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Biopsychosocial factors associated with sexual dysfunction in self-identified females in Gauteng, South Africa, during 2013-2023

Corlia Brandt

Student nr 620729

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Supervisor: Prof S Mall (Associate Professor, University of the Witwatersrand)

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Table of Contents

List of Tables

List of Figures and Graphs

Declaration

I, Corlia Brandt, declare that this dissertation is my independent, unaided work except to the extent indicated in the acknowledgement sections. This dissertation is being submitted for the degree of Masters in Epidemiology (Implementation Science) at the University of the Witwatersrand, Johannesburg, South Africa. This script has not previously been submitted for any other degree or examination at this or any other university/faculty.

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Corlia Brandt 09 May 2025

List of abbreviations

AOR: adjusted odds ratio

BPSM: Biopsychosocial model of care

FASD: female sexual arousal disorder

FSD: female sexual dysfunction

HIV: human immunodeficiency virus

HSDD: hypoactive sexual disorder

LGBTQI: lesbian, gay, bisexual, transgender, queer (or questioning), and intersex

STI: sexually transmitted infection

WHO: World Health Organisation

Glossary of terminology/ operational definitions

Biopsychosocial model of care: The Biopsychosocial Model of Care (BPSM) defines sexual dysfunction, a component of sexual health, as a complex interaction of biological/biomedical (genetics, pathology, physiology), social (socio-economical, cultural, environmental, and relational) and psychological (emotions, thoughts and behavioural) factors (Nimbi et al., 2022).

Female sexual dysfunction: Female sexual dysfunction (FSD) is a complex disorder, defined as a sexual complaint that can be associated with personal stress (such as anxiety or depression) or interpersonal difficulties (such as relationships) (Campbell & Stein, 2014; Rogers et al., 2018; Wolpe et al., 2017). The female sexual response affect, or can be related to overlapping neurovascular, endocrine, emotional, and psychosocial responses (Prabhu et al., 2022). According to the Diagnostic and Statistical Manual of Mental Illnesses (DSM-V) criteria, FSD is categorised into female sexual interest/arousal disorder, female orgasmic disorder, genito-pelvic pain disorder or pleasure disorder (Campbell & Stein, 2014; Ishak & Tobia, 2013; Rogers et al., 2018).

Hypoactive sexual disorder: Hypoactive sexual disorder (HSDD) (newly termed female sexual interest/arousal dysfunction or FSIAD) is defined as the absence of sexual fantasies/thoughts and/or desire for sexual activity (Sharma & Kalra, 2016).

Sexual health: Sexual health-related issues are wide-ranging, and encompass sexual orientation and gender identity, sexual expression, relationships, and pleasure. They also include negative consequences or conditions such as: infections with human immunodeficiency virus (HIV), sexually transmitted infections (STIs) and reproductive tract infections (RTIs) and their adverse outcomes (such as cancer and infertility); unintended pregnancy and abortion; sexual dysfunction; sexual violence; and harmful practices (such as female genital mutilation) (World Health Organisation, 2023).

Abstract

Female sexual dysfunction (FSD) is an important component of overall sexual health. FSD can be linked to quality of life and mental disorders and is an important public health issue. The Biopsychosocial Model of Care (BPSM) defines sexual dysfunction as a complex interaction of biological (genetics, pathology, physiology), social (socio-economical, cultural, environmental, and relational) and psychological (emotions, thoughts and behavioural) factors. Few South African studies have investigated the above factors and if they influence FSD.

The aim of this study was to examine the biopsychosocial factors (exposures) mentioned above and if they were associated with sexual dysfunction in self-identified females in Gauteng, South Africa, during 2013-2023. Clinical records were accessed from two sexual health clinics. These were exported to Microsoft Excel and Stata Version 18.0. A cross-sectional design was assembled to analyse a convenient sample of 1,595 patient records. Prevalence and associations were examined by different biopsychosocial exposure variables and FSD, using inferential statistics, prevalence ratios, and multivariate logistic regression models. Potential confounders included employment, relationship status, sexual orientation, concern about having a sexually transmitted infection (STI), contraception use, pain, menopausal status, amongst other biopsychosocial factors. No interactions between variables were found.

The prevalence estimate of FSD was 84.17% (N = 1595). Stratified prevalence estimates of FSD by factors such as concern about sex drive, orgasm, or sexually transmitted infections, were > 90%. Prevalence ratios amongst all factors varied between 0.87-1.34. Pain during sex (AOR = 6.02, p = 0.000), concern about sex drive (AOR = 6.48, p = 0.000) and orgasm (AOR = 5.22, p = 0.000), number of sexual partners (AOR = 0.61, p = 0.000) and relationship status (AOR = 0.17, p = 0.005) were found to be significantly associated with FSD. In addition, factors such as contraception use (OR = 1.33, p = 0.048), urinary symptoms (OR = 2.22, p = 0.000), concern about STI (OR = 0.37, p = 0.000), and doing exercise (OR = 0.56, p = 0.000) were also associated with FSD and adjusted for in the final regression model.

The results suggest that several biopsychosocial factors were associated with FSD and that FSD is multifactorial. Future research should focus on longitudinal, cohort and/or

intervention studies to determine not only association, but also temporality and ultimately causation.

Acknowledgements

I would like to acknowledge Prof Sumaya Mall for her input and guidance on the protocol planning and review of the manuscript.

Chapter 1 Introduction

1.1 Introduction and background

1.1.1 Defining Female Sexual Dysfunction (FSD)

Female sexual dysfunction (FSD) is a complex disorder, defined as a sexual complaint that can be associated with personal stress (such as anxiety or depression) or interpersonal difficulties (such as relationships) (Campbell & Stein, 2014; Rogers et al., 2018; Wolpe et al., 2017). The female sexual response affect, or can be related to overlapping neurovascular, endocrine, emotional, and psychosocial responses (Prabhu et al., 2022). According to the Diagnostic and Statistical Manual of Mental Illnesses (DSM-V) criteria, FSD is categorised into female sexual interest/arousal disorder, female orgasmic disorder, genito-pelvic pain disorder or pleasure disorder (Campbell & Stein, 2014; Ishak & Tobia, 2013; Rogers et al., 2018).

The different types of FSD relates to the specific phases of sexual function. Hypoactive sexual disorder (HSDD) (newly termed female sexual interest/arousal dysfunction or FSIAD) is defined as the absence of sexual fantasies/thoughts and/or desire for sexual activity. If the disorder is related to the inability to attain or maintain sexual activity till completion, it is called female sexual arousal disorder (FASD). FASD may include physiological factors such as lubrication and swelling or expansion of the external genitals. Orgasmic disorder is defined as the difficulty, delay, or absence of attaining orgasm (Sharma & Kalra, 2016).

Dyspareunia, vaginismus, and noncoital sexual pain disorders are all classified under the umbrella term, sexual pain disorders. In the DSM-V Diagnostic Criteria for Female Sexual Dysfunction dyspareunia and vaginismus has been merged into the same category namely, genito-pelvic pain/penetration disorder (Ishak & Tobia, 2013). Dyspareunia occurs when genital pain is associated with intercourse. Vaginismus is defined as involuntary spasm of the vaginal musculature that interferes with penetration. Genital pain induced by sexual stimulation not related to the coitus, is referred to as non coital sexual pain disorder (Sharma & Kalra, 2016).

