214]. Risk factors noted by doctors in this study, such as poor mental health, poor physical health, menopause, and childbirth coincide with the predictors seen in epidemiological studies [215]. Doctors' responses in this sample therefore reveal a certain level of awareness in terms of the high prevalence rates and the many risk factors related to sexual dysfunction in women.

The current study also suggests that German OB/GYNs may be aware of their patients' reluctance to report any sexual problems. Over half of respondents acknowledge an under-reporting of symptoms among their patients. A recent US survey of women showed that although 90% of respondents would like to have or desire sex more often, most women did

[3] In the framework of this thesis, parts of the discussion have already been published in: McCool et al. Diagnosing and Treating Female Sexual Dysfunction: A Survey of the Perspectives of Obstetricians and Gynecologists. Sexual Health, Apr 2016; 13: 3, p 234-240.

not realize that distressing low sexual desire was a treatable medical condition and had never mentioned their problems to health care providers [216]. This may be due to reasons of shame or embarrassment and the expectation for the doctor to take the initiative [23, 34, 217]. Finally, there may be a cultural aspect involved. European studies on patients' help-seeking behaviors in different countries show that Germans are among those who are least likely to seek help from their doctor concerning their sexual problems [211].

However, there are few areas of medicine and psychotherapy in which the patient can be helped so effectively and is so appreciative than when the doctor addresses her sexual problems [23]. Yet, according to the present study, only one in five doctors does this. There are a number of reasons for this discrepancy. According to a report published by a major German health insurance company (Barmer GEK) in 2010, German doctors have about eight minutes' time with each patient, including the time needed for documentation [218]. Doctors feel that this amount of time is not sufficient for addressing sexual function with patients, as has been shown in this study and others [31, 32, 36]. Doctors are also not financially reimbursed for taking a sexual history [36]. If sexual dysfunction is in fact diagnosed by a doctor, psychosocial counseling – the most common form of therapy used by OB/GYNs to treat sexual dysfunction – is highly time-consuming and poorly compensated [219]. The present study shows that both time and money were the primary barriers in diagnosing and treating sexual dysfunction in the practice.

However these are not the only barriers which may hinder doctors from addressing sexual health with their patients. The current results show that initiating a conversation about sexual health is significantly related to a doctor's perceived communication skills. While doctors did not consider "getting too personal with the patient" as a barrier to care for them, they may not know how to begin a conversation about sex. Some doctors may also experience a lack of comfort in talking about this topic, for example due to differences in age and gender of the OB/GYN. Burd et al. illustrated that specialists report and perceive the greatest discomfort when taking a sexual history with patients of the opposite gender or with patients who are very old or very young [220].

Furthermore, results also showed that initiating a conversation about sexual health is significantly related to a doctor's perceived medical competence in the field of sexual medicine. OB/GYN residency programs, both past and present, do not prepare doctors for diagnosing and treating female dysfunction. Over 70% of doctors in each age group stated that the training in residency was poor, with 80% of the youngest doctors (31-40) rating it poorly. These results show that residency programs need to be improved and more opportunities for continuing medical education must be provided [34]. Of the doctors in this sample, 85% stated that there is a lack of evidence-based therapy options for treating

female sexual dysfunction, showing that more clinical research is desperately needed in this field.

In the case that a referral for psychotherapy is necessary, OB/GYNs encounter a number of barriers as well. In an analysis of the German health care system in 2000, Beier et al. criticized the low number of qualified therapists and doctors in sexual medicine [34]. Unfortunately, the German Society for Sexual Medicine, Sexual Therapy and Sexology does not have a current statistic on the number of psychologists providing sex therapy [221]. However, based on reports from the National Board for Psychotherapy, there are not enough qualified personnel in Germany to satisfy the demand for any form of psychological therapy [35]. Patients with psychological problems such as depression, trauma or eating disorders will wait up to three months for their first appointment. Psychologists in Germany must go through additional training to perform sexual therapy for individuals and couples, reducing the number of qualified professionals in this field even further. Considering the negative effect that sexual dysfunction has on quality of life and on partnerships, the lack of therapy options – whether pharmacotherapy or psychotherapy – poses a serious health dilemma [34].

Suggestions for improvement

While some barriers mentioned in this study would require major changes in the health care system, not all barriers are complete impasses. German OB/GYNs can attend continuing medical education (CME) courses from the OB/GYN National Academy (Frauenärztliche BundesAkademie GmbH, FBA GmbH) and receive training in diagnosing and treating female sexual dysfunction. They also receive CME points for these courses. However, the FBA courses are fully booked already nine months in advance [222]. This indicates that there is a high demand for CME among OB/GYNs.

Patients expect the doctor to initiate the conversation on sexual health but resources are limited in the out-patient setting. OB/GYNs may consider using validated questionnaires such as the Female Sexual Function Index to screen patients for sexual disorders [44]. This brief 19-item questionnaire has been validated in the German language and could be filled out by the patient in the waiting room [223]. The results of the questionnaire could serve as a basis for a conversation about sexual health.

Strengths and limitations of the current study (part III)

No other internationally peer-reviewed research on the provision of care for German women with female sexual dysfunction could be found. Therefore this study, although small,

contributes to the understanding of the level of care for female sexual dysfunction and provides insight into current barriers to care specifically in Germany.

With no former German questionnaire available, the current survey relied heavily on a survey from Pauls et al., later used by Roos et al. [31, 33]. Originally, the Pauls et al. survey was created together with a survey research expert and then pilot-tested with 34 OB/GYNs, revised, and finally pilot-tested again with 10 OB/GYNs. The survey showed high test-retest reliability. The German adaptation went through forward-backward translation and was then pilot tested by medical professionals and by researchers with survey expertise.

Achieving a high response rate among medical professionals in out-patient care is challenging. Surveys with physicians in (uro)gynecology have shown varying response rates: 49% (n=471) by mail [33], 13% (n=1946) in person [32], and 67% (n=100) online [31]. Out-patient practitioners are hard-pressed for time and are often inundated with requests to participate in surveys [224]. The non-response survey reiterated the fact that OB/GYNs have very little time. A shorter questionnaire may have increased the response rate, as may have sending a second and even third reminder. In light of the known low response rates for such questionnaires, the non-response survey aimed to uncover any potential biases in the sample. Five non-respondents (7%) did not fill out the questionnaire because they did not feel competent in the field of sexual dysfunction. A lack of perceived competence was expressed among the respondents as well, with up to 35% of the sample describing their competence as less than satisfactory or poor. A further bias could be that the respondents participated due to greater interest in the topic or its relevance to their practices. If this were the case, the doctors' estimation of the prevalence of female sexual dysfunction among their patients may be exaggerated. However, the non-respondents' replies indicate that diagnosing and treating sexual dysfunction is indeed part of their field of work and that patients do approach them with sexual complaints. Therefore, selection biases in terms of competence or low or high interest in sexual dysfunction do not seem to be present in the sample. Although the non-response survey did not gather demographic information, the sample does not differ greatly from the source population and it appears to be representative of Bavarian OB/GYNs based on statistics from January 2015 [57].

6. Summary and outlook

The three parts of this project provide a clearer picture of the epidemiology and care of female sexual dysfunction. Through systematic analyses of current literature, it could be determined that 41% of premenopausal women worldwide report female sexual dysfunction. No former review has included such a breadth of international studies or provided a meta-analytical estimate using both quality-weighted and random-effects approaches. The review illustrates that the prevalence of the individual domains of sexual dysfunction among women varies considerably: hypoactive sexual desire disorder 26%, female sexual arousal disorder 15%, lubrication difficulties 16%, female orgasm disorder 21%, sexual aversion disorder 5%, and pain disorder(s) 14%.

Prevalence rates of female sexual dysfunction correlated with the Gender Inequality Index and rates were higher in countries with male-centered sexual regimes. Therefore, the predictors of female sexual dysfunction were assessed in qualitative form through the paradigm of gender inequality levels and human development. While a wide variety of predictors of female sexual dysfunction were identified across countries, the factors which consistently had a significant, protective effect across all domains of sexual function were: an older age at marriage, exercising, good overall health, daily intimacy and relationship satisfaction, having a positive body image, sex education and finding sex to be "important."

Beyond determining prevalence rates and predictors, one of the main reasons for performing epidemiological research is for the planning of medical services [16]. A disorder which is reported in nearly two out of every five women demands particular attention from the health care system and health professionals. Furthermore, through the aging population and the increase in chronic illnesses and psychological problems, such acquired (secondary) female sexual dysfunction is predicted to become more prevalent, making it a significant public health problem [34, 37]. In order to address this need, doctors reported a need for more thorough training during residency, a more efficient referral process to sex therapists, and better compensation for the counseling of their own patients.

All three parts of the current project illustrate significant research gaps concerning the epidemiology and care of female sexual dysfunction. To close the gap in epidemiology, further investment in both clinical and observational studies is needed across the globe. However, attaining public funding for sex research has proven to be very challenging, even in countries with gender-equal sexual regimes and levels of human development [225]. A unique finding of this project was that epidemiological research on female sexual dysfunction which was supported by pharmaceutical companies yielded more robust results and higher quality studies than did research without such funding. The determining factor

here is the funding. Pharmaceutical companies have greater financial capabilities and invest heavily clinical trials and observational studies. Funding for sexual medicine research in the public sector is meager. In 2015, the National Institutes for Health (NIH) in the US invested 0.005% of its budget in one type of female sexual disorder, vulvodynia; for 2016, the NIH budget allotted for research on female sexual dysfunction will be cut by 33% [226]. It is impossible to drive epidemiological research forward in an unbiased and qualitative fashion if public funding bodies do not invest in independent research in the field of sexual medicine. Furthermore, in terms of the care of female sexual dysfunction, medical training and health care systems must be improved. Equipping doctors with the training they need to address sexual dysfunction in the out-patient setting may not only aid in improving the sexual lives of women, but – in developed countries – it may help to identify more critical, life-threatening illnesses such as heart disease, diabetes or depression [23]. In developing countries, predictors of female sexual dysfunction were closely tied to aspects of basic reproductive health and human rights (female genital mutilation, rape by partner, arranged marriage, polygamy, fear of pregnancy, etc.). Programs such as the United Nations Population Fund [227] and United Nations Human Rights [228] aim to improve women's sexual and reproductive health on a global level.

In the course of this project, progress has been made in terms of therapy options for women with sexual desire disorder. Up until August 2015, treatment options for female sexual dysfunction have been confined to psychotherapy and off-label pharmacotherapy. With the United States Food and Drug Administration's approval of Flibanserin, American women now have access to a non-hormonal, oral therapy which is approved for the treatment of hypoactive sexual desire disorder [229]. It is unclear when and if this therapy will be approved by the European Medicines Agency. The drug's availability may encourage many women to talk to doctors about their sexual problems for the first time, as was the case with Sildenafil (Viagra) among men [230, 231]. Still, considering the 26 approved medications and 20+ approved generics for treating men's sexual disorders, therapy options for women's sexual dysfunction and research on women's sexual health, in general, has considerable room for growth.

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Appendix

Appendix 1 | Full text screening check list

1	Less than 100 women in the study
2	Validation study or methodological study (comparing questionnaires, translation of instrument)
3	Book, review, abstract, conference paper
4	Reports only on satisfaction or frequency of sex OR does not report on prevalence of overall FSD, orgasm disorder, arousal disorder, lubrication disorder, pain disorder (vaginismus, vulvar pain, dyspareunia), aversion disorder and desire disorder
5	Reports on relevant disorder but not in % or prevalence rates
6	Women are already diagnosed with an FSD OR women are seeking help for treatment of FSD
7	Age range exceeds 49 AND data is not extractable for women under 49 → in notes, indicate which age brackets are extractable → author to be contacted

Appendix 2 | Quality criteria from Prins et al., 2002

External validity

a) Does the method to select and invite participants result in a study population that covers the complete population or a random sample?

b) Is the age range specified?

c) Are inclusion and exclusion criteria specified?

d) Response rate >70%, or information on non-responders sufficient to make inference on the representativeness of the study population?

e) Is the study period specified?

f) Are important population characteristics (age, comorbidities, lifestyle factors, socio-economic data like education level, marital status) specified?

Internal validity

g) Are the data prospectively collected?

h) Is the measurement instrument validated?

i) Is the period covered by the measurement instrument specified?

k) Are age-specific prevalences reported?

Informativity

m) Is the method of data collection properly described (interview, questionnaire, additional measurement)?

n) Are the questions and answer possibilities stated?

o) Are the reported prevalence rates reproducible (presence of raw data, actual numbers, confidence intervals)?

Criteria j) and l) are only relevant for studies on male sexual dysfunction and were therefore omitted.

Appendix 3 | Questionnaire in German

Sexuelle Störungen bei Frauen | Befragung von Frauenärztinnen und Frauenärzten

1. Bitte machen Sie Angaben zur prozentualen Häufigkeit der Patientinnen, die Sie zurzeit behandeln:

Schwangere Frauen	_____%
Frauen bis zu 1 Jahr nach Geburt	_____%
Junge Frauen (unter 25 Jahren)	_____%
Frauen in mittlerem Alter (zwischen 26-49 Jahren)	_____%
Frauen in höherem Alter (über 50 Jahre)	_____%
Insgesamt:	100%

HÄUFIGKEITEN

2. Wie hoch schätzen Sie den Anteil Ihrer Patientinnen, die von sexuellen Störungen (Libidostörungen, Lubrikationsprobleme, Orgasmusstörungen oder Schmerzen beim Koitus) berichten?