FSD can reduce sexual satisfaction, lead to psychological conflict, affect reproductive health and quality of life adversely (such as social life), and consequently adversely affect public health (Wolpe et al., 2017) suggesting that it is an important public health issue. It is also part of a broader sexual health state which is defined by the World Health Organisation (WHO) as "…a state of physical, emotional, mental, and social well-being in relation to sexuality; it is not merely the absence of disease, dysfunction or infirmity." (World Health Organisation, 2023).

FSD can be acquired, situational, generalised or a lifelong dysfunction. Sexual dysfunction is characterised by the presence of chronic sexual symptoms (persistence of more than three months) related to the desire, arousal and the orgasm sexual response cycles, as well as sexual pain (Parish et al., 2019). Normal variation in sexual function is differentiated from FSD by variation that occur with at least 75% of the patient's sexual experiences and the link it has with personal distress. Distress can be described in terms of hopelessness, frustration, unhappiness, bother, concern, inadequacy, regrets, embarrassment, dissatisfaction, or anger that the patient might experience related to sexual function (Parish et al., 2019; Sharma & Kalra, 2016). Although sexual distress is not classified as a specific FSD, it is part of the classification criteria and must be managed for attainment of optimal sexual function (Sharma & Kalra, 2016).

Clinically, female sexuality is only defined as a dysfunction if it leads to distress, affects the relationship with the partner and is recurrent or persistent (Sharma & Kalra, 2016).

1.1.2 Symptoms and contributing factors

The most common complaints of patients with FSD include a hypoactive sexual desire, low sexual arousal, difficulties in reaching orgasm, and dyspareunia (Wolpe et al., 2017). Conditions that may contribute to FSD include several anatomical, psychological, or pathological conditions such as genital mutilation, violence or other harmful practices; endometriosis, gynaecological cancer, urinary infections, reproductive tract infections, urinary incontinence, endocrine alterations, degenerative and vascular diseases (including HIV), psychological problems (e.g., depression) or consumption of psychoactive drugs

(Wolpe et al., 2017; World Health Organisation, 2023). According to Butt et al. (2019) factors that have been investigated in FSD, can be broadly divided into five groups: biological factors (e.g. hormonal status), psychological factors (e.g. anxiety and depression), sociocultural factors (e.g. traditional customs and religion), demographic factors (e.g. age and education level), and pathophysiological factors (e.g. complications due to chronic disease).

1.1.3 Epidemiology of FSD

Approximately 40-45% of women globally suffer from sexual dysfunction (McCool-Myers et al., 2018). A systematic review and narrative analysis conducted by McCool-Myers et al. (2018), found poor physical and mental health, stress, female genital mutilation, sexual abuse, abortion, genitourinary problems, relationship dissatisfaction, and being religious to be significant risk factors of FSD. Protective factors that were significant included older marital age, exercise, affection, having a positive body image, sex education, and intimate communication. Factors that had an unclear effect included age, employment, education, parity, frequency of sexual intercourse, being in a relationship, race, alcohol consumption, smoking and masturbation.

The prevalence of FSD and association with for example pathological conditions, sexually transmitted infections, and in the LGBTQI communities, remain an unexplored area within the South African context (Campbell & Stein, 2014). This point is further consolidated by a global systematic review and meta-analysis by Hosseini et al. (2021) who indicate that FSD is highly prevalent in African women; more than when compared to Asian and European women (Hosseini et al., 2022). This is concerning, for example, as approximately 10 702 new cases of cervical cancer (a contributing factor to FSD) were reported in South Africa (SA) in 2020. This may stem from the fact that SA has the highest HIV burden worldwide and that women with HIV are more prone to persistent Human Papillomavirus (HPV) infections which is a major contributor to the development of cervical cancer, and consequent possible FSD (Ghebre et al., 2017). The effect it may have on women's sexual function, is however unknown. The latter could perhaps be due to the complexity of FSD as well as that the problem is further exaggerated by poor health seeking behaviour. Less than 20% of people with sexual dysfunction, seek advice or treatment from their healthcare providers and less

than 9% report that they are asked about their sexual health by their healthcare providers (McCool-Myers et al., 2018). This was reiterated by Pretorius et al. (2022) who found that sexual dysfunction in a South African population is overlooked, due to poor history taking.

1.1.4 Sexual dysfunction and the Biopsychosocial Model of Care

Recent advances in the field sexual health have created a deeper understanding regarding sexuality, sexual behaviour, and sexual health from a holistic perspective (Nimbi et al., 2022). The Biopsychosocial Model of Care (BPSM) defines sexual dysfunction, a component of sexual health, as a complex interaction of biological (genetics, pathology, physiology), social (socio-economical, cultural, environmental, and relational) and psychological (emotions, thoughts and behavioural) factors (Nimbi et al., 2022). Holistically, it is a discipline that includes sexual medicine, clinical psychology, public health, research, social, behavioural, and anthropological sciences, education, human rights, ethics, genetics, advocacy, systems medicine and sexology, engineering, informatics, economics, and politics. It is therefore also closely related to the Socio-Ecological Model of Health. Although these models are comprehensive to explain and manage sexual health, limitations still exist in the application and consideration of socio-cultural factors during research (Nimbi et al., 2022).

Socio-cultural factors have been defined as a variety of cultural and social influences that can affect a person's feelings, thoughts, behaviours and health outcomes. It may include factors such as race, ethnicity, sex, occupation, education, beliefs, values, religion, amongst other factors (Baraki & Thupayagale-Tshweneagae, 2023; Hernandez et al., 2006; Scott et al., 2017).

Concerns have been raised that the BPSM may over-simplify and compartmentalise health care and research. This has been supported by the discovery of connections between emotions, beliefs, the central nervous system, pain, and disability amongst other factors (Daluiso-King & Hebron, 2022). To remove the boundaries (and allow integration and individualised care) between the themes of the BPSM, Daluiso-King and Hebron (2022) conducted a concept analysis and derived five master themes and four sub-themes to give the BPSM a holistic, but individualised, perspective. The five master themes include

biomedical factors, psychological factors, social factors, communication, and individualised care. The sub-themes include education, cognitive, behavioural, occupational factors, and therapeutic alliance (Daluiso-King & Hebron, 2022). Although studies have investigated different biopsychosocial factors and its association with FSD, limited studies have focused on the connections and interrelationships between different factors as mentioned above. There is also still no consensus on the predictability of the effect of the identified factors (Butt et al., 2019). The compartmentalised approach can be seen in the findings and focus of some studies on prevalence and associated factors with FSD, as well as in clinical practice due to poor translation of evidence into practice.

In many instances, approaches to sexuality are still focusing on the medical and biological factors, emphasizing adverse health outcomes and concomitant risks, rather than incorporating all aspects of the biopsychosocial model of care which can affect sexual health and wellbeing, across the lifespan. This risk-focused approach is unfortunately still practiced in many settings, especially public health settings (Mitchell et al., 2021). The concern is that this approach may obscure the other aspects of sexuality and overlook the evolving contemporary body of scientific evidence supporting much broader perspectives on sexual health. The dilemma is that in practice, perspectives on what defines normal sexuality, are in many instances understood through a public health lens; while in research, confusion and inconsistency across studies, methodology and operational definitions, make it difficult to be innovative and advance science in this area (Mitchell et al., 2021). For example, not considering sexual wellbeing and sexual health as an interactive and integrated phenomenon, can mask the diversity of patient experiences as applicable to their holistic wellbeing. This limited perspective affects clinician's ability to understand and address everyday sexual health issues patients may complain of (Mitchell et al., 2021).