- ☐ 0%
- ☐ 1-5%
- ☐ 6-10%
- ☐ 11-20%
- ☐ 21-30%
- ☐ 31-50%
- ☐ 51-75%
- ☐ Über 75%

3. Wie hoch schätzen Sie den Anteil Ihrer Patientinnen, die tatsächlich aus Ihrer klinischen Sicht von sexuellen Störungen (Libidostörungen, Lubrikationsprobleme, Orgasmusstörungen oder Schmerzen beim Koitus) betroffen sind?

- ☐ 0%
- ☐ 1-5%
- ☐ 6-10%
- ☐ 11-20%
- ☐ 21-30%
- ☐ 31-50%
- ☐ 51-75%
- ☐ Über 75%

4. Welche der genannten Störungen kommen bei folgenden Patientinnengruppen in Ihrem Praxisalltag am häufigsten vor? (Mehrfachauswahl möglich)

Patientinnengruppe	Libido-störungen	Lubrikations-probleme	Orgasmus-störungen	Schmerzen b. Koitus	Keine Angabe
Schwangere Frauen	☐	☐	☐	☐	☐
Frauen bis zu 1 Jahr nach Geburt	☐	☐	☐	☐	☐
Junge Frauen (unter 25)	☐	☐	☐	☐	☐
Frauen in mittlerem Alter (26-49)	☐	☐	☐	☐	☐
Frauen in höherem Alter (über 50)	☐	☐	☐	☐	☐

5. Auf einer Skala von 1 bis 5: In welcher Patientengruppe stellen Sie am häufigsten sexuelle Störungen fest? **1** bedeutet „am häufigsten“, **5** bedeutet „am seltensten“

Schwangere Frauen _____
Frauen bis zu 1 Jahr nach Geburt _____
Junge Frauen (unter 25) _____
Frauen im mittleren Alter (26-49) _____
Frauen im höheren Alter (über 50) _____

DIAGNOSE und BEHANDLUNG

6. Welche Gruppe/n von Frauen/Patientinnen hat/haben Ihrer Meinung nach ein erhöhtes Risiko für sexuelle Störungen („Risiko-Patientinnen“)?: (Mehrfachauswahl möglich)

- ☐ Schwangere Frauen
- ☐ Frauen bis zu 1 Jahr nach Geburt
- ☐ Junge Frauen (unter 25)
- ☐ Frauen im mittleren Alter (26-49)
- ☐ Frauen im höheren Alter (über 50)
- ☐ Frauen mit chronischen körperlichen Erkrankungen
- ☐ Frauen mit psychischen Erkrankungen
- ☐ Frauen nach einer OP
- ☐ Frauen mit niedriger Bildung
- ☐ Frauen mit hohem BMI
- ☐ Frauen mit Migrationshintergrund
- ☐ bisexuelle oder homosexuelle Frauen
- ☐ Alle
- ☐ Sonstige:_____

7. Es gibt verschiedene Möglichkeiten, mit dem Thema sexuelle Störungen im Rahmen der Routine-Untersuchungen umzugehen. Was trifft auf Sie zu? (Mehrfachauswahl möglich)

- ☐ Das Thema sexuelle Störungen spreche ich routinemäßig bei fast allen Patientinnen an.
- ☐ Das Thema sexuelle Störungen spreche ich nur bei vereinzelten Patientinnen, z.B. Risiko-Patientinnen, an.
- ☐ Ich überlasse es den Patientinnen, das Thema sexuelle Störungen anzusprechen.
- ☐ Andere: _____

8. Es besteht die Möglichkeit, Frauen mit sexuellen Störungen zu überweisen. Bitte geben Sie bezogen auf Patientinnen mit sexuellen Störungen aus Ihrer Praxis die prozentuale Häufigkeit der folgenden Überweisungsmöglichkeiten an, die Sie nutzen:

Ich überweise an sexualtherapeutisch arbeitende Psychologen/Psychiater _____%
Ich überweise an eine Familienberatungsstelle _____%
Ich behandele / betreue sie selbst _____%
Sonstige _____ _____%
Insgesamt: 100%

9. Wenn Sie Ihre Patientinnen mit sexuellen Störungen selbst behandeln/betreuen, welche Therapien wenden Sie an:

_____

_____

BARRIEREN IN DER VERSORGUNG

10. Welche Schwierigkeiten ergeben sich in der Zusammenarbeit mit sexualtherapeutisch arbeitenden Psychologen/Psychiatern/anderen Ärzten? (Mehrfachauswahl möglich)

- Lange Wartezeiten
- Probleme bei der Kostenübernahme
- Akzeptanz durch die Patientin (Bereitschaft, eine Psychotherapie mitzumachen)
- Ungenügende Fachkenntnisse der Psychologen
- Es gibt keine Schwierigkeiten.
- Andere:_____

11. Welche Schwierigkeiten ergeben sich, wenn Sie Patientinnen auf das Thema sexuelle Funktion und Dysfunktion ansprechen? (Mehrfachauswahl möglich)

- Es fällt mir schwer, die richtigen Worte zu finden.
- Ich habe Angst, der Patientin zu nahe zu treten.
- Ich fühle mich fachlich nicht ganz sicher mit diesem Thema (Therapiemöglichkeiten).
- Ich kenne keine Fragebögen, mit denen ich betroffene Patientinnen im Vorfeld identifizieren könnte, um dann ein Gespräch einzuleiten.
- Ich habe nicht genügend Zeit.
- Entsprechende Gespräche werden nicht angemessen vergütet.
- Ich spreche meine Patientinnen nicht zu diesem Thema an.
- Es gibt keine Schwierigkeiten.
- Andere:_____

12. Begegnen Ihnen in Ihrem Praxisalltag Patientinnen mit Libidostörungen, die nach medikamentösen Therapiemöglichkeiten fragen?

- ja
- nein

12a. Wenn ja, welche Patientinnen sind dies? (Mehrfachauswahl möglich)

- Schwangere Frauen
- Frauen bis zu 1Jahr nach Geburt
- Junge Frauen (unter 25)
- Frauen im mittleren Alter (26-49)
- Frauen im höheren Alter (über 50)

INFORMATION / WISSEN

13. Wie würden Sie die fachärztliche Ausbildung in Bezug auf sexuelle Störungen (Diagnosestellung und Therapiemöglichkeiten) bei Frauen bewerten?

- mangelhaft
- ausreichend
- befriedigend
- gut
- sehr gut

14. Wie würden Sie die Verfügbarkeit von evidenzbasierten Therapiemöglichkeiten für Frauen mit sexuellen Störungen bewerten?

- ☐ mangelhaft
- ☐ ausreichend
- ☐ befriedigend
- ☐ gut
- ☐ sehr gut

15. Wie würden Sie Ihre fachliche Kompetenz im Umgang mit sexuellen Störungen bei Frauen einschätzen?

- ☐ mangelhaft
- ☐ ausreichend
- ☐ befriedigend
- ☐ gut
- ☐ sehr gut

16. Wie würden Sie Ihre kommunikative Kompetenz im Umgang mit sexuellen Störungen bei Frauen einschätzen?

- ☐ mangelhaft
- ☐ ausreichend
- ☐ befriedigend
- ☐ gut
- ☐ sehr gut

ZUSAMMENFASSUNG

17. Was sind aus Ihrer Sicht die drei größten Probleme/Schwierigkeiten in der Versorgung von Frauen mit sexuellen Störungen? (1, 2, 3)

_____ Mangelnde Information zu diesem Thema im Medizinstudium
_____Mangelnde Information zu diesem Thema in der Facharztausbildung
_____ Mangelnde Information zu diesem Thema in der ärztlichen Weiterbildung
_____ Unzureichende Evidenz von Therapieverfahren
_____ Mangel an sexualtherapeutisch arbeitenden Psychologen/Psychiatern
_____ Ineffektivität der Psychotherapie bei sexuellen Störungen
_____ Fehlende medikamentöse Therapiemöglichkeiten
_____ Zu wenig Zeit mit Patientinnen über sexuelle Störungen zu sprechen
_____ Akzeptanz durch Patientinnen, z.B. mangelnde Bereitschaft, eine Psychotherapie mitzumachen
_____ Sexuelle Störungen bei Frauen werden medizinisch nicht anerkannt
_____ Andere: _____

Gibt es noch weitere Punkte zu diesem Thema, die Sie gerne mitteilen möchten?

ZU IHNEN und IHRER PRAXIS

18. Wie lange arbeiten Sie bereits als Frauenarzt / Frauenärztin?

- ☐ Ich befinde mich noch in der Facharztausbildung
- ☐ <5 Jahre nach Facharztausbildung
- ☐ 5-10 Jahre nach Facharztausbildung
- ☐ 11-20 Jahre nach Facharztausbildung
- ☐ >20 Jahre nach Facharztausbildung

19. Wie viele Patientinnen behandeln Sie insgesamt in etwa pro Quartal?

_____ Pat. / Q

20. In welchem Regierungsbezirk befindet sich Ihre Praxis?

- ☐ Mittelfranken
- ☐ Niederbayern
- ☐ Oberbayern
- ☐ Oberfranken
- ☐ Oberpfalz
- ☐ Schwaben
- ☐ Unterfranken

21. Wie viele Einwohner hat die Stadt, in der sich Ihre Praxis befindet?

- ☐ <5.000
- ☐ 5.000 – <20.000
- ☐ 20.000 – <100.000
- ☐ 100.000 und mehr

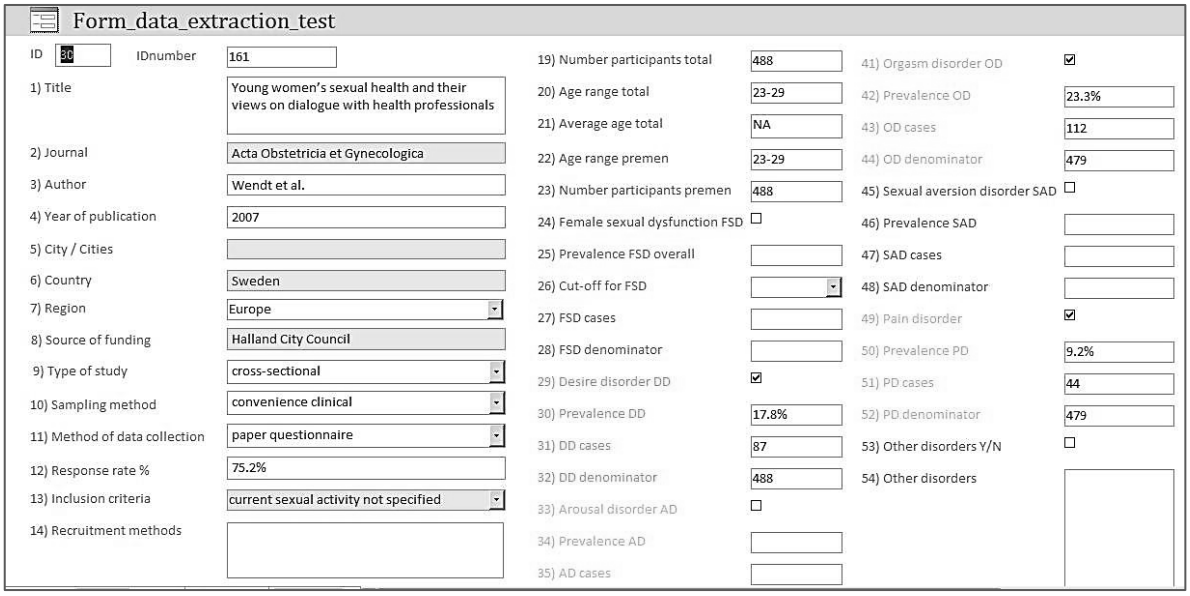
22. Welches Geschlecht haben Sie?

- ☐ Männlich
- ☐ Weiblich

23. Wie alt sind Sie?

- ☐ 20-30
- ☐ 31-40
- ☐ 41-50
- ☐ 51-60
- ☐ >60

Appendix 4 | Screen shot extraction sheet



Appendix 5 | Characteristics and prevalence rates of included studies

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Prevalence of sexual dysfunctions and correlated conditions in a sample of Brazilian women—results of the Brazilian study on sexual behavior (BSSB)	Abdo et al., 2004, Brazil [64]	convenience community, paper questionnaire	NR	original tool, NV	ever / current	813	18-40	44.6%	At least 1 disorder	18.5%			16.0%		26.4%	9
Hypoactive sexual desire disorder in a population-based study of Brazilian women: Associated factors classified according to their importance	Abdo et al., 2010, Brazil [65]	convenience community, paper questionnaire	NR	original tool, NV	ever / current	2298	18-49			7.4%						8
Factors associated with sexual dysfunction in Jordanian women and their sexual attitudes	Abu Ali et al., 2009, Jordan [66]	convenience clinical, interview + questionnaire	NR	FSFI	past month	293	<50									

Appendix

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Vulvar pain in women attending a general medical clinic in Accra, Ghana	Adanu et al., 2005, Ghana [67]	random, face-to-face interview	NR	original tool, NV	ever / current	166	Premenopausal								21.1%	5
Sexual dysfunction among secondary school teachers in Ilorin, Nigeria	Adegunloye et al., 2010, Nigeria [68]	random, paper questionnaire	93.0%	original tool, NV	past 6 months	NA	NA									
Sexual dysfunction in women: An overview of risk factors and prevalence in Indian women	Aggarwal et al., 2012, India [69]	convenience clinical, paper questionnaire	NR	FSFI	past month	458	18-42	52.8%	FSFI <26.55	11.0%	18.1%	20.5%	21.0%		20.1%	10
Incidence of sexual dysfunction: A prospective survey in Ghanaian females	Amidu et al., 2010, Ghana [70]	random, paper questionnaire	75.3%	GRISS	ever / current	285	18-47	71.9%	GRISS >5				71.9%		67.0%	12

Appendix

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Sexual dysfunction among married couples living in Kumasi metropolis, Ghana	Amidu et al., 2011, Ghana [71]	convenience community, paper questionnaire	89.5%	GRISS	ever / current	NA	<50									
Survey of the prevalence of sexual dysfunctions in Kurdish women	Arasteh et al., 2013, Iran [72]	convenience clinical, paper questionnaire	NR	FSFI	past month	155	15-39	72.3%	FSFI <26.55							9
Prevalence and risk factors for low sexual function in women: A study of 1009 women in an outpatient clinic of a university hospital in Istanbul	Aslan et al., 2008, Turkey [73]	convenience clinical, face-to-face interview	NR	FSFI	past month	805	20-49	34.9%	FSFI <26.55							7
Sexual behavior of married young women: A preliminary study from north India	Avasthi et al., 2008, India [74]	convenience clinical, paper questionnaire	NR	BISF-W	ever / current	100	20-40	17.0%	At least 1 disorder			5.0%	9.0%		7.0%	6

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Relationship between loss of libido and signs and symptoms of depression in a sample of Puerto Rican middle-aged women	Avellanet et al., 2008, Puerto Rico [75]	convenience community, paper questionnaire	55.0%	original tool, NV	past 2 months	502	40-49			34.3%						10
Dyspareunia in Puerto Rican middle-aged women	Avellanet et al., 2009, Puerto Rico [76]	convenience community, paper questionnaire	55.0%	original tool, NV	past 2 months	502	40-49								16.5%	10
Chronic vulvar and gynecologic pain: Prevalence and characteristics in a self-reported survey	Bachmann et al., 2006, USA [77]	convenience clinical, paper questionnaire	36.8%	original tool, NV	past 6 months	NA	18-49									
Prevalence of female sexual dysfunction and related factors for under treatment in Bushehrian women of Iran	Bagherzadeh et al., 2010, Iran [78]	convenience clinical, paper questionnaire	NR	FSFI	past month	889	18-49	33.9%	FSFI <23	69.9%	55.3%	25.2%	30.4%	21.3%	37.2%	8

Appendix

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Distress about sex: A national survey of women in heterosexual relationships	Bancroft et al., 2003, USA [51]	random, telephone interview	53.1%	original tool	past month	685	20-50	41.5%	At least 1 disorder		10.7%	28.2%	7.7%		2.8%	11
Vulvar pain, sexual behavior and genital infections in a young population: A pilot study	Berglund et al., 2002, Sweden [79]	convenience clinical, paper questionnaire	NR	original tool, NV	ever / current	172	12-26					26.0%			34.0%	8
The impairment of sexual function is less distressing for menopausal than for premenopausal women	Berra et al., 2010, Italy [80]	convenience clinical, paper questionnaire	NR	FSFI	past month	100	21-35	31.0%	FSFI <26.55	65.0%	34.0%	34.0%	38.0%		32.0%	11
Sexual desire and sexual activity of men and women across their lifespans: Results from a representative German community study	Beutel et al., 2007, Germany [81]	random, face-to-face interview	65.0%	original tool, NV	past month	627	18-50									

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Sexual dysfunction in middle-aged women: A multicenter Latin American study using the Female Sexual Function Index	Blumel et al., 2009, South America [82]	random, paper questionnaire	NR	FSFI	past month	3853	Premenopausal									
Associations among everyday stress, critical life events, and sexual problems	Bodenmann et al., 2006, Switzerland [83]	convenience community, paper questionnaire	NR	original tool based on DSM IV, NV	ever / current	147	20-40			60.5%	29.3%		36.1%	23.8%	17.7%	5
Effect of parity on sexual function - An identical twin study	Botros et al., 2006, USA [84]	convenience community, paper questionnaire	NR	PISQ-12	ever / current	297	Premenopausal									
Insufficient assessment of sexual dysfunction: A problem in gynecological practice	Briedite et al., 2013, Latvia [85]	convenience clinical, paper questionnaire	89.9%	FSFI	past month	300	18-50			26.8%	46.4%	40.7%	29.7%		6.2%	8

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Recent and lifelong sexual dysfunction in a female UK population sample: Prevalence and risk factors	Burri and Spector, 2011, UK [50]	convenience clinical, paper questionnaire	50.0%	FSFI	past month	335	18-50	21.8%	FSFI <26.55							8
The relationship between same-sex sexual experience, sexual distress, and female sexual dysfunction	Burri et al., 2012, Finland [86]	random, paper questionnaire	52.9%	FSFI	past month	5998	18-49			7.4%	6.5%	6.6%	7.8%		5.7%	9
Sexual functioning and practices in a multi-ethnic study of midlife women: Baseline results from SWAN	Cain et al., 2003, USA [87]	random, interview + questionnaire	51.0%	original tool, UV	ever / current	1748	Premenopausal			41.4%	5.1%				17.3%	10
Prevalence of sexual dysfunction in a cohort of middle-aged women: Influences of menopause and hormone replacement therapy	Castelo-Branco et al., 2003, Chile [88]	convenience clinical, paper questionnaire	NR	Based on Laumann / NHSLS 1999	past 12 months	184	40-49	35.3%	At least 1 disorder	23.9%	16.3%		15.2%		21.7%	10

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
The prevalence of female sexual dysfunction and potential risk factors that may impair sexual function in Turkish women	Cayan et al., 2004, Turkey [89]	convenience community, paper questionnaire	89.5%	FSFI	past month	121	18-47	34.7%	FSFI <22.7							10
Prevalence of dyspareunia in healthy Thai perimenopausal women	Chen and Taneepanichskul, 2003, Thailand [90]	convenience clinical, interview + questionnaire	NR	original tool	ever / current	NA	40-49									
Assessment of sexual dysfunction and determination of its risk factors in the Republic of Korea	Choi et al., 2013, Korea [91]	convenience clinical, paper questionnaire	89.6%	FSFI	past month	831	18-50	44.0%	FSFI <23							9

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Sexual dysfunctions and difficulties in Denmark: Prevalence and associated sociodemographic factors	Christensen et al., 2011, Denmark [49]	random, interview + questionnaire	54.0%	original tool, NV	past 12 months	1414	16-49	66.8%	At least 1 disorder			46.6%	55.6%		26.8%	
Sexual behaviors and mental perception, satisfaction and expectations of sex life in men and women in France	Colson et al., 2006, France [92]	random, telephone interview	NR	original tool, UV	NA	317	35-44									
Prevalence and incidence of prolonged and severe dyspareunia in women: Results from a population study	Danielsson et al., 2003, Sweden [93]	convenience clinical, interview + questionnaire	83.0%	original tool, NV	ever / current	2244	20-49								10.3%	9
Study of the prevalence of female sexual dysfunction in sexually active women 18-40 years of age in Medellin, Colombia	Echeverry et al., 2010, Colombia [94]	convenience community, paper questionnaire	NR	FSFI	past month	391	18-40	29.9%	FSFI <26.55	18.2%						10

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Young Swedish women's experience of pain and discomfort during sexual intercourse	Elmerstig et al., 2009, Sweden [95]	convenience clinical, paper questionnaire	98.0%	original tool	past month	300	13-21								48.7%	11
Prioritizing the partner's enjoyment: A population-based study on young Swedish women	Elmerstig et al., 2013, Sweden [96]	convenience community, paper questionnaire	99.7%	original tool	ever / current	1259	18-22								46.9%	10
The impact of female genital cutting on health of newly married women	Elnashar and Abdel-hady, 2007, Egypt [97]	not clearly described, interview + questionnaire	NR	original tool, NV	ever / current	NA	<20-35+									

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Female sexual dysfunction in Lower Egypt	Elnashar et al. 2007, Egypt [98]	convenience clinical, interview + questionnaire	93.6%	original tool, NV	NA	936	16-49	68.9%	At least 1 disorder	49.6%	36.0%		43.0%		31.5%	10
Female sexual dysfunction in urological patients: findings from a major metropolitan area in the USA	Elsamra et al., 2010, USA [99]	convenience clinical, paper questionnaire	NR	FSFI	past month	228	18-45									
Sexual desire in a nationally representative Danish population	Eplov et al., 2007, Denmark [100]	random, paper questionnaire	84.8%	original tool	ever / current	2592	16-44			9.7%						12
Prevalence and risk factors for female sexual dysfunction among Turkish women attending a maternity and gynecology outpatient clinic	Erbil, 2011, Turkey [101]	convenience clinical, paper questionnaire	NR	FSFI	past month	NA	18-49									

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Level of bother and treatment-seeking predictors among male and female in-patients with sexual problems: A hospital-based study	Evangelia et al., 2010, Greece [102]	convenience clinical, face-to-face interview	63.3%	BSSC	NA	NA	18-49									
Sexual dysfunction among female patients of reproductive age in a hospital setting in Nigeria	Fajewonyomi et al., 2007, Nigeria [103]	convenience clinical, interview + questionnaire	NR	original tool, NV	past 3 months	384	21-44	63.2%	At least 1 disorder	8.3%	5.4%		63.6%		22.7%	10
Presence of a sexual problem may not affect women's satisfaction from their sexual function	Ferenidou et al., 2008, Greece [104]	convenience clinical, paper questionnaire	NR	FSFI	past month	109	18-49	41.3%	FSFI <26.55	44.0%	13.8%	19.3%	22.0%		23.9%	9
The Canadian Contraception Study: Part I and Part II	Fisher et al., 2004, Canada [105]	random, paper questionnaire	47.3%	original tool, NV	past 12 months	1582	15-44	55.0%	At least 1 disorder	43.0%			24.0%		15.0%	9

Title	Author, year, country	Sampling method, method of data collection	Res-ponse rate	Name of assess-ment tool, valida-tion	Time period refer-enced	Nr. of pre-meno pausal women	Age range of pre-meno-pausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire dis-order	Prev. arousal disorder	Prev. lubri-cation diffi-culties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain dis-order(s)	Quality score
Symptoms associated with menopausal transition and reproductive hormones in midlife women *	Freeman et al., 2007 USA[106]	random, interview + questionnaire	NR	original tool	past month	201	Pre-meno-pausal									
Pelvic pain and associated characteristics among women in Northern Mexico	Garcia-Perez et al., 2010, Mexico [107]	random, face-to-face interview	92.0%	Oxfordshire Women's Health Study quest.	past 12 months	436	25-34								17.4%	10
Prevalence of female sexual dysfunction in gynecological and urogynecological patients according to the International Consensus Classification	Geiss et al., 2003, Austria [108]	convenience clinical, paper questionnaire	94.0%	original tool based on ICC	ever / current	NA	18-49									
Female sexual dysfunction in Iran: Study of prevalence and risk factors	Ghanbar-zadeh et al., 2013, Iran [109]	random, interview + questionnaire	91.2%	original tool based on ICC	ever / current	758	15-45									

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Relation of demographic and lifestyle factors to symptoms in a multi-racial/ethnic population of women 40-55 years of age	Gold et al., 2000, USA [110]	random, telephone interview	NR	original tool, UV	past two weeks	4497	Premenopausal					7.1%				10
Prevalence and potential risk factors of female sexual difficulties: An urban Iranian population-based study	Goshtasebi et al., 2009, Iran [111]	random, interview + questionnaire	NR	original tool	past 3 months	1318	16-45	52.0%	At least 1 disorder							13
Prevalence and evaluation of sexual health problems - HSDD in Europe	Graziottin, 2007, Europe [112]	random, paper questionnaire	65.0%	PFSF	past month	NA	20-45			11.0-24.0%						
Prevalence and risk factors of female sexual dysfunction among healthcare personnel in Malaysia	Grewal et al., 2014, Malaysia [113]	convenience clinical, paper questionnaire	75.6%	FSFI	past month	157	20-49	3.8%	FSFI <55	16.6%						10

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Self-reported frequency of feeling sexual desire among a representative sample of 18-49 year old men and women in Oslo, elicudated by epidemiological data	Hamilton et al., 2001, Norway [114]	random, paper questionnaire	48.2%	original tool	ever / current	1129	18-49			6.3%						9
Prevalence and characteristics of female sexual dysfunction in a sample of women from Upper Egypt	Hassanin et al., 2009, Egypt [115]	convenience clinical, interview + questionnaire	92.7%	original tool based on DSM IV, NV	NA	500	18-50									
Risk factors for female sexual dysfunction in the general populations: Exploring factors associated with low sexual function and sexual distress	Hayes et al., 2008, Australia [116]	random, paper questionnaire	45.0%	SFQ	past month	200	20-49			32.0%	37.5%		25.5%			12