FSD is therefore a fundamental component of a population's overall public and sexual health and well-being and a factor that may affect the social and economic well-being of an individual, community or country (Butt et al., 2019; Wolpe et al., 2017). FSD can be addressed through comprehensive, high-quality information and sexual health care; knowledge about contextual risks and vulnerability (associated factors) of FSD; and an environment that acknowledge and prioritise sexual health within a BPSM of care (World

Health Organisation, 2023). The literature review (paragraph 1.2) will provide further insight and conceptualise the concepts within this study's context and elucidate gaps in the field.

1.1.5 Assessment of female sexual dysfunction

Effective strategies to clinically assess sexual dysfunction is important as addressing sexual concerns or problems during a clinical assessment is still seen as undesirable, stigmatising or awkward in many situations (Parish et al., 2019). This may also be a reason for clinicians to resort to a compartmentalised approach in some cases. Asking three basic questions, can however suffice as a basic screening tool for sexual dysfunction. These questions are depicted in Figure 1.1.

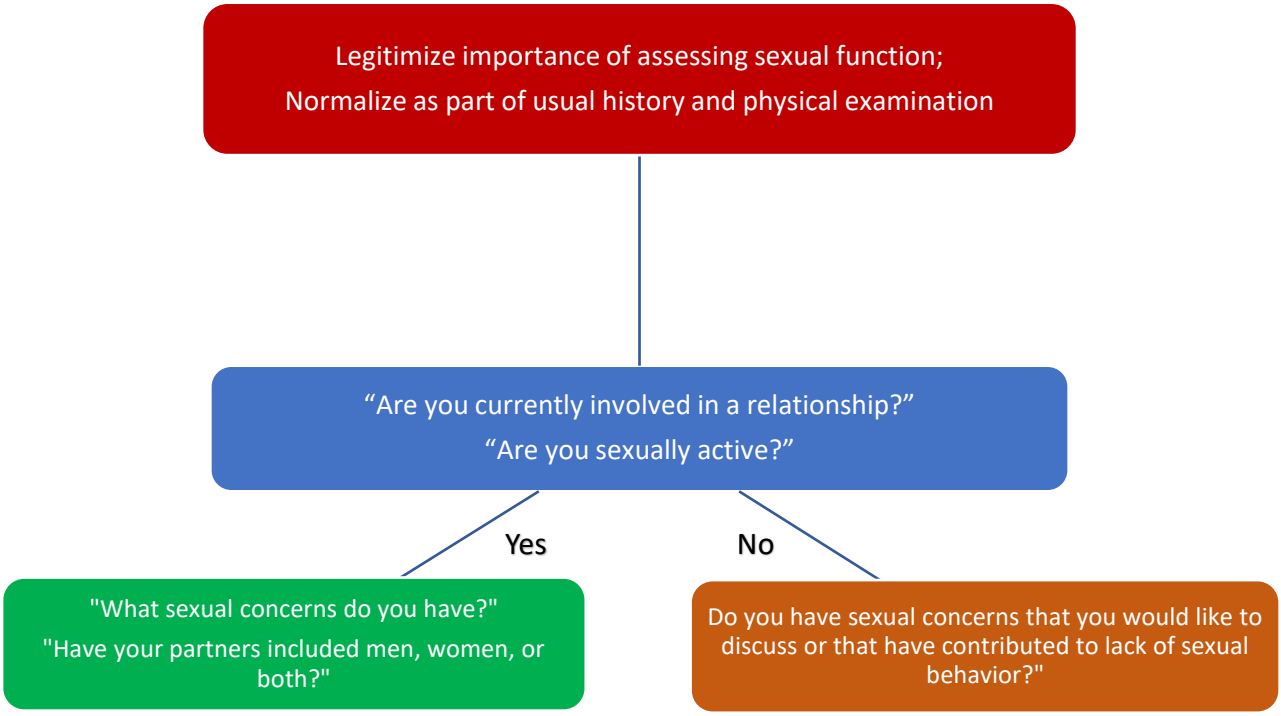


Figure 1.1. Screening algorithm for sexual dysfunction (Parish et al., 2019).

It is interesting to note that although clinicians are expected not to make assumptions about sexual orientation or behaviour (Parish et al., 2019), (Figure 1.1), these aspects are often overlooked or excluded in research on sexual dysfunction.

Parish et al. (2019) published the International Society for the Study of Women’s Sexual Health process of care for the identification of sexual concerns and problems in women. This four-step model consists of i. screening; ii. eliciting the patient’s story, reframing attention to the sexual problem or concern, empathic witnessing, referral/assessment/treatment; iii. core level assessment (current sexual function for each sexual domain, presence of sexual pain, sexual and romantic relationships, distress, and impact of sexual problem); and iv. core level treatment. Based on the findings of the core level assessment, advanced level assessment or referral to a specialist might be indicated (Parish et al., 2019).

The aim of the core level assessment is to identify patients with sexual problems, and then to refer them to sexual health experts for advanced level assessment. These experts are

defined as clinicians with a greater interest in sexual health or sexual medicine specialists (Parish et al., 2019).

The patient records that were analysed for this study included information that adhered to the above guidelines at the advanced assessment level of sexual dysfunction. Adding value and validity to the data source (records reviewed), was the fact that the patients were assessed by the same sexual health expert during the period 2013-2023.

1.1.5.1 Screening tools for female sexual dysfunction

Although physical assessment and interviewing the patient remains the gold standard for assessment, screening tools and scales can be valuable when eliciting information from patients on sensitive topics. A variety of tools and scales exist to measure different aspects of sexual functioning such as sexual knowledge, Dhat syndrome, gender identity, sexual orientation, multiple domains of sexual dysfunction, drug-related sexual dysfunction, sexual desire, sexual arousal, orgasm, satisfaction, quality of life, vaginismus, marital functioning and pornography use (Grover & Shouan, 2020). Tools that have been recommended for screening of multiple domains of sexual dysfunction (Table 1.1) include the Arizona Sexual Experience Scale, The Sexual Functioning Questionnaire, Golombok-Rust Inventory of Sexual Satisfaction, Decreased Sexual Desire Screener, the Brief Profile of Female Sexual Dysfunction, or a brief screener as suggested by Hatzichristou et al. (2010) (Grover & Shouan, 2020; Parish et al., 2019). The Female Sexual Function Index (FSFI) is a self-report instrument which has been validated in a variety of populations and cultures to assess FSD. It was also specifically developed to be applicable to sexual minority women, as well as heterosexual women.

Table 1.1. Comparison of instruments assessing multiple and other aspects of sexual functioning (Grover & Shouan, 2020).