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Prevalence rates of sexual difficulties and associated distress in heterosexual men and women: Results from an Internet survey in Flanders	Hendrickx et al., 2014, Belgium [117]	convenience community, online survey	NR	SFS	ever / current	13940	16-49	37.8%	At least 1 disorder	19.0%	8.4%		18.8%	2.9%	3.8%	8
Prevalence of female sexual dysfunction symptoms and its relationship to quality of life: A Japanese female cohort-study	Hisasue et al., 2005, Japan [118]	convenience community, paper questionnaire	56.3%	original tool, NV	ever / current	505	30-39			27.7%	29.7%	12.5%	15.2%		7.9%	8
Prevalence and risk factors for female sexual dysfunction among Egyptian women	Ibrahim et al., 2013, Egypt [119]	convenience clinical, interview + questionnaire	NR	FSFI	past month	248	Premenopausal	28.6%	FSFI <26.55							9
Prevalence, risk factors, and predictors of female sexual dysfunction in a primary care setting:A survey finding	Ishak et al., 2010, Malaysia [120]	convenience clinical, paper questionnaire	90.6%	FSFI	past month	105	18-49									

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Female sexual dysfunction: Prevalence and risk factors	Jaafarpour et al., 2013, Iran [121]	random, interview + questionnaire	82.8%	FSFI	past month	400	18-50	46.2%	FSFI <28	45.3%	37.5%	41.2%	42.0%		42.5%	13
Female sexual dysfunction: Facts and factors among gynecology outpatients	Jahan et al., 2012, Bangladesh [122]	convenience clinical, face-to-face interview	NR	original tool based on ICC, NV	ever / current	137	Premenopausal	51.8%	At least 1 disorder	54.9%	32.4%		43.7%		71.8%	7
Risk factors for the individual domains of female sexual function	Jiann et al., 2009, Taiwan [123]	convenience community, paper questionnaire	73.2%	FSFI	past month	805	Premenopausal									
Prevalence of female sexual dysfunction in urban Chinese women based on cutoff scores of the Chinese version of the FSFI: A preliminary study	Ma J et al., 2014, PR China [124]	convenience clinical, paper questionnaire	86.0%	FSFI	past month	423	22-49	31.7%	At least 1 disorder	19.1%	20.8%	30.7%	26.5%		21.0%	10

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Sexual dysfunction in women: Population based epidemiological study	Kadri et al., 2002, Morocco [125]	random, face-to-face interview	NR	original tool based on DSM IV, NV	past 6 months	386	20-34									
Sexual motivation and the duration of partnership	Klusmann, 2002, Germany [126]	convenience community, paper questionnaire	41.0%	original tool, UV	ever / current	967	19-32			13.3%						7
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	Lau et al., 2005, Hong Kong [127]	random, telephone interview	50.0%	Based on Laumann / NHSLS 1999	past 12 months	2704	18-49	50.5%	At least 1 disorder	24.0%		21.5%	13.4%		11.4%	12

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Prevalence and correlates of sexual dysfunction among young adult married women in rural China: A population-based study	Lau et al., 2006, PR China [126]	convenience community, face-to-face interview	92.2%	Based on Laumann / NHSLS 1999, NV	past 12 months	1198	20-39	43.4%	At least 1 disorder	25.0%		26.1%	30.5%		20.7%	11
Prevalence of vulvar pain in an urban, minority population	Lavy et al., 2007, USA [129]	convenience clinical, paper questionnaire	72.8%	original tool, NV	ever / current	224	<21-40									
Hypoactive sexual desire disorder in postmenopausal women: US results from the Women's International Study of Health and Sexuality (WISHeS)	Leiblum et al., 2006, USA [130]	random, paper questionnaire	68.0%	PFSF	past month	414	20-49			23.2%						12
Vaginal dryness: A comparison of prevalence and interventions in 11 countries	Leiblum et al., 2009, Europe [131]	convenience community, online survey	NR	original tool, NV	ever / current	NA	18-49									

Appendix

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Risk factors for low sexual function among urban Chinese women: A hospital-based investigation	Lianjun et al., 2011, PR China [132]	convenience community, paper questionnaire	69.8%	FSFI	past month	1320	20-49	78.3%	FSFI <23	18.6%	27.0%	53.3%	47.6%		37.5%	10
Sexual behavior and symptoms among reproductive age Chinese women in Hong Kong	Lo and Kok, 2014, Hong Kong [133]	convenience clinical, paper questionnaire	88.0%	original tool based on DSM IV, NV	past 12 months	2146	21-40	59.0%	At least 1 disorder	31.8%	31.7%		40.0%		33.8%	9
Prevalence and correlates of sexual activity and function in women: Results from the Boston Area Community Health (BACH) survey	Lutfey et al., 2009, USA [134]	random, face-to-face interview	63.3%	FSFI	past month	1856	30-49									
Negative affect and somatically focused anxiety in young women reporting pain with intercourse	Meana et al, 2009, USA [135]	convenience community, paper questionnaire	NR	Sexual History Form	ever / current	759	18-29								6.0%	9

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Sexual function problems and help seeking behaviour in Britain: National probability sample survey	Mercer et al., 2003, UK [136]	random, interview + questionnaire	65.4%	Based on Laumann / NHSLS 1999	past 12 months	5530	16-44	53.8	At least 1 disorder	40.6%		9.2%	14.4%		11.8%	9
Prevalence of low sexual desire among women in Britain: Associated factors	Mitchell et al., 2009, UK [137]	random, computer-assisted self-interview	65.4%	Based on Laumann / NHSLS 1999	past 12 months	6655	16-44			10.7%						12
Sexual function in Britain: Findings from the third National Survey of Sexual Attitudes and Lifestyles (Natsal-3)	Mitchell et al., 2013, UK [138]	random, interview + questionnaire	57.7%	Based on Laumann / NHSLS 1999	past 12 months	4974	16-44	47.3%	At least 1 disorder	30.6%	8.0%	9.1%	17.3%		7.9%	12
Prevalence and related factors for anorgasmia among reproductive aged women in Hesarak, Iran	Najafabady et al., 2011, Iran [139]	convenience clinical, interview + questionnaire	NR	FSFI	past month	1200	15-45						26.3%			10

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Sexual dysfunction in the Australian population	Najman et al., 2003, Australia [140]	convenience clinical, paper questionnaire	61.0%	Based on Laumann / NHSLS 1999	past 12 months	654	18-49			33.8%		19.1%	19.4%		17.0%	12
Use of the Italian translation of the Female Sexual Function Index (FSFI) in routine gynecological practice	Nappi et al., 2008, Italy [141]	convenience clinical, paper questionnaire	78.0%	FSFI	past month	371	Premenopausal	22.3%	lowest quartile	27.5%	27.2%	25.3%	23.0%		25.3%	11
Problems with sexual function in people attending London general practitioners: cross-sectional study	Nazareth et al., 2003, UK [142]	convenience clinical, paper questionnaire	71.0%	BISF-W	past month	NA	NA									
Sexual behavior and sexual dysfunctions after age 40: The Global Study of Sexual Attitudes and Behaviors (GSSAB)	Nicolosi et al., 2004, Global [143]	random, telephone interview	19.0%	original tool, NV	ever / current	NA	40-49									

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The prevalence and importance of sexual concerns among female military beneficiaries	Nusbaum and Gamble, 2001, USA [144]	random, paper questionnaire	39.0%	original tool, NV	ever / current	NA	18-49									
The changing nature of women's sexual health concerns through the midlife years	Nusbaum et al., 2004, USA [143]	convenience clinical, paper questionnaire	39.0%, 65.0%	original tool	ever / current	633	< 45			13.9%		11.8%	13.0%	5.1%	12.3%	10
The sexual concerns of African American, Asian American and white women seeking routine gynecological care	Nusbaum et al., 2005, USA [146]	convenience clinical, paper questionnaire	65.0%	original tool	ever / current	NA	NA									

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
On categorization and quantification of women's sexual dysfunctions: An epidemiological approach	Oeberg et al., 2004, Sweden [147]	random, face-to-face interview	NR	original tool based on DSM IV, NV	past 12 months	880	premeno-pausal									
Sexual activity and background variables among Finnish middle-aged women	Ojanlatva et al., 2004, Finland [148]	random, paper questionnaire	70.0%	original tool, NV	ever / current	1819	42-46			38.6%						11
Sexual problems among married Nigerian women	Ojomu et al., 2007, Nigeria [149]	convenience clinical, interview + questionnaire	98.0%	original tool based on DSM IV, NV	ever / current	293	17-49	71.0%	At least 1 disorder	39.2%	39.9%		54.9%		30.7%	10
Prevalence and risk factors for female sexual dysfunction in Turkish women	Oksuz, Malhan, 2006, Turkey [150]	convenience clinical, interview + questionnaire	86.3%	FSFI	past month	465	18-45	46.0%	FSFI <25.0	50.5%	34.2%	39.8%	42.4%		42.6%	10

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The prevalence and causes of sexual problems among premenopausal Turkish women	Oniz et al., 2007, Turkey [151]	convenience clinical, paper questionnaire	27.0%	GRISS	past 3 months	115	19-51	26.1%	GRISS >5				8.7%		41.7%	8
Prevalence and characteristics of sexual functioning among sexually experienced middle to late adolescents	O'Sullivan et al., 2014, Canada [152]	convenience community, online survey	NR	FSFI	past month	144	16-21	41.6%	FSFI <26.55	22.2%						10
Dyspareunia and urinary sensory symptoms in India: Population-based study	Padmadas et al., 2006. India [153]	random, face-to-face interview	95.5%	original tool, NV	ever / current	84644	15-49								12.6%	11
Sexual dysfunctions in urban China: A population-based national survey of men and women	Parish et al., 2007, PR China [154]	random, face-to-face interview	76.0%	original tool, NV	past 12 months	NA	NA									

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Prevalence and socio-demographic predictors of sexual problems in Portugal	Peixoto and Nobre, 2013, Portugal [155]	convenience community,paper questionnaire	NR	FSFI	past month	258	18-44	23.1%	FSFI <26.55	20.5%	11.2%	8.5%	14.0%		16.7%	9
Prevalence of sexual problems and associated distress among lesbian and heterosexual women	Peixoto and Nobre, 2014, Portugal [156]	convenience community, online survey	NR	original tool, NV	past 6 months	1348	18-44			22.6%	14.8%		22.7%		17.6%	9
Sexual dysfunction, depression, and anxiety in young women according to relationship status: An online survey	Pereira et al., 2013, Brazil [157]	convenience community, online survey	NR	FSFI	past month	155	20-29	41.3%	FSFI <26.55	52.9%	36.8%	30.0%	39.4%		32.9%	10

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
How common are symptoms? Evidence from a New Zealand national telephone survey	Petrie et al., 2014, New Zealand [158]	random, telephone interview	NR	original tool	past week	314	18-44	2.9%	At least 1 disorder							10
Female sexual dysfunction in a healthy Austrian cohort: Prevalence and risk factors	Ponholzer et al., 2004, Austria [159]	convenience clinical, interview + questionnaire	NR	original tool based on ICC, NV	past month	353	20-40				20.0%		20.0%		16.1%	8
Pain at the vulvar vestibule: A web-based survey	Reed et al., 2004, USA [160]	random, online survey	NR	original tool, NV	ever / current	NA	18-49									
Prevalence and demographic characteristics of vulvodynia in a population-based sample	Reed et al., 2012, USA [161]	random, paper questionnaire	79.0%	original tool	ever / current	NA	18-49									

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Sex in Australia: Sexual difficulties in a representative sample of adults	Richters et al., 2003, Australia [162]	random, telephone interview	73.1%	original tool, UV	past 12 months	6572	16-49			55.2%		22.4%	27.0%		22.1%	12
Sexual desire problems in women seeking healthcare: A novel study design for ascertaining prevalence of HSDD in clinic-based samples of US women	Rosen et al., 2012, USA [163]	convenience clinical, paper questionnaire	44.0-59.0%	DSDS	ever / current	417	18-49			8.4%						10
Female sexual dysfunction in a population-based study in Iran: Prevalence and associated risk factors	Safarinejad, 2006, Iran [164]	random, interview + questionnaire	NR	FSFI	past month	1801	20-49	30.0%	FSFI <23	28.8%	25.4%	30.4%	33.7%		30.5%	11
Predicting sexual problems in women: The relevance of sexual excitation and sexual inhibition	Sanders et al., 2008, USA [165]	convenience community, paper questionnaire	38.0%	original tool, NV	ever / current	440	18-49									

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
The Global Online Sexuality Survey (GOSS): Female sexual dysfunction among Internet users in the reproductive age group in the Middle East	Shaeer et al., 2012, Middle East [166]	convenience community, online survey	NR	FSFI	past month	342	18-49									
Sexual problems and distress in United States women	Shifren et al., 2008, USA [167]	random, paper questionnaire	63.0%	CSFQ-14	ever / current	12959	18-44	27.2%	At least 1 disorder	22.2%	10.0%		9.9%			12
Medical student sexuality: How sexual experience and sexuality training impact US and Canadian medical students' comfort in dealing with patients' sexuality in clinical practice	Shindel et al., 2010, USA and Canada [168]	convenience community, online survey	NR	FSFI	past month	1343	22-29	49.1%	FSFI <26.55							7