Scale	IIEF	ASEX	CSFQ	SFQ	DISF	FSFI	GRISS
Number of items	15	5	6	38	25	19	56 (28 for male and female)
Gender	Males	Both	Both	Both	Both	Females	Both
Time= frame	4 weeks	1 week	Compared to past	1 month	-	1 month	-
Rater	Clinician	Self or clinician	Self	Clinician	Self or clinician	Self	Self
Applica= bility	Heterosexual	Hetero- /homosexual or without partner	Hetero- /homosexual or without partner	Hetero- /homosexual or without partner	-	Hetero- /homosexual or without partner	Heterosexual
Domains	Erectile dysfunction Orgasmic dysfunction Sexual desire Satisfaction	Arousal Vaginal lubrication/penile erection Orgasm and satisfaction Sex drive	Illness and medical changes Arousal Erection Orgasm/ ejaculation Desire	Sexual functioning in patients with MSI Arousal Orgasm/ ejaculation Libido	Sexual arousal, experience and relationship Orgasm Sexual drive	Lubrication Pain Arousal Orgasm Sexual desire Satisfaction	Vaginismus, non-sensuality, sexual contact and communi= cation Impotence Orgasm/ejaculation Infrequency Dissatisfaction

International Index of Erectile Dysfunction (IIEF); Change in Sexual Functioning Questionnaire (CSFQ); Arizona Sexual Experience Scale (ASEX); Sexual Function Questionnaire (SFQ); Female Sexual Function Index (FSFI); Derogatis Interview for Sexual Functioning (DISF); Golombok-Rust Inventory of Sexual Satisfaction (GRISS)

The FSFI assesses the six domains that constitutes the definition of FSD namely: orgasm, desire, lubrication, pain, satisfaction and arousal (Meston et al., 2020). Compared to the other proposed sexual dysfunction scales (Table 1.1), the FSFI is the only self-rated scale that can be applicable to assess hetero- and homosexual individuals, with and/or without a partner. It is also one of few scales that covers all the dimensions of sexual dysfunction, as defined by the updated DSM-V criteria (Grover & Shouan, 2020). The FSFI can therefore provide insight into the degree and type of sexual dysfunction that the patient experiences, but unfortunately no tool can replace the gold standard of a clinical interview and physical

assessment findings. The FSFI has been validated in different populations with different types of sexual dysfunction and provides an indication of general (non-specific) sexual dysfunction. The domain scores do however help to make differential diagnoses about the type of sexual dysfunction and should therefore always be reported (Meston et al., 2020). The desire domain score and the total FSFI scores are the only scores for which a cut-off value has been established. A desire domain score of less or equal to 5 indicates that the women meet the diagnostic criteria for hypoactive sexual disorder (HSDD). A total FSFI score of ≤ 26.55 indicates clinically relevant sexual dysfunction which requires further management (sensitivity = 0.889; specificity = 0.733). Due to the absence of measurement of the distress component, as required by the diagnostic criteria, it cannot be used to make a diagnosis of sexual dysfunction. Ideally the FSFI should therefore be administered in combination with the measurement of distress, which was done subjectively and noted in the patient records used for analysis in the current study. The time reference of the FSFI namely, four weeks, also does not allow for diagnosis of FSD, as the diagnostic criteria requires establishment of symptoms over a couple of months (Parish et al., 2019). The details about the calculation of scores and interpretation of the tool are discussed in Chapter 2, paragraph 2.6.1.

The above factors, namely the domain that is measured and the tool that is used to measure FSD, need to be considered when interpreting and comparing operational definitions in different studies, prevalence rates and data on associated factors in the following sections.

1.2 Literature review

This section will be focusing on the current literature available, aligned with the objectives of this study (paragraph 1.4), reporting on the overall prevalence of FSD (paragraph 1.2.1), the prevalence of FSD per biopsychosocial correlate (paragraph 1.2.1), and an elaboration on the association of FSD with these correlates (paragraph 1.2.2). The following databases were searched for evidence published up to 2024: Medline, CINAHL and PubMed. The search strategy is summarised in Addendum A. Search terms included were: sexual dysfunction;

sexual health; biopsychosocial; biological; psychological; social; factors; predictors; association; orgasmic; arousal; lubrication; desire; satisfaction; amongst others.

1.2.1 Studies estimating the prevalence estimate of sexual dysfunction and correlates

The prevalence of FSD seems to range between 40-60% as cited above possibly due to the use of different tools and differences in defining or categorising exposure variables, as further described below (Jaafarpour et al., 2013; Madbouly et al., 2021).

A systematic review conducted on a Brazilian population, which is comparable to the South African population based on socioeconomic inequalities, found a much larger prevalence range of 13.36% - 79.3% (Wolpe et al., 2017). Two cross-sectional studies involving Saudi and Iranian women attending a primary health clinic, found a 46.2% and 60% prevalence of sexual dysfunction respectively, as reported on the Female Sexual Function Index (FSFI) (Jaafarpour et al., 2013; Madbouly et al., 2021). Another study conducted in South-Western Nigeria, found an 80% point prevalence of FSD in women aged 19 – 56 years, as measured with the Sexual Function Questionnaire (SFQ-28), with sexual desire as the most common domain affected (99.4%) (Adebusoye et al., 2020). These prevalences are much higher compared to a multi-country European study that was conducted in 2006, which found a 32% prevalence of at least one sexual dysfunction component in women (Nicolosi et al., 2006). Their study however included a select and possibly biased sample of only middle-aged and elderly European women. Adebusoye et al. (2020) reported that in South-Western Nigeria, sexual activity is related to procreation in the younger age group, and sexual pleasure and desire is not the priority.

Although studies have been reporting on prevalence by different correlates, these correlates have not been categorised into or aligned with a specific theoretical model; therefore, investigating it in a compartmentalised manner (paragraph 1.1.3). Prevalence of FSD seems to be higher in women with increased age, with a lower education level, who are having intercourse less than three times a week, using contraception, living in an urban area, who had more than three deliveries, who had husbands older than 40 years, who were married

for more than ten years, who were unemployed, and who had a smoking history (Butt et al., 2019; Jaafarpour et al., 2013). The significance of these factors showed slight variation, depending on the included population. The study by Madbouly et al. (2021) found a higher prevalence of FSD in women living in rural areas, while prevalence across education levels did not seem to differ much. Prevalence was also higher in postmenopausal women, women suffering from infertility, gynaecological disease, chronic pelvic pain and medical disease (Madbouly et al., 2021). The study by Adebusoye et al. (2020) on Nigerian women found a high prevalence (50-100%) of FSD in women with obstetric and gynecological problems such as menorrhagia, vaginal discharge, abdominal pain, candidiasis, uterine fibroids, mastalgia, gynecologic malignancy and infertility. They attribute the high prevalence to the fact that women recruited for other studies have not been forthcoming with reporting FSD. An underlying issue, reported in a South African population, may be the lack of detailed history taking, where clinicians do not enquire regarding the sexual health of patients during regular consultations (Pretorius et al., 2022). The generalisation of the results of the studies are however limited due to the exclusion of, for example, unmarried women (due to cultural, religious and social aspects), menopausal women, women with medical illness or infertility, and immediate postpartum women, especially as seen in the study by Jaafarpour et al. (2013) and Adebusoye et al. (2020). The latter factors may be important associated or confounding factors for FSD according to the contemporary BPSM of care and may affect results if omitted. The exclusion criteria of these studies highlight the concern regarding the consideration of psycho-socio-cultural factors that was referred to in paragraph 1.1.

1.2.2 Studies examining the relationship of different factors with sexual dysfunction

Studies on prevalence of sexual dysfunction, in most instances, also report on the relationship of sexual dysfunction with certain selected factors, although not within a biopsychosocial framework.

A systematic review by McCool-Myers et al. (2018) provides a summary of the evidence on factors associated with FSD. The review included 135 observational studies from 41 countries to determine predictors of FSD. Due to the included studies' designs, the review was not able to demonstrate causal associations between FSD and the identified predictive

factors. The review identified some associated factors consistently across all the domains of the FSFI. Classifying the factors according to the contemporary BPSM, biological factors included poor physical health, poor partner health, having had an abortion, menopause, genitourinary symptoms; psychological factors included poor mental health and stress. Majority of factors were socio-cultural in nature and included unemployment of the partner, low partner education, female genital mutilation, sexual dysfunction of the partner, sexual abuse, relationship dissatisfaction and religion. Older marital age, exercise, intimate communication, positive body image, affection, sex education and recognising sex as an important component of a relationship, are the factors that showed a protective effect across all domains. Some of these socio-cultural factors might however overlap with the psychological and even the biological domain, indicating the complexity and interactive nature of the BPSM of care. The risk nor protective effect of age, education, parity, employment, relationship status, frequency of intercourse, race, smoking, masturbation and alcohol consumption with FSD could be established in the review of McCool-Myers et al. (2018), due to unclear and insignificant findings. Less than 15% of the studies included in the review were from low- and medium human development countries, indicating the gap in research and limited knowledge available on FSD in these countries. The review also highlighted that certain factors associated with women's rights and reproductive health may lead to different associated factors in different populations (McCool-Myers et al., 2018).

The differences in associated factors are highlighted by studies that have been done in African and the Eastern countries where education and age, amongst other factors, seems to have a more significant association with FSD when compared to other populations. A cross-sectional study by Adebusoye et al. (2020) on Nigerian women found years of being in a relationship, age, number of children, education level, age at coitarche, parity and family dysfunction to be associated with sexual dysfunction. Age, parity, family dysfunction and education level were found to be related to FSD though as the design is cross-sectional it is difficult to infer causality.

A cross-sectional study by Oindi et al. (2019), in a Kenyan sample (recruited in a gynaecological outpatient clinic), found in addition to age and education level, that contraception was associated with FSD in a sub-fertile cohort of women (women presenting

with a form of reduced fertility over an unwanted and extended time of non-conception) (Gnoth et al., 2005). Alcohol consumption together with a higher maternal age, seemed to have a protective effect. Fertility was however not associated with FSD (Oindi et al., 2019). Butt et al. (2019) also found a significant association between FSD and hormonal contraception in a cross-sectional study, investigating a cohort of Kenyan women of reproductive age sampled from outpatient clinics in the family planning, family medicine and gynaecological departments. No association of FSD with alcohol intake, employment, miscarriage, chronic illness, or the use of chronic medication were found.

Following on the above discussion, socio-economic-cultural differences are further illustrated by two cross-sectional studies involving Saudi (Madbouly et al., 2021) and Iranian women (Jaafarpour et al., 2013) respectively, who excluded women with certain characteristics from their study (paragraph 1.2.1). In both these studies participants were, similar to other studies, also recruited from primary health and gynaecological clinics. It is interesting to note their results when compared to the systematic review by McCool-Myers et al. (2018). Jafaarpour et al. (2013) found educational level to be inversely correlated with risk of FSD in a sample of Iranian women. Patients with FSD were significantly more likely to have sexual intercourse less than three times a week, be 40 years or older, to have been married for more or equal to 10 years, to have three children or more, husbands aged 40 years or more, and to be unemployed. No significant differences were noted in residence, smoking history, and contraception methods used ($p>0.05$). The study by Madbouly et al. (2021) involving Saudi women showed similar trends to the study of Jafaarpour et al. (2013) regarding associated factors. Most of the findings from these two cross-sectional studies, differ from the results of the systematic review by McCool-Myers et al. (2018). The association of contraception also differs from the findings of Oindi et al. (2019) and Butt et al. (2019) and raise the question on the effect that the exclusion of women with certain socio-cultural characteristics may have on results and generalisability to different, or even similar, populations. Although most of the above cross-sectional studies refer to predictive, and in some instances, risk factors, the limitations of a cross-sectional design to infer causality should be considered.

1.2.2.1 Biopsychosocial factors and sexual function: mechanisms and interactions

As stated in the above sections, several biopsychosocial factors have been found to be associated with sexual function. The strength of association and factors differ across studies and populations globally, such as in Kenya, Saudi, Iran, and Nigeria, with limited to no findings available in the South African population. Common risk factors include depression, anxiety, poor self-assessed health, low educational level, sexual problems of the partner, sexual abuse, marital difficulties, stress, antidepressant drug use, poor health, cancer, urinary incontinence, chronic disease (e.g. diabetes), neurologic diseases, and pain (Parish et al., 2019). Biopsychosocial factors that were available for analysis in this study are listed in Chapter 2, paragraph 2.6.2.

The sections below describe some of the mechanisms and interactions as applicable to the biopsychosocial factors that were investigated in this study.

Motherhood and body perception

A cross-sectional study by Guleroglu and Uludag (2021), investigating a sample of 280 pregnant women from a pregnancy outpatient clinic in Turkey, found a moderately significant positive relationship between sexual function, as measured with the FSFI, and pregnancy-related motherhood perception ($r = 0.430$, $p < 0.001$). A moderately significant negative relationship was found with pregnancy-related body perception in their study ($r = -0.376$, $p < 0.001$) (Tosun Güleroğlu & Uludağ, 2022). This psychological aspect could also help to explain the association between FSD and number of pregnancies or children that have been found in some populations (paragraph 1.2.5).

Smoking

Smoking is currently a global health challenge, killing more than 8 million people globally per year. Approximately 80% of all the tobacco users are in low- and mid-income countries (Tobacco (who.int), accessed 19 September 2024). One of the pathologic effects of smoking is the fluctuation in sexual hormones and decreased blood flow to the clitoris. Nicotine in cigarettes also inhibits the production endothelium-derived relaxing factor, a vasoactive substance. This vascular damage is hypothesised to be the main cause of FSD. Vaginal

lubrication and orgasmic response are affected consequently, leading to sexual dissatisfaction and infrequent intercourse. A systematic review and meta-analysis by Salari et al. (2022), investigating the effects of smoking leading to FSD and including ten eligible studies and a sample of 15,334 female smokers, found that female smokers were 48% more susceptible to FSD when compared to female non-smokers (OR 1.48, 95% CI: 1.2-1.38) (Salari et al., 2022).

Ageing and chronic medical conditions

Even in healthy women, the normal ageing process leads to increased prevalence of sexual complaints, most related to the desire domain. Distress may or may not be present (Kuhle et al., 2021). There are different factors that play a role in sexual health during ageing. Factors such as Genito-urinary syndrome of menopause and use of medication that are more common in older women, are discussed below. Other factors such as chronic medical conditions (Table 1.2) or even the partner's health, may affect sexual function in older women. Factors such as discrepancy between the healthcare provider's and the patient's age and gender, may also lead to ineffective assessment or management of FSD, and therefore contribute to the higher prevalence of unresolved FSD in older women (Kuhle et al., 2021).

Table 1.2. Chronic medical conditions and the effect on sexual function (Kuhle et al., 2021).