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
An Internet survey of demographic and health factors associated with risk of sexual dysfunction in women who have sex with women	Shindel et al., 2012, USA [169]	convenience community, online survey	NR	FSFI	past month	1332	18-50	22.7%	FSFI <26.55							12
The prevalence of sexual dysfunction and potential risk factors which may impair sexual function in Malaysian women	Sidi et al., 2007, Malaysia [170]	convenience clinical, paper questionnaire	93.0%	FSFI	past month	161	18-45	23.0%	FSFI <55	45.3%	60.2%	49.7%	52.2%		52.8%	10
Prevalence and risk factors for female sexual dysfunction in women attending a medical clinic in south India	Singh et al., 2009, India [171]	convenience clinical, face-to-face interview	NR	FSFI	past month	128	17-49									
Rate and related factors of dyspareunia in reproductive age women: A cross-sectional study	Sobhgol et al., 2007, Iran [172]	convenience clinical, interview + questionnaire	NR	original tool, NV	ever / current	319	15-49								54.5%	8

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
The prevalence and risk factors of female sexual dysfunction in young Korean women: An Internet-based survey	Song et al., 2008, Korea [173]	convenience community, online survey	17.9%	FSFI	past month	504	20-49	43.5%	FSFI <25	44.0%	49.0%	45.4%	32.0%		34.6%	10
Dyspareunia, urinary sensory symptoms, and incontinence among young Chinese women	Stones et al., 2006, PR China [174]	random, telephone interview	98.0%	original tool, UV	past 6 months	3150	15-34								4.7%	11
Sexual problems of urban women in Croatia: Prevalence and correlates in a community sample	Stulhofer et al., 2005, Croatia [175]	convenience community, paper questionnaire	48.0%	BISF-W	past month	350	20-49	33.7%	At least 1 disorder	10.6%	11.1%		24.9%		8.6%	11
Sexual health difficulties in a population-based sample of Croatian women aged 18-35 and the effects of the dual (career and motherhood) role	Stulhofer et al., 2011, Croatia [176]	random, face-to-face interview	37.3%	Based on Laumann / NHSLS 1999	past 12 months	870	18-35	47.4%	At least 1 disorder	27.6%		18.5%	23.1%		23.6%	12

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Gynecologic pain related to occupational stress among female factory workers in Tianjin, China	Sznajder et al., 2014, PR China [177]	convenience community,paper questionnaire	100%	Oxfordshire Women's Health Study questionnaire	past 12 months	456	18-29								15.0%	11
Living with genital pain: Sexual function, satisfaction and help-seeking among women living in Sweden	Thomten, 2014, Sweden [178]	random, paper questionnaire	23.0%	original tool, NV	ever / current	944	18-35								7.7%	7
Correlates of lesbian sexual functioning	Tracy and Junginger 2007, USA [179]	convenience community, online survey	NR	FSFI	past 6 months	NA	18-49									
Reduced sexual desire in a random sample of Norwegian couples	Traeen et al., 2007, Norway [180]	random, paper questionnaire	31.0%	original tool	past 12 months	274	25-49			53.7%						10

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Sexual problems in 18–67-year-old Norwegians	Traeen and Stigum, 2010, Norway [181]	random, computer-assisted self-interview	39.0%	original tool, NV	past 12 months	577	18-49			33.6%		12.7%	23.7%		6.8%	9
Help-seeking behaviors for female sexual dysfunction: A cross sectional study from Iran	Vahdaninia et al., 2009, Iran [182]	convenience clinical, face-to-face interview	92.0%	original tool	past 3 months	1472	15-50	51.1%	At least 1 disorder	16.8%	16.8%	10.7%	19.4%		16.6%	12
Prevalence of sexual dysfunction and its associated factors women aged 40-65 years with 11 years or more of formal education: a population-based study	Valadares et al., 2008, Brazil [183]	random, paper questionnaire	83.3%	SPEQ	past month	147	40-49									

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Sexual health in the Netherlands: Main results of a population survey among Dutch adults	Vanwesenbeeck et al., 2010, The Netherlands [184]	random, online survey	28.0%	Questionnaire of Sexual Dysfunctions, UV	ever / current	871	19-34	33.4%	At least 1 disorder		12.4%	12.4%	16.1%	7.7%	8.0%	9
Sexual dysfunction among young married women in southern India	Varghese et al., 2012, India [185]	convenience clinical, face-to-face interview	NR	FSFI	past month	139	Premenopausal									
Orgasmic dysfunction: Prevalence and risk factors from a cohort of young females in Mexico	Villeda Sandoval et al., 2014, Mexico [186]	convenience community, online survey	NR	FSFI	past month	262	18-40						18.3%			8

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Prevalence of sexual dysfunction and impact of contraception in female German medical students	Wallwiener et al., 2010, Germany [187]	convenience community, online survey	15-20%	FSFI	past month	1057	<25-35+	32.4%	FSFI <26.55	5.8%	1.0%	1.2%	8.7%		1.1%	7
Female sexual arousal disorder with and without a distress criterion: Prevalence and correlates in a representative Czech sample	Weiss and Brody, 2009, Czech Rep [188]	random, paper questionnaire	53.0%	original tool, NV	ever / current	512	15-49				6.6%					8
Young women's sexual health and their views on dialogue with health professionals	Wendt et al., 2007, Sweden [189]	convenience clinical, paper questionnaire	75.2%	original tool, NV	past 12 months	488	23-29			17.8%		17.7%	23.3%		9.2%	10
Prevalence of low sexual desire and hypoactive sexual desire disorder in a nationally representative sample of US women	West et al., 2008, USA [190]	random, telephone interview	56.7%	PFSF	past month	750	30-50			26.7%						11

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Characteristics of women who experience mood and sexual side effects with use of hormonal contraception	Wiebe, 2011, Canada [191]	convenience clinical, paper questionnaire	NR	SIDI-F	ever / current	978	15-50			24.7%	24.8%				19.4%	8
Female sexual dysfunction, sexual distress and compatibility with partner	Witting et al., 2008, Finland [52]	convenience clinical, paper questionnaire	55-58.0%	FSFI	past month	5463	18-52	34.4%	FSFI <26.55	55.4%	18.4%	10.9%	31.6%		20.9%	10
Sexual dysfunction among women of low-income status in an urban setting	Worly et al., 2010, USA [192]	convenience clinical, paper questionnaire	67.1%	FSFI	past month	NA	NA									
Sexual dysfunction and related risk factors in a cohort of middle-aged Ecuadorian women	Yanez et al., 2006, Ecuador [193]	convenience clinical, interview + questionnaire	NR	original tool based on DSM IV, NV	past 12 months	269	40-49	76.2%	At least 1 disorder	60.6%	55.8%		55.4%		50.2%	10

Title	Author, year, country	Sampling method, method of data collection	Response rate	Name of assessment tool, validation	Time period referenced	Nr. of premenopausal women	Age range of premenopausal women	Prev. FSD overall	Cut-off for FSD	Prev. desire disorder	Prev. arousal disorder	Prev. lubrication difficulties	Prev. orgasm disorder	Prev. sexual aversion disorder	Prev. pain disorder(s)	Quality score
Female sexual dysfunction among young and middle-aged women in Hong Kong	Zhang and Yip, 2012, Hong Kong [194]	random, face-to-face interview	66.3%	original tool based on DSM IV, NV	past 3 months	1375	19-49	37.9%	At least 1 disorder	11.7%		16.3%	14.7%		13.8%	11

Abbreviations and notes for Appendix 5: NR=not reported, NA=not available. Abbreviations: NV=not validated, UV=unclear validity, FSFI=Female Sexual Function Index, GRISS=Golombok Rust Inventory of Sexual Satisfaction, BISF-W=Brief Index of Sexual Functioning for Women, PISQ=Pelvic Organ Prolapse/Urinary Incontinence, BSSC=Brief Sexual Symptom Checklist, PFSF=Profile of Female Sexual Function, SFQ=Sexual Function Questionnaire, SFS=Sexual Functioning Scale, DSDS=Decreased Sexual Desire Screener, CSFQ=Changes in Sexual Functioning Questionnaire, SPEQ=Short Personal Experiences Questionnaire, SIDI-F=Sexual Interest and Desire Inventory–Female, ICC=International Consensus Classification. Studies which provided absolute numbers for prevalence rates were included in the meta-analyses; these studies have quality scores. *Cohort study

Appendix 6 | Predictors of female sexual dysfunction

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Prevalence of sexual dysfunctions and correlated conditions in a sample of Brazilian women—results of the Brazilian study on sexual behavior (BSSB)	Abdo et al., 2004 [64]	**FSD**: lower education **Desire:** aged 26 to 40, aged 41 or older, only high school education, only elementary education, race ("brown"). **Pain:** unmarried, only high school education, only elementary education. **Orgasm:** aged 41 or older, unmarried, only high school education, only elementary education.	**Pain**: aged 26 to 40, aged 41 or older, race (brown), orgasm: unmarried. **Desire**: unmarried.	**Desire:** race (black and other) pain: race (black, brown, other), depression, cardiopathies. **Orgasm**: race (black, brown, other) aged 26 to 40, separated/divorced /widowed, religion, non-heterosexual orientation, depression, cardiopathy, hypercholesterolemia. **Pain**: separated/divorced /widowed, race (black, brown, other), religion, non-heterosexual orientation, diabetes, cardiopathy, systematic arterial hypertension, hypercholesterolemia.
Hypoactive sexual desire disorder in a population-based study of Brazilian women: Associated factors classified according to their importance	Abdo et al., 2010 [65]	**Desire:** older age, widowed, low education, having children, unemployment, cardiovascular disease, diabetes, breast cancer, PTSD, hypertension, depression, low hormone levels, excessive use of medication (addiction), first sexual intercourse after age 21, only one significant sexual partner in lifetime, no foreplay or too little foreplay.	**Desire**: single or divorced, moderate alcohol consumption, sex education, spontaneous sexual initiation, varied sexual repertoire.	
Factors associated with sexual dysfunction in Jordanian women and their sexual attitudes	Abu Ali et al., 2009 [66]	**FSD**: older age, obesity, higher education.		**FSD**: SES.

Appendix

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Sexual dysfunction among secondary school teachers in Ilorin, Nigeria	Adegunloye et al., 2010 [68]	**Orgasm**: being single. **Pain**: being married.		
Sexual dysfunction in women: An overview of risk factors and prevalence in Indian women	Aggarwal et al., 2012 [69]	**FSD:** illiteracy, lower education level, chronic disease, menopause, pelvic inflammatory disease, endometriosis, 24-30 years, 38-42 years, older than 42 years		**FSD**: primary education, higher secondary education, graduate education, post graduate education, history of candida infection, <24 years,31-37 years.
Incidence of sexual dysfunction: A prospective survey in Ghanaian females	Amidu et al., 2010 [70]	**FSD**: alcohol, non-sensuality. **Pain (vaginismus):** increased with non-sensuality and infrequency and older age. **Orgasm**: non-sensuality.	**Aversion**: older age.	**FSD:** exercise, smoking, married, educational attainment, aged older than 36 years.
Sexual dysfunction among married couples living in Kumasi metropolis, Ghana	Amidu et al., 2011 [71]	**FSD**: long duration of marriage (13+ yrs).		**FSD**: smoking, alcohol, level of education, physical activity.
Survey of the prevalence of sexual dysfunctions in Kurdish women	Arasteh et al., 2013 [72]	**FSD**: older age.	**FSD**: older age at marriage.	**FSD:** rural or urban, level of education, employment status.
Prevalence and risk factors for low sexual function in women: A study of 1009 women in an outpatient clinic of a university hospital in Istanbul	Aslan et al., 2008 [73]	**FSD**: older age, low education (less than 8 yrs), menopause, depression, partner has SD.	**FSD**: using some form of contraceptive.	**FSD**: partner's age, duration of marriage, age at first sexual experience, smoking, alcohol, chronic disease, drugs, sexual abuse, HRT.