CONDITION	PHYSIOLOGIC EFFECT	SEXUAL FUNCTION IMPACTED
Diabetes mellitus	Diminished genital vascular supply	Decreased arousal and orgasm
Cardiovascular disease	Diminished vascular supply	Decreased arousal and orgasm
Peripheral neuropathy	Impact on small nerve fibres in vulva and anterior vagina	Decreased genital sensation and impaired arousal
Neuromuscular disorders/ spinal cord/ multiple sclerosis	Direct effect on vulva/vaginal innervation Associated pain	Decreased desire and arousal
Malignancy	Direct effect of diagnosis and treatment – menopausal hormone loss Genitito-urinary syndrome of menopause Vaginal stenosis/dyspareunia	Decreased desire, genital sensation, arousal, and orgasm
Musculoskeletal conditions	Difficulty with movement/positioning	Decreased desire and arousal
Gynecologic conditions **Pelvic organ prolapse** **Urinary incontinence** **Surgical interventions: hysterectomy/ oophorectomy**	Dyspareunia Loss of urine during intercourse Loss of systemic estrogen	Decreased desire and genital sensation, arousal, and orgasm

Mental health

The neurovascular basis of sexual physiology may be interrupted by chronic disease. It is reported that it is not the burden of the chronic disease, nor the complications of it, that affect sexual function in these patients. Depression (a risk factor for sexual dysfunction) is rather regarded as the independent factor that determines the presence or absence of

sexual dysfunction in women with chronic disease (Basson & Gilks, 2018; Lorenz et al., 2016).

In return, antidepressant and antipsychotic medication, the neurobiology and symptoms of the psychological condition, previous trauma, relationship difficulties and stigmatization associated with the mental disorder, can further contribute to sexual dysfunction. This leads to a complex management approach, as there might be several overlapping etiologies interacting (Basson & Gilks, 2018; Lorenz et al., 2016).

The chain reaction continues when arousal and pleasure dysfunction may in turn cause trait anxiety. Patients may often resort to other help-seeking behaviours or compensative strategies such as smoking or substance abuse; each with their own link to sexual dysfunction (Basson & Gilks, 2018; Lorenz et al., 2016).

Alcohol consumption

Improved sexual function has been associated with moderate alcohol consumption, while intoxication impairs sexual response (Kuhle et al., 2021; Salari et al., 2023). High alcohol dosages have negative effects on relationships and sexual health due to vascular and neurological mechanisms, as well as hormonal toxicity. Alcohol is a depressant that can impair sensory input, cause hypersensitivity, decreased libido, arousal, delay in orgasm, reduced genital blood flow, and lead to vaginal dryness. The concern is that alcohol dependence has increased among women in recent years and is a public health concern (Salari et al., 2023). A systematic review and meta-analysis by Salari et al. (2023) have shown that alcohol consumption increases the odds of sexual dysfunction by 74%. It seems that the association might be related to the amount of alcohol consumption.

Oral contraceptives

Oral contraceptives can either improve or reduce sexual satisfaction. Women using combined hormonal contraceptives may experience low desire, pain, decrease orgasm or arousal (Parish et al., 2019). The effect of hormonal contraceptives on sexuality is however controversial due to difficulty investigating the physiological and therapeutic effects within a biopsychosocial framework. When prescribing hormonal contraceptives in the case of FSD,

hormonal contraceptives with less antiandrogenic progestins or combined hormonal contraceptives with natural oestrogens should be considered (Cucinella et al., 2024). These contraceptives have less impact on the sex-hormone binding globulin and can avoid hypoandrogenism. Long-acting reversible contraceptives on the other hand has a neutral effect on sexuality (Cucinella et al., 2024). It has however been documented that hormonal contraceptives alter sexual response only in a few women (Cucinella et al., 2024), and therefore the association with FSD and prevalence of FSD amongst these patients might differ, depending on the type of treatment received.

Urinary incontinence

The effect of urinary incontinence on female sexual function can either be direct, or indirect. Urinary incontinence can directly affect sexual function due to leaking during intercourse, or indirectly due to consequent avoiding of intercourse due to fear of leaking (Koparal et al., 2024). Different forms of incontinence may affect different stages of intercourse. For example, stress incontinence has been associated with incontinence during penetration, while detrusor overactivity has been linked to incontinence that occur during orgasm (Koparal et al., 2024). It may be hypothesised that it could also be related to the severity of dysfunction of the pelvic floor muscles, leading to different types of pelvic floor dysfunction, including faecal incontinence that could occur with severe damage or weakness of the muscles (Koparal et al., 2024).

Medication

Several medications can influence libido or sexual response. Amongst these medications are different anticonvulsants, cardiovascular medications, hormonal agents, pain medication (such as nonsteroidal anti-inflammatory drugs and opioids) and psychotropic medications (Parish et al., 2019). Serotonin reuptake inhibitors can lead to sexual dysfunction (desire, arousal and orgasmic dysfunction) in 30-70% of women. Arousal may be impeded by antihistamine and anticholinergic medications, while desire is commonly affected by cardiovascular drugs such as β-blockers (Kuhle et al., 2021).

Genito-urinary syndrome of menopause (GSM)

Fifty percent of postmenopausal women may suffer from GSM. Vulvovaginal atrophy, one of the symptoms of GSM, may lead to dyspareunia, decreased libido or orgasmic difficulties

(Parish et al., 2019). Urogenital atrophy impairs vasocongestion, sensation, and lubrication. Reduced genital arousal and sexual pain disorders (such as dyspareunia and vulvodynia) may occur due to hypo-oestrogenism. The affected genital receptivity may lead to a further cycle of events that increase pain (Nappi & Lachowsky, 2009).

Patients with chronic sexual pain, commonly demonstrate a lack of mental arousal and/or a decrease in sexual desire. This reduction in orgasmic capacity, may then reduce sexual satisfaction, which in turn can lead to sexual demotivation, negatively influence sexual activity and/or the couple's relationship (Nappi & Lachowsky, 2009).

Pain

Literature has indicated that FSD is common in patients experiencing pain due to different pathological conditions. Amongst these conditions are pelvic pain, chronic pain, low back pain, fibromyalgia, migraine and tension-type headaches, endometriosis, among others (Flegge et al., 2023). For example, endometriosis is characterised by the presence of chronic inflammation which leads to pelvic pain (Zhu et al., 2023). Different factors can however contribute to the sexual dysfunction associated with pain. It includes physical limitations, poor sleep patterns, psychological factors such as depression, relationship satisfaction, or the effects of the medication used to treat the pain (Flegge et al., 2023).

From the above it is clear that multiple medical or psychological problems that affect physical or mental functioning or wellbeing of a patient, as well as the treatment thereof, can have a significant effect on sexual function. Clinicians should be aware of these factors and recognise them upon patient assessment and treat these factors and/or effects appropriately (Parish et al., 2019).

1.2.3 Problem statement

With limited studies available in South Africa, and variability in the findings from studies in low- and mid-income countries, it is unclear which factors are associated with sexual dysfunction in a South African population (Section 1.2). Sexual dysfunction has a

biopsychosocial aetiology, stemming from a biological, socio-cultural or psychological condition. Differences in context specific socio-cultural or other factors are still neglected during research and clinical screening, and interrelationships between factors are not explored.