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Relationship between loss of libido and signs and symptoms of depression in a sample of Puerto Rican middle-aged women	Avellanet et al. 2008 [75]	**Desire**: having symptoms of depression, genitourinary symptoms, older age, unemployment, having children, menopausal.	**Desire**: smoking, drinking alcohol, exercising 2x per week.	**Desire**: BMI, use of oral contraceptives.
Dyspareunia in Puerto Rican middle-aged women	Avellanet et al., 2009 [76]	**Pain**: low educational attainment, working status, with a partner, menopausal/HRT, urinary incontinence.	**Pain**: current employment.	**Pain**: use of oral contraceptives, current cigarette smoking, BMI, exercising at least 2x per week, any alcohol use.
Prevalence of female sexual dysfunction and related factors for under treatment in Bushehrian women of Iran	Bagherzadeh et al., 2010 [78]	**FSD**: low education, low education of husband, unemployment, unemployment of husband, low SES, smoking, husband smokes. **Desire**: urban, low education, low education of husband, unemployment of husband, low SES. **Arousal**: low education, low education of husband, unemployment, unemployment of husband, low SES. **Lubrication**: low education, low education of husband, unemployment, unemployment of husband, low SES. **Orgasm**: low education, low education of husband, unemployment, unemployment of husband, low SES, smoking. **Pain**: low education of husband, unemployment, unemployment of husband, low SES, husband smokes.		**FSD**: urban or rural, addiction of husband, husband drinks alcohol, husband drug consumption. **Desire**: employment, smoking, husband smoking, addiction of husband, husband drinks alcohol, husband drug consumption. **Arousal**: urban or rural, husband smoking, addiction of husband, husband drinks alcohol, husband drug consumption. **Lubrication**: urban or rural, husband smoking, addiction of husband, husband drinks alcohol, husband drug consumption. **Orgasm**: urban or rural, husband smoking, addiction of husband, husband drinks alcohol, husband drug consumption. **Pain**: urban or rural, level of education, smoking, addiction of husband, husband drinks alcohol, husband drug use.

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Vulvar pain, sexual behavior and genital infections in a young population: A pilot study	Berglund et al., 2002 [79]	**Pain**: regular sexual intercourse before the age of 15 years or earlier, using oral contraceptives for more than 2 years.	**Pain:** More than 4 years of regular intercourse; coitus at least 4x a week.	**Pain:** STD; history of candida infection, chronic UTI.
The impairment of sexual function is less distressing for menopausal than for premenopausal women	Berra et al., 2010 [80]	**Desire**: older age. **Arousal**: older age. **Lubrication**: older age. **Orgasm**: older age. **Pain**: older age.		
sexual desire and sexual activity of men and women across their lifespans: Results from a representative German community study	Beutel et al., 2007 [81]	**Desire**: older age, lack of partnership, childhood sexual abuse		**Desire:** income, employment status.
Sexual dysfunction in middle-aged women: A multicenter Latin American study using the Female Sexual Function Index	Blumel et al., 2009 [82]	**FSD**: poor lubrication, older age, urinary incontinence, HRT, negative perception of own health, being married, partner has SD.	**FSD**: higher education, access to private health care, faithful partner.	

Appendix

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Associations among everyday stress, critical life events, and sexual problems	Bodenmann et al., 2006 [83]	**Desire**: internal stress (within couple). **Aversion**: internal stress. **Arousal**: poor relationship quality, internal stress. **Orgasm**: critical life event.		**Desire**: psychological symptoms, relp quality, external stress (job, outside life), critical life event. **Aversion**: psychological symptoms, relp quality, external stress, critical life event. **Arousal**: psychological symptoms, external stress, critical life event. **Orgasm**: psychological symptoms, relp quality, internal stress, external stress. **Pain**: psychological symptoms, relationship quality, internal stress, external stress, critical life event.
Effect of parity on sexual function - An identical twin study	Botros et al., 2006 [84]	**FSD**: multiparity, urinary incontinence.		**FSD**: age, menopause, BMI, smoking, hysterectomy, mode of delivery, weight of baby, episiotomy.
Recent and lifelong sexual dysfunction in a female UK population sample: Prevalence and risk factors	Burri and Spector, 2011 [86]	**FSD**: relationship dissatisfaction. **Arousal**: age. **Lubrication**: age, relationship dissatisfaction. **Orgasm**: age, relationship dissatisfaction. **Pain**: relationship dissatisfaction, anxiety.	**FSD**: emotional intelligence. AD: emotional intelligence.	**FSD**: BMI, history of emotional abuse, history of sexual abuse, history of physical abuse, number of pregnancies, parity, smoking.
Sexual functioning and practices in a multi-ethnic study of midlife women: Baseline results from SWAN	Cain et al., 2003 [87]	**Desire:** ethnicity (Chinese, Japanese), older age, never being married, paying for basics in hard, paying for basics is moderately hard. **Pain:** perimenopause, race (African American, Chinese) marital status (never married, widowed/separated/divorced). **Arousal:** race (African American, Hispanic, Chinese.	**Pain:** older age. **Arousal:** never married, widowed/separated/divorced, college graduate, more than college.	**Desire:** African American, Hispanic, perimenopause, widowed/separated/divorced **Arousal:** perimenopause, less than high school education, more than high school education, paying for basics moderately hard, paying for basics hard, **pain:** race (Hispanic, Japanese)

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Prevalence of sexual dysfunction in a cohort of middle-aged women: Influences of menopause and hormone replacement therapy	Castelo-Branco et al., 2003 [88]	**FSD:** partner has ED, hysterectomy, menopause, age > 49 years.	**FSD:** church attendance, higher education, good general health, HRT.	**FSD:** alcoholic husband, sexual abuse history, psychiatric complaints, only 1 sexual partner, stable couple, healthy husband.
The prevalence of female sexual dysfunction and potential risk factors that may impair sexual function in Turkish women	Cayan et al., 2004 [89]	**FSD**: older age, low education, unemployment, chronic disease, multiparity, menopause.		**FSD**: smoking history, age at marriage, pelvic surgery, contraceptive methods used.
Sexual dysfunctions and difficulties in Denmark: Prevalence and associated sociodemographic factors	Christensen et al., 2011 [49]	**FSD**: living in city with more than 100,000 inhabitants (urban living), more than 12 years of school attendance, high further education, economic hardship in the family, unmarried. **Lubrication**: non or semi-skilled worker, difficulties paying bills during the previous year. **Orgasm**: living in a city with more than 100,000 inhabitants (urban living), unmarried women. **Pain**: living in a city with more than 100,000 inhabitants (urban living).		**FSD**: towns with 10,000-99,999 inhabitants (rural living), current employment, difficulties paying bills in the previous year. **Lubrication**: living in a city with more than 100,000 inhabitants (urban living), towns with 10,000-99,999 inhabitants (rural living), years of school attendance, low or intermediate education, current employment, household incomes, marital status. **Orgasm**: years of school attendance, low intermediate or high education, current employment, economic hardship in the family. **Pain**: years of school attendance, education, current employment, economic hardship in the family, household income, difficulties paying bills in the previous year, marital status.

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Prevalence and incidence of prolonged and severe dyspareunia in women: Results from a population study	Danielsson et al., 2003 [93]	**Pain:** younger age (20-29, 30-39).		**Pain:** use of oral contraceptives.
Study of the prevalence of female sexual dysfunction in sexually active women 18-40 years of age in Medellin, Colombia	Echeverry et al., 2010 [94]	**FSD:** elementary education, high school education, not living together, depressive feelings, current use of antidepressives.		**FSD**: aged 31-40, economic status, marital status, former use of antidepressants, contraceptive use, type of contraceptive, irregular menstrual cycle, children.
Young Swedish women's experience of pain and discomfort during sexual intercourse	Elmerstig et al., 2009 [96]			**Pain**: pain during first sexual intercourse, perception (positive/negative) of experience of first sexual intercourse.
The impact of female genital cutting on health of newly married women	Elnashar and Abdelhady, 2007 [97]	**FSD:** female genital mutilation.		
Female sexual dysfunction in Lower Egypt	Elnashar et al., 2007 [98]	**FSD:** older age, secondary education, female genital mutilation, abnormal menstrual pattern, nulliparity, having 3 or more children (multiparity).		**FSD:** residency (rural or urban), type of family (extended or nuclear), employment status, duration of marriage, having other wives, mode of delivery, mode of contraceptive.
Female sexual dysfunction in urological patients: findings from a major metropolitan area in the USA	Elsamra et al., 2010 [99]	**FSD:** age, menopause, SSRI usage (selective serotonin reuptake inhibitors).		**FSD:** chronic medical disease, psychiatric illness, smoking, alcohol use, history of pelvic surgery, radiotherapy or malignancy.

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Sexual desire in a nationally representative Danish population	Eplov et al., 2007 [100]	**Desire**: older age, low SES, sexual abuse, anxiety, emotional problems.	**Desire**: moderate alcohol consumption, exercising.	**Desire**: marital status, level of education, parity, self-perceived health status, diabetes.
Prevalence and risk factors for female sexual dysfunction among Turkish women attending a maternity and gynecology outpatient clinic	Erbil, 2011 [101]	**FSD:** younger age at marriage, higher number of births, higher number of children, housewife (unemployment), rural residence, low education, low education level of the husband, being brought up by parents with restrictive attitudes, having genital infections or symptoms, arranged marriage.	**FSD**: sex education.	**FSD:** age, duration of marriage, BMI, income, family type (large/small), mode of delivery, opinion on virginity (abstinence), chronic disease, depression, menopause.
Level of bother and treatment-seeking predictors among male and female in-patients with sexual problems: A hospital-based study	Evangelia et al. 2010 [102]	**FSD**: older age.		
Sexual dysfunction among female patients of reproductive age in a hospital setting in Nigeria	Fajewonyomi et al., 2007 [103]	**FSD:** tertiary education higher education), history of sexual abuse, guilt feelings about previous abortions, medications, current illness, polygamous relationship.		
Presence of a sexual problem may not affect women's satisfaction from their sexual function	Ferenidou et al., 2008 [104]	**Desire:** older age. **Arousal:** older age. **Lubrication:** older age. **Orgasm:** older age.		**Pain:** age

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Pelvic pain and associated characteristics among women in Northern Mexico	Garcia-Perez et al., 2010 [107]	**Pain**: older age, age of sexual debut 10-14, cesarean birth, IUD use, history of STI /PID, history of colitis, chronic UTI.		**Pain**: marital status, having uterine fibroids, BMI, height.
Female sexual dysfunction in Iran: Study of prevalence and risk factors	Ghanbarzadeh et al., 2013 [109]	**Orgasm**: housewife or manual laborer. **Pain**: nulliparity, having 1-3 deliveries.	**Orgasm**: satisfactory relp with husband, being sexually active.	**Orgasm**: age, education duration of marriage, menopause status, method of contraception, chronic disease, use of medication. **Pain**: not reported.
Prevalence and potential risk factors of female sexual difficulties: An urban Iranian population-based study	Goshtasebi et al., 2009 [111]	**Desire**: older age, tubal ligation. **Arousal**: older age. **Pain**: low education.	**Arousal**: older age at marriage. **Orgasm**: using contraceptives. **Pain**: older age.	**Desire**: level of education, employment status, age at marriage, contraceptive method. **Arousal**: level of education, employment status, contraceptive method, genital surgery. **Lubrication**: age, education, employment status, age at marriage, contraceptive method, genital surgery. **Orgasm**: age, education, employment, age at marriage, genital surgery. **Pain**: employment, age at marriage, contraceptive method, genital surgery.
Prevalence and evaluation of sexual health problems - HSDD in Europe	Graziottin, 2007 [112]	**Desire**: older age		
Prevalence and risk factors of female sexual dysfunction among healthcare personnel in Malaysia	Grewal et al., 2014 [113]	**Desire:** low frequency of intercourse, partner with ED, longer duration of marriage.		

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Self-reported frequency of feeling sexual desire among a representative sample of 18-49 year old men and women in Oslo, elicudated by epidemiological data	Hamilton et al., 2001[114]		**Desire**: masturbating in last 30 days.	
Prevalence and characteristics of female sexual dysfunction in a sample of women from Upper Egypt	Hassanin et al., 2009 [115]	**FSD**: older age, multiparity, married more than 10 years, menopause, female genital mutilation.		**FSD**: level of education, use of contraceptive, urban or rural, age of husband.
Risk factors for female sexual dysfunction in the general populations: Exploring factors associated with low sexual function and sexual distress	Hayes et al., 2008 [116]	**Desire**: unemployment, sex is not important, in relationship for 20-29 years, dissatisfaction with partner. **Arousal**: perimenopausal, postmenopausal, depression, low education, sex is not important. **Orgasm:** sex is not important.	**Arousal**: middle age (30-49), taking hormone therapy. **Orgasm:** middle age (30-39).	**Desire**: age, menstrual cycle, HRT, depression, antidepressants, level of education, employment, forced into sexual activity, relationship status, communication. **Arousal**: HRT, antidepressants, employment, forced into sexual activity, relationship status, duration of partnership, communication, sexual satisfaction. **Orgasm**: menstrual cycle, HRT, depression, antidepressants, level of education, employment ,forced into sexual activity, relationship status, duration of partnership, communication, sexual satisfaction.

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Prevalence of female sexual dysfunction symptoms and its relationship to quality of life: A Japanese female cohort-study	Hisasue et al., 2005 [118]	**FSD:** older age. **Desire:** older age. **Arousal**: older age. **Lubrication**: older age. **Orgasm**: older age. **Pain**: older age.		
Prevalence and risk factors for female sexual dysfunction among Egyptian women	Ibrahim et al., 2013 [119]	**FSD:** older age, menopausal, married over 10 years, female genital mutilation, partner over 50 years old, partner has SD.	**FSD**: HRT	**FSD**: education, parity, smoking, chronic disease, rural or urban, mode of delivery, use of contraceptives.
Prevalence, risk factors, and predictors of female sexual dysfunction in a primary care setting: A survey finding	Ishak et al., 2010 [120]	**FSD**: having a medical illness, menopause, low frequency of intercourse.		**FSD**: age, husband's age, duration of marriage, use of contraceptives.
Female sexual dysfunction: Prevalence and risk factors	Jaafarpour et al., 2013 [121]	**FSD:** older age, lower education, sexual intercourse less than 3x per week, having 3 or more children, having a husband age 40 or more, being married 10 years or more, unemployment.		**FSD**: contraceptive use, residency (rural or urban), smoking history.
Female sexual dysfunction: Facts and factors among gynecology outpatients	Jahan et al., 2012 [122]	**FSD**: multiparity, mental stress, partner has SD.		**FSD**: mode of delivery, abortion, contraceptive, history of STD, hypertension, pelvic surgery.