Previous factors that have been associated with sexual dysfunction have been described in the literature review (paragraph 1.2). The current study investigated some of these factors, such as relationship status, age, contraception, amongst other variables, but it also investigated other neglected factors such as sexual orientation, different genito-urinary symptoms, different types of pain, concern about having an STI, low desire or orgasm.

McCool-Myers et al. (2018) indicated that risk and protective factors are however not universal across countries and that the complexity of addressing factors depends on the country and their culture. Currently there is also contradicting findings amongst African studies that were done in the same country or population, as summarised and included in the systematic review by McCool-Myers et al. (2018) compared to findings such as by Adebusoye et al. (2020) (Campbell & Stein, 2014). The systematic review by McCool-Myers et al. (2018), investigating the predictors of sexual dysfunction, included only nine studies from Africa (out of a total of 135) and only three of the included studies were executed in low- to mid-income countries. Campbell and Stein (2014) also highlighted in their systematic review that South-African based research on sexual health is limited and outdated (Campbell & Stein, 2014). Only four studies have been published in South Africa and those focused on the association of FSD with comorbidities only (Alexander et al., 2011; Jespersen et al., 2004; Krige, 1985; Michaelidis, 1977).

The findings of Pretorius, Couper and Mlambo (2021) also showed the need to address sexual dysfunction in a South African context. They found that 91% of women visiting primary healthcare clinics in Northwest region, South Africa, for chronic illness, had complaints of sexual dysfunction. No similar statistics are available for other regions in South Africa (Pretorius et al., 2022).

1.2.3 Justification

A gap in research and knowledge about a South African context, lead to patient concerns remaining unanswered, and compilation of effective, contextualised prevention programs remains neglected. Biopsychosocial associated factors should be addressed at an individual level when treating the patient, while researchers should aim to establish associated factors at population level to determine which factors are different amongst populations and different patient profiles (McCool-Myers et al., 2018). Further research could focus on establishing causation and risk factors by means of cohort, case-control and empirical designs.

Clinically, prevention strategies should eventually address modifiable factors such as physical activity, access to sex education or other associated factors appropriate to the context of the population and specific to the component of sexual dysfunction (McCool-Myers et al., 2018). The current study helped to identify the associated factors with sexual dysfunction, which is unique to the South African population; but simultaneously identified protective factors which can be further explored to establish the role of these factors in prevention of FSD.

1.2.4 Conclusion

There is a cause of concern, as the prevalence of FSD in African and Eastern countries seem to be higher than the global prevalence of approximately 40-60%. This may be explained by several reasons, as discussed in paragraph 1.2.1. In addition, the management and investigation of FSD is complicated due to several factors. FSD has multiple causative factors; there is overlap between different types of sexual dysfunction; there are limited options for treatment that has been proven to be effective; physicians are unfamiliar with available treatment options; and there is limited expertise when it comes to the treatment of FSD (Mohapatra et al., 2014). Due to FSD being complex and multifactorial, management and research should be aligned to deal with all contributing factors. This is done through a biopsychosocial and patient-centred approach (Mohapatra et al., 2014).

A patient-centred approach implies an understanding and incorporation of the patient's attitudes, background, beliefs, knowledge, fertility, misconceptions, physical and social

environment, and medical, gynaecological, urological, and endocrine health into their individualised treatment plan (Sharma & Kalra, 2016).

Management options may include pharmacological or non-pharmacological approaches such as education, psychotherapy, physical therapy, occupational therapy, targeted sexual therapy and treatment of the contributing or causative factors, as applicable to the individual (Mohapatra et al., 2014). Treatment and research therefore need to follow a multidisciplinary approach and may include investigation of vasoactive, neurobiological and hormonal aspects, as well as cultural and psychosocial aspects (Mohapatra et al., 2014).

These approaches improve effectiveness of intervention, acceptability, and patient adherence (Sharma & Kalra, 2016) which is centre to effective implementation.

1.3 Conceptual framework

Figure 1.2 depicts the conceptual framework of the study, which is based on the theoretical and contemporary Biopsychosocial Model of Care, as well as the variables that were available to analyse for this study. It also indicates how the conceptual framework could relate to the Socio-Ecological Model of Health (Nimbi et al., 2022). The Biopsychosocial Model of Care illustrates the complex interaction between the biomedical, sociocultural, and psychological factors that can contribute to sexual health and well-being of a woman. The internal and external factors that were investigated in this study, are mostly at an individual level as defined by the Social Ecological Model of Health, while relationship factors that were investigated, are more at an interpersonal level (Daluiso-King & Hebron, 2022; Nimbi et al., 2022). The Socio-Ecological Model of Health highlights that sexual behaviour is multifaceted and an interactive process between personal and environmental factors, as also indicated in the Biopsychosocial Model of Care (Baraki & Thupayagale-Tshweneagae, 2023).

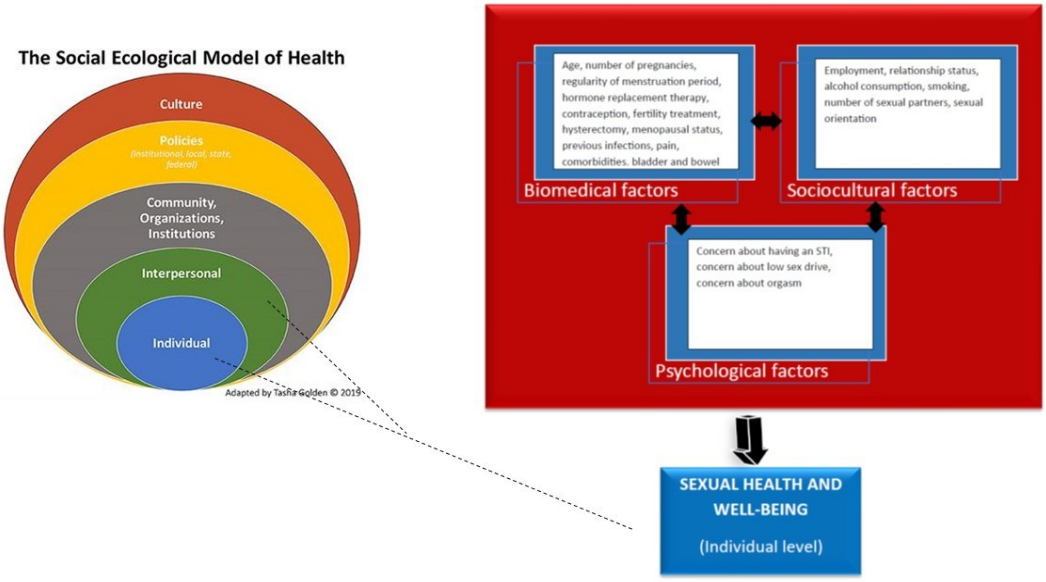


Figure 1.2. Conceptual framework of the study and the relationship to the Biopsychosocial and Socio-Ecological Model of Health.

Based on the literature and the mentioned frameworks, a Directed Acyclic Graph (DAG) is used by epidemiologists to (Figure 1.3) depict the possible effect modification and confounding between biopsychosocial factors and sexual dysfunction. There is evidence on associations between biomedical, psychological and sociocultural factors (confounding) as described in the literature review, while more than one of these factors may be present in an individual with sexual dysfunction, indicating possible effect modifications.