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Risk factors for the individual domains of female sexual function	Jiann et al., 2009 [123]	**Desire**: parity, married 6-10 years (vs. <5 or >10), diabetes, poor relp with partner, no steady partner, partner has ED. **Arousal**: older age, poor relp with partner, partner has ED, partner has prem ejaculation, partner has low desire. **Lubrication**: older age, urinary incontinence, no steady partner, partner has ED. **Orgasm**: poor relp with partner, partner has ED, partner has prem ejaculation. **Pain**: younger age, urinary incontinence, no steady partner.	**Orgasm**: married 5 yrs or less	**Desire:** age, urinary incontinence, partner has PE, partner has low desire. **Arousal:** children, duration of marriage, diabetes, urinary incontinence. **Lubrication**: children, duration of marriage, diabetes, partner has PE, partner has low desire. **Orgasm**: age, children, diabetes, urinary incontinence, partner has low desire. **Pain**: children, duration of marriage, diabetes, partner has ED, partner has PE, partner has low desire.
Sexual motivation and the duration of partnership	Klusmann, 2002 [126]	**Desire** (sexual motivation): duration of partnership, imbalance of commitment, lifetime number of sexual partners.		**Desire** (sexual motivation): older age, living together, age at first coitus, church attendance, political orientation left to right, approval for feminist views.
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	Lau et al., 2005 [127]	**FSD**: older age, inadequacy of sex knowledge, belief that sex life is not very important or neutrality, low general life satisfaction, low mental health QOL score, low vitality QOL score., **Pain:** low perceived health status, inadequate sexual knowledge, sexual dissatisfaction, belief that sexual life is not important or neutrality, low mental health QOL score. **Lubrication**: 40-59 years old, married, div/wid/other, low perceived health status,	**Pain**: married	**FSD**: educational level, full-time employment, marital status, chronic physical disease, perceived general health status, Lubrication: educational level. **Orgasm:** older age, inadequate sexual knowledge, belief that sexual life is not important or neutrality, low vitality QOL. **Desire ("lack of interest"):** older age, inadequacy of sex knowledge, perceived general health status, low vitality QOL

Title	Author, year	Risk factor	Protective factor	Non-significant factors
		inadequate sexual knowledge, low mental health QOL. **Desire ("lack of interest"):** married, div/wid/other, belief that sex life is not very important or neutrality, low sexual satisfaction, low mental health QOL score, low general life satisfaction		

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Prevalence and correlates of sexual dysfunction among young adult married women in rural China: A population-based study	Lau et al., 2006 [128]	**Pain:** education junior high school or above, average annual income 500-999 RMB Yuan, average annual income ≥1000 RMB Yuan, sharing a bedroom with non-spouse family members; ever been pregnant, currently pregnant, age at menarche 13-14, age at menarche >15, whether using IUD, self-reporting menstruation disorder, ever having cervical erosion, experienced RTI, frequency of intercourse per week ≥2x per week masturbated in the last 12 months, belief that sex life is important. **Orgasm:** education junior high school or above, average annual income 500-999 RMB Yuan, average annual income > 1000 RMB Yuan, sharing a bedroom with non-spouse family members, smoking, alcohol use, age at menarche 13-14, age at menarche >15, self-reporting menstruation disorder, ever having cervical erosion, experienced RTI, frequency of intercourse per week >2x per week masturbated in the last 12 months, belief that sex life is important. **Desire**: education junior high school or above, age at first marriage ≥ 25, average annual income 500-999 RMB Yuan, average annual income > 1000 RMB Yuan, sharing a		**Pain:** age at first marriage, smoking, alcohol use. **Orgasm:** age at first marraiage.

Title	Author, year	Risk factor	Protective factor	Non-significant factors
		bedroom with non-spouse family members, ever been pregnant, currently pregnant, age at menarche 13-14, age at menarche >15, self-reporting menstruation disorder, ever having cervical erosion, experienced RTI, frequency of intercourse per week >2x per week masturbated in the last 12 months, belief that sex life is important. **Lubrication**: age at first marriage 20-24, average annual income 500-999 RMB Yuan, average annual income > 1000 RMB Yuan, sharing a bedroom with non-spouse family members, age at menarche 13-14, age at menarche >15, self-reporting menstruation disorder, ever having cervical erosion, experienced RTI, frequency of intercourse per week >2x per week masturbated in the last 12 months, belief that sex life is important.		
Hypoactive sexual desire disorder in postmenopausal women: US results from the Women's International Study of Health and Sexuality (WISHeS)	Leiblum et al., 2006 [131]		**Desire**: higher frequency of intercourse, spontaneous sexual initiation, masturbation.	

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Risk factors for low sexual function among urban Chinese women: A hospital-based investigation	Lianjun et al., 2011 [132]	**FSD**: older age, low education, difficult delivery, depression, alcohol consumption, chronic disease, poor partner health, partner has SD, menopause, living separately from partner.	**FSD:** frequent communication with partner.	**FSD:** marital status, employment, having children, smoking, physical activity, attitude towards sex (positive / neg).
Sexual behavior and symptoms among reproductive age Chinese women in Hong Kong	Lo and Kok, 2014 [133]	**Desire**: low foreplay enjoyment, unidirectional coitus initiation, sexual intercourse less than 1x per month. **Arousal**: low foreplay enjoyment, high acceptance for pornography, neutral towards pornography, unidirectional coitus initiation, sexual intercourse less than 1x per month, chronic illness. **Orgasm**: low foreplay enjoyment, unidirectional coitus initiation, sexual intercourse less than 1x per month, primary education. **Pain**: unidirectional coitus initiation, sexual intercourse less than 1x per month, secondary education or less, planning to have more children.		**Desire**: level of education, attitudes towards pornography, chronic illness, planning to have more children. **Arousal**: level of education, planning to have more children. **Orgasm**: attitudes towards pornography, chronic illness, planning to have more children. **Pain**: foreplay enjoyment, attitudes towards pornography, chonic illness.
Prevalence and correlates of sexual activity and function in women: Results from the Boston Area Community Health (BACH) survey	Lutfey et al., 2009 [134]	**FSD:** race "white", older age, being married, sexual abuse, poor mental health.		**FSD:** SES, BMI, physical activity, alcohol consumption.
Prevalence of low sexual desire among women in Britain: Associated factors	Mitchell et al. 2009 [137]	**Desire**: older age, having children under 5, giving birth in past year.	**Desire**: single/never married.	**Desire**: ethnicity, self-perceived health status.

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Sexual function in Britain: Findings from the third National Survey of Sexual Attitudes and Lifestyles (Natsal-3)	Mitchell et al. 2013 [138]	**FSD**: older age, unemployment, current depression, self-reported poor physical health, menopausal, no stead relationship -previously cohabitating, no steady relationship - never cohabitated, difficulty talking about sex with partners, relationship dissatisfaction, non-competence at first intercourse, not having four or more sexual acts in the previous 4 weeks, masturbating in the previous 4 weeks, no genital contact without intercourse in the previous 4 weeks, having at least one same sex partner in the previous 5 years, having 3-4, 5-9 or more than 10 partners during lifetime, ever having non-volitional sex, being diagnosed with an STI in the previous 5 years	**FSD:** pregnancy in the last year, steady relationship - not cohabitating	
Prevalence and related factors for anorgasmia among reproductive aged women in Hesarak, Iran	Najafabady et al., 2011 [139]	**Orgasm**: older age, younger age at time of marriage, longer duration of marriage, less sex education during puberty, sexual dissatisfaction, belief that sex is a "duty", feelings of anxiety, fatigue, pain, guilt, anti-masculinity and embarrassment, absence of sexual pleasure.	**Orgasm**: higher education.	**Orgasm**: frequency of intercourse per month.
Use of the Italian translation of the Female Sexual Function Index (FSFI) in routine gynecological practice	Nappi et al., 2008 [141]	**FSD, Desire, Arousal, Lubrication, Orgasm, Pain** were significantly negatively associated with age. **FSD**: multiparity. **FSD**: menopause.	**FSD:** HRT.	**FSD:** using oral contraceptives.

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Problems with sexual function in people attending London general practitioners: cross-sectional study	Nazareth et al., 2003 [142]	**FSD**: older age, unemployment, poor physical health, poor mental health, dissatisfaction with sex life.		
Sexual activity and background variables among Finnish middle-aged women	Ojanlatva et al., 2004 [148]	**Desire**: being married / marriage-like relationship, having a spouse.		**Desire**: level of education, vocational education, residency (rural or urban).
Sexual problems among married Nigerian women	Ojomu et al., 2007 [149]	**Desire:** poor communication, chronic medical condition. **Arousal**: older age (46-55), polygamous marriage, chronic medical condition, current medication. **Pain**: gynecological condition. **Orgasm:** Islamic religion, polygamous marriage, occupation as housewife, forced sex by husband, poor communication.	**Desire**: some education. **Arousal**: some education.	
Prevalence and risk factors for female sexual dysfunction in Turkish women	Oksuz and Malhan, 2006 [150]	**FSD:** older age, smoking, marital status, menopause, .		**FSD:** education, contraceptive use, chronic illness.
The prevalence and causes of sexual problems among premenopausal Turkish women	Oniz et al., 2007 [151]	**Pain**: low education	**Orgasm**: using contraceptives	
Dyspareunia and urinary sensory symptoms in India: Population-based study	Padmadas et al., 2006 [153]	**Pain**: urinary sensory symptoms, nulliparity.		**Pain**: age at first union, duration of marriage.

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Sexual dysfunctions in urban China: A population-based national survey of men and women	Parish et al., 2007 [154]	**Desire**: absence of daily intimacy, higher education, mental distress, fear of pregnancy, older age. **Pain**: varied sexual practices, finding sex "dirty", mental distress, poor health, older age. **Lubrication**: physical assault, unattractive partner, adulterous partner, finding sex "dirty", knowledge of clitoris, mental distress, older age. **Arousal**: absence of daily intimacy, physical assault, finding sex "dirty", higher education, liberal sex values, fear of pregnancy, genito-urinary symptoms, younger age. **Orgasm**: absence of daily intimacy, unattractive partner, adulterous partner, higher education, knowledge of clitoris, fear of pregnancy, job insecurity.		**Desire**: physical assault, knowledge of sexual needs, varied sexual practices, partner's attractiveness, fidelity, sexual values, job security, overall health. **Pain**: physical assault, knowledge of sexual needs, partners attractiveness, fidelity, sexual values, job security. **Lubrication**: knowledge of sexual needs, varied sexual practices, level of education, overall health. **Arousal**: knowledge of sexual needs, varied sexual practices, partner's attractiveness, fidelity, mental distress, job security. **Orgasm**: knowledge of sexual needs, sexual practices, sexual values, mental distress, overall health, age
Prevalence and socio-demographic predictors of sexual problems in Portugal	Peixoto and Nobre 2013 [155]	**FSD:** older age, low education. **Desire**: older age. **Orgasm**: older age.	**FSD:** level of education, marital status, duration of relationship. **Desire**: level of education, marital status, duration of relationship. **Arousal:** age, education, marital status, duration of relp. **Lubrication:** age, education, marital status. **Orgasm**: education, marital status, duration of relationship. **Pain:** age, education, marital status, duration of relationship.	**FSD:** marital status, duration of relationship.

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Prevalence of sexual problems and associated distress among lesbian and heterosexual women	Peixoto and Nobre 2014 [156]		**Orgasm:** homosexual preference (lesbian). **Arousal**: lesbian. **Pain:** lesbian.	**Desire**: sexual preference (homo or hetero).
Sexual dysfunction, depression, and anxiety in young women according to relationship status: An online survey	Pereira et al., 2013 [157]	**FSD:** marital status (single), **Lubrication**: marital status (single), **Orgasm:** marital status (single), **Pain:** marital status (single).		**Desire**: marital status. **Arousal:** marital status.
Female sexual dysfunction in a healthy Austrian cohort: Prevalence and risk factors	Ponholzer et al., 2004 [15]	**Desire**: older age, low physical activity. **Arousal**: age, low physical activity. **Orgasm**: stress.		**Desire**: BMI, education, alcohol, stress, smoking, hypertension, heart disease, diabetes, menopause, HRT. **Arousal**: BMI, education, alcohol, stress, smoking, hypertension, heart disease, diabetes, menopause, HRT. **Orgasm**: age, physical activity, BMI, education, alcohol, smoking, hypertension, heart disease, diabetes, menopause, HRT.
Pain at the vulvar vestibule: A web-based survey	Reed et al., 2004 [160]	**Pain:** race		
Sex in Australia: Sexual difficulties in a representative sample of adults	Richters et al., 2003 [162]	**FSD**: age 20-29, age 30-39, physical health reported as being bad, fair or good--versus very good or excellent, physical disability in the previous year. **Orgasm**: aged 50-59. **Lubrication:** older age. **Pain:** younger age.	**Desire:** aged -16-19. **Pain:** older age.	**FSD:** nationality, sexual identity, education, region of residence, household income, occupational classification, relationship status, medication for cardiovascular disease or hypertension, hyperglycemia/diabetes, regular sexual partner.

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Female sexual dysfunction in a population-based study in Iran: Prevalence and associated risk factors	Safarinejad, 2006 [164]	**Desire:** older age, secondary education or less, unemployment, menopausal, having 3 or more children, having a chronic disease, marrying young (<= 18), having psychological problems, exercising 1x per week or less. **Arousal**: older age, primary school or less, menopausal, having a chronic disease, marrying young (<= 18), having psychological problems, exercising 1x per week or less. **Lubrication**: older age, secondary education or less, unemployment, menopausal, having a chronic disease, marrying young (<= 18), having psychological problems. **Orgasm**: older age, secondary education or less, unemployment, menopausal, having 3 or more children, having a chronic disease, marrying young (<= 18), having psychological problems, exercising 1x per week or less. **Pain**: primary education or less, menopausal, having a chronic disease, marrying young (<= 18), having psychological problems.	Significant association between FSD and good physical health, between FSD and good mental health.	**Desire**: contraceptive use, smoking history, previous pelvic surgery. **Arousal**: employment status, contraception use, number of children, smoking history, previous pelvic surgery. **Lubrication**: contraceptive use, number of children, smoking history, previous pelvic surgery, physical activity. **Orgasm**: contraceptive use, smoking history, previous pelvic surgery. **Pain**: employment status, contraception use, number of children, smoking history, previous pelvic surgery, physical activity.
Predicting sexual problems in women: The relevance of sexual excitation and sexual inhibition	Sanders et al., 2008 [165]	**Arousal:** full time employment, in a relationship. **Orgasm**: never reached orgasm, unsure if orgasm reached. **Desire**: full time employment, living with children, being married.	**Desire:** non-exclusive relationship.	**Arousal:** age. **Orgasm:** age. **Desire**: age.

Title	Author, year	Risk factor	Protective factor	Non-significant factors
The Global Online Sexuality Survey (GOSS): Female sexual dysfunction among Internet users in the reproductive age group in the Middle East	Shaeer et al., 2012 [166]	**FSD:** depression, low education, insufficient foreplay, masturbation, partner has ED, dissatisfaction with partner's penis size.		**FSD:** age, diabetes, hypertension, smoking pregnancy, mode of delivery, infertility, menstrual irregularities, dysmenorrhea, interpersonal distress, hirsutism (excessive hairiness), female genital mutilation.
Sexual problems and distress in United States women	Shifren et al., 2008 [167]	**Desire:** middle age group, being married, no current partner, employment, menopause, poor health, anxiety, thyroid problem, urinary incontinence, depression. **Arousal**: older age, being married, low education, menopause, poor health, arthritis, anxiety, thyroid problem, irritable bowel, urinary incontinence, depression. **Orgasm**: older age, low education, menopause, poor health, arthritis, anxiety, thyroid problem, urinary incontinence, depression.	**Desire**: African American race. **Orgasm:** African American race, being divorced.	**Desire:** education, HRT. **Arousal:** race, having a partner, employment, HRT. **Orgasm:** having current partner, employment, HRT.
An Internet survey of demographic and health factors associated with risk of sexual dysfunction in women who have sex with women	Shindel et al., 2012 [169]	**FSD:** older age, heart disease, depression, yeast infection, gynecological surgery, menopause, urinary incontinence, bisexual preference, having no partner, currently being with male partner.	**FSD:** Asian/Pacific Islander, higher frequency of sex (more than 3x / month).	
The prevalence of sexual dysfunction and potential risk factors which may impair sexual function in Malaysian women	Sidi et al., 2007 [170]	**FSD:** Malaysian race, long duration of marriage, multiparity, older husband, higher education.	**FSD:** older age, high frequency of intercourse.	**FSD:** income, illness, contraceptives, HRT, smoking, alcohol.

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Prevalence and risk factors for female sexual dysfunction in women attending a medical clinic in south India	Singh et al., 2009 [171]	**FSD:** older age, low education.		**FSD:** income, duration of marriage.
Rate and related factors of dyspareunia in reproductive age women: A cross-sectional study	Sobhgol et al., 2007 [172]	**Pain:** vaginal delivery, parity, cesarean, delivery without episiotomy, heavy lifting, chronic lung disease, pelvic organ prolapse, pelvic muscle strength, frequency of urinary infection >2x per year, stress incontinence, urgency, low back pain, history of pelvic inflammation disease, constipation, arthritis, low education.		**Pain:** age, delivery with episiotomy, BMI, weight of largest infant, genital hiatus, perineal diameter, depth of posterior fornix, exercise, employment status, hypertension, varicose, connective tissue disorder, familial history of pelvic floor dysfunction, previous pelvic surgery (hysterectomy, urinary incontinence surgery, pelvic organ prolapse surgery), uterus position, hemorrhoid, varicose, connective tissue disorder, familial history of pelvic floor dysfunction, pelvic organ prolapse
The prevalence and risk factors of female sexual dysfunction in young Korean women: An Internet-based survey	Song et al., 2008 [173]	**FSD:** older age, depression, negative attitude toward sex, history of sexual harassment, homosexuality, urinary problems (high IPSS score).	**FSD:** higher frequency of sex, masturbation.	**FSD:** IUD usage.
Dyspareunia, urinary sensory symptoms, and incontinence among young Chinese women	Stones et al., 2006 [174]	**Pain:** early sexual debut (<20), low education, not Han Chinese.		**Pain**: age, child birth / mode of delivery, rural or urban, occupation.

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Sexual problems of urban women in Croatia: Prevalence and correlates in a community sample	Stulhofer et al., 2005 [175]	**Desire:** older age, length of relationship, religious morality. **Arousal:** age, religious morality. **Pain:** religious morality.	**Desire:** intimate communication. **Arousal:** intimate communication, positive body image. **Orgasm:** age, intimate communication. **Pain**: age, positive body image.	**Desire**: having children, body image. **Arousal:** length of relationship, having children. **Orgasm:** length of relationship, having children, religious morality, body image. **Pain**: length of relationship, having children, intimate communication.
Sexual health difficulties in a population-based sample of Croatian women aged 18-35 and the effects of the dual (career and motherhood) role	Stulhofer et al., 2011 [176]	**Desire:** older age, secondary education or less. **Lubrication:** secondary education or less.	**Desire:** intimate communication. **Lubrication:** intimate communication. **Orgasm**: being married/in a relationship, intimate communication. **Pain:** being married/in a relationship.	**Desire:** income, being married/in a relationship, employment status, dual role. **Lubrication**: age, income, being married/in a relationship, employment status, dual role. **Orgasm**: age, level of education, income, employment status, dual role. **Pain:** age, level of education, income, intimate communication, employment status, dual role.
Gynecologic pain related to occupational stress among female factory workers in Tianjin, China	Sznajder et al., 2014 [177]	**Pain**: irregular periods, worked overtime in the last 12 months, feeling exhausted.	**Pain:** excellent or good physical health.	**Pain**: age, marital status, having children, level of education, income, alcohol consumption, use of hormonal contraceptives, compulsory overtime, high noise level, high job strain, job type, heavy/light period, working late shifts, number of sick days taken.
Correlates of lesbian sexual functioning	Tracy and Junginger, 2007 [179]	**FSD**: psychological symptoms, dissatisfaction with relationship, duration of relationship (cut off not specified but negative correlation)		

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Reduced sexual desire in a random sample of Norwegian couples	Traeen et al., 2007 [180]	**Desire:** significant negative association between number of children, age of youngest child, satisfaction with how the family does house work, frequency of orgasm during sex, frequency of simultaneous orgasm during sex, significant positive association between habitualized negative thinking about the partner, habitualized negative thinking about oneself, negative work to home interference.		**Desire:** age, satisfaction with work-home division.
Help-seeking behaviors for female sexual dysfunction: A cross sectional study from Iran	Vahdaninia et al., 2009 [182]	**FSD:** low education, unemployment.		
Prevalence of sexual dysfunction and its associated factors women aged 40-65 years with 11 years or more of formal education: a population-based study	Valadares et al., 2008 [183]	**FSD:** older age.	**FSD**: subjective good health, in partnership.	
Sexual health in the Netherlands: Main results of a population survey among Dutch adults	Vanwesenbeeck et al., 2010 [184]	significant association between FSD and sexual violence.	significant association between FSD and good physical health, between FSD and good mental health.	Associations which were non-significant were not given in article.
Sexual dysfunction among young married women in southern India	Varghese et al., 2012 [185]	**FSD:** contraceptive use.	**FSD:** higher income.	

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Orgasmic dysfunction: Prevalence and risk factors from a cohort of young females in Mexico	Villeda Sandoval et al., 2014 [186]	**Desire**: being unsatisfied with thickness/size of partner's penis.	**Desire:** older age (30-40 vs. 18-29).	**Desire:** marital status, level of education, homosexual experience, frequency of sexual intercourse.
Prevalence of sexual dysfunction and impact of contraception in female German medical students	Wallwiener et al., 2010 [187]	**FSD**: smoking. **Desire**: hormonal contraception. **Arousal:** hormonal contraception.		**FSD**: age, former pregnancy, wish for children, partnership status.
Female sexual arousal disorder with and without a distress criterion: Prevalence and correlates in a representative Czech sample	Weiss and Brody, 2009 [188]	**Orgasm**: older age.		
Female sexual dysfunction, sexual distress and compatibility with partner	Witting et al., 2008 [52]	**Desire, Arousal** and **Lubrication** were significantly negatively associated with age. **Desire, Arousal, Lubrication** and **Orgasm** were significantly negatively associated with longer duration of relationship.	**Orgasm** and **Pain** had positive association with age. **Pain**: positive association with longer duration of relationship.	
Sexual dysfunction among women of low-income status in an urban setting	Worly et al., 2010 [192]	**FSD:** older age, unemployment, African American race, sleeping problems, urinary incontinence, depression, polypharmacy.		**FSD:** relationship status, income, level of education, BMI, parity, diabetes, hysterectomy
Sexual dysfunction and related risk factors in a cohort of middle-aged Ecuadorian women	Yanez et al., 2006 [193]	**FSD:** partner with SD, antidepressant use, being married.	**FSD:** employment, high education, frequent intercourse (4x/month or more), only 1 sexual partner.	**FSD:** church attendance.

Title	Author, year	Risk factor	Protective factor	Non-significant factors
Female sexual dysfunction among young and middle-aged women in Hong Kong	Zhang and Yip, 2012 [194]	**Desire**: being married more than once, sex perceived as unimportant, dissatisfied in marriage. **Lubrication:** high education, infertility, seeking medical help, partner has SD. **Orgasm:** being married more than once, had an abortion, seeking medical help, partner has premature ejaculation, sex perceived as unimportant. **Pain:** high education, infertility, had an abortion, seeking medical help.	**Desire:** liberal attitudes towards sex. **Pain**: liberal attitudes towards sex.	**Desire**: level of education, having children, employment status, being religious, sexual experience factors. **Lubrication:** being married more than once, having children, employment status, being religious, had an abortion, partner has premature ejaculation, sex attitudes, satisfaction with marriage. **Orgasm:** level of education, being married more than once, having children, being religious, infertility, had an abortion, partner has SD, sex attitudes, satisfaction with marriage.

Abbreviations for Appendix 6: FSD = Female sexual dysfunction, SD = Sexual disorder / dysfunction, HRT = Hormone replacement therapy, SES = Socioeconomic status, BMI = Body mass index, UTI = Urinary tract infection, ED = Erectile disorder, PE = Premature ejaculation, IUD = Intrauterine device, STI / STD = Sexually transmitted infection / disease, QOL = Quality of life, RTI = Reproductive tract infection, SSRI = Selective serotonin re-uptake inhibitors

Curriculum Vitae

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2010	Communications intern, Munich DE, pro familia Bayern – a member of International Planned Parenthood Federation
2005 – 2011	Project Manager for international trade fairs and exhibitions, Munich DE, Tobias Renz FAIR / Hannover Trade Fairs
1999	Intern as English teacher, Lyon FR, Académie de Lyon

Education

2008 –2010	Master in Public Health, Munich DE, Ludwig Maximilian University
1999 –2003	Bachelor of Arts, Auburn AL USA, Auburn University
1995 – 1999	Advanced high school diploma, Birmingham AL USA, Vestavia Hills

Training

2013 – 2014	Regensburg city tour guide

Memberships

European Society for Sexual Medicine

Signature_____ Date_____

Selbstständigkeitserklärung

Ich, Megan Elizabeth McCool, geboren am 25. Juni 1981 in Birmingham, Alabama, USA erkläre hiermit, dass ich die vorliegende Arbeit ohne unzulässige Hilfe Dritter und ohne Benutzung anderer als der angegebenen Hilfsmittel angefertigt habe.
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