Sexual dysfunction may however in turn affect psychological or sociocultural factors, such as leading to poor self-esteem in women or contributing to depression and relationships (Atlantis & Sullivan, 2012; Orji & Ogunjuyigbe, 2021).

The path from sexual dysfunction back to psychological factors and sociocultural factors, may seem like a recursive component. It should however be seen as the shorthand for a path to psychological and sociocultural factors at a separate time, therefore considering it as a separate variable and maintaining the acyclic nature of the DAG.

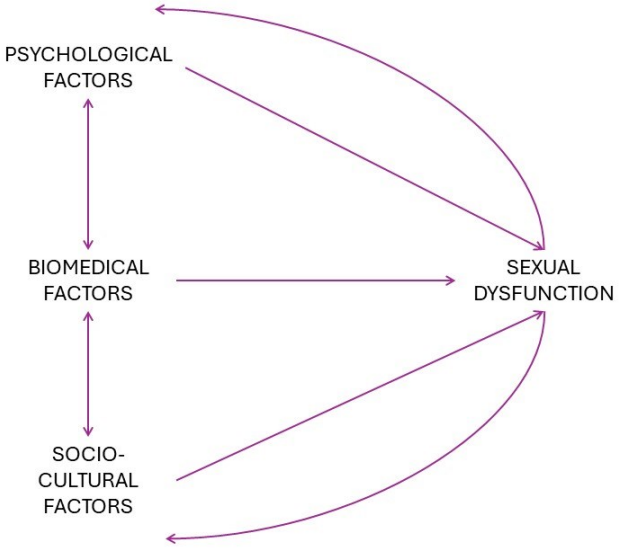


Figure 1.3. Directed Acyclic Graph (DAG) of factors associated with sexual dysfunction.

1.4 Research questions, aims and objectives

1.4.1 Research question

What are the biopsychosocial factors associated with sexual dysfunction in self-identified females in Gauteng, South Africa, during 2013-2023?

1.4.2 Aim

To examine the biopsychosocial factors associated with sexual dysfunction in self-identified females in Gauteng, South Africa, during 2013-2023.

1.4.3 Objectives

1. To describe the biopsychosocial characteristics and period prevalence of sexual dysfunction in the self-identified females visiting the clinics in Gauteng for the period 2013-2023.
2. To estimate the prevalence of sexual dysfunction by biopsychosocial characteristics in self-identified females in Gauteng, South Africa, during 2013-2023.

3. To examine the relationship between the biopsychosocial factors and sexual dysfunction in women in Gauteng, South Africa, during 2013-2023.

Chapter 2 Methodology

2.1 Study design

This study is designed as a cross-sectional study design. The information that was used for data analysis was gathered from the sexual health practitioner's patient records. The patient records used for analysis contained information that was gathered at a once-off first visit from the patient, during the period 2013-2023. No follow-up data, such as from second visits by the patients, were included for analysis. The data therefore could be used to estimate period prevalence of FSD by biopsychosocial characteristics in this population, as well as associated factors (rather than risk factors), mainly due to a lack of establishing temporality. (Puntumetakul & Karukunchit, 2015).

2.2 Study site

The electronic records of routinely collected data from two privately managed, medical sexual health clinics in the Gauteng Province, South Africa, specializing in providing care for a gender-diverse population and focusing on sexual health, were analysed for the purpose of this study. There are two clinics in Gauteng: one in Pretoria and one in Johannesburg. The clinics were established in 2010. Although the clinics are in Gauteng, it serves a wider geographical area due to limited specialised sexual health services that are available. Approximately 4000 patients have visited these clinics in the specified period seeking care for hormonal therapy, infertility, chronic pelvic pain, sexually transmitted infections (STIs), Human Papillomavirus (HPV) infections, and sexual dysfunction, amongst other conditions. More than 10 years' patient records and completed sexual health questionnaires have been digitalised over time by a medical administrator and electronically stored in an Excel format.

2.3 Study population

The records of self-identified females visiting the abovementioned sexual health clinics in Gauteng, South Africa, during 2013-2023, were included in the study. Self-identified females included patients identifying as binary, cisgender, transgender, non-binary, agender, or

gender-queer. Patients visiting these clinics are from a variety of cultural backgrounds and socio-economic status. The size of the population was 4155, based on the available records at the clinic for the period 2013-2023. The number of patients that completed the standardised Female Sexual Function Index (FSFI), that was used as the outcome measure for this study, were 1598 during this period.

2.4 Sampling

Convenience sampling was conducted, and all available records were used. A post-hoc power calculation of the total sample size after the merging of the records (the intake questionnaire and the FSFI) was done. A total of 1,598 records were included for analysis, which ensured sufficient statistical power for the analysis. A post-hoc power calculation at $\alpha = 0.05$ indicated a required total sample size of 116-154, to reach a power of 80-90% respectively. Based on proportions of 0.5 and 0.75 in the unexposed and exposed respectively, a total sample size of 500 would be sufficient to achieve 100% power in the analysis.

2.4.1 Eligibility criteria

The study included the records of self-identified female patients (binary, cisgender, transgender, non-binary, agender, or gender-queer), older than 18 years of age, for whom the FSFI data and medical intake questionnaire were available.

2.5 Data collection

An analysis of patient records during the 2013-2023 period was conducted. The principal investigator identified the applicable information to be analysed based on the research question and captured it in a data collection form in Excel. The data management and variables that were extracted by the principal investigator are listed below under *Data Management and analysis plan*.

2.6 Data management and analysis plan

Patient files were shared in the format of Excel files (Microsoft 365), as originally captured from manual patient records by a medical administrator at the clinics. The Excel files were cleaned by the principal investigator, capturing only the variables to be analysed in this study. Any patient identifiers such as birth date or names were anonymised by the principal investigator. Each patient received a unique participant number. The principal investigator and an assistant checked the anonymised data for possible capturing errors before exporting it to Stata Version 18.0. Variables were coded (Addendum B), and data cleaned by merging and matching the FSFI questionnaire and the medical intake questionnaire and removing any duplicate entries in Stata. Calculation of the FSFI scores in Stata were compared to the sexual health practitioner's original scores and corrected as applicable.

2.6.1 Outcome variable

The presence of sexual dysfunction was defined as a total sexual dysfunction score of $\leq$ 26.55 on the standardised FSFI (Addendum C). Every item in the FSFI is scored on a 1-5 point Likert Scale with lower scores indicating greater level of sexual dysfunction. The domains that were measured include sexual desire, arousal, lubrication, orgasm, satisfaction, and pain. The sum of each domain is multiplied by a factor (0.6 for desire; 0.3 for arousal; 0.3 for lubrication; 0.4 for orgasm; 0.4 for satisfaction; and 0.4 for pain) and then summed to get the final sexual dysfunction score (Meston et al., 2020).

When interpreting the individual domain scores, the desire score is the only domain for which a cut-off score has been established through a ROC analysis. A score of ≤5 on the desire domain has been found to be indicative of possible hypoactive sexual disorder (HSDD); while women with scores >5 mostly likely do not meet the criteria for HSDD. A cut-off score for the lubrication, arousal, orgasm, satisfaction, and pain domains have not yet been established. Meston et al. (2020) therefore suggests that the mean scores for the latter domains rather be used to indicate change in domain outcomes and reporting purposes.

2.6.2 Exposure variables

The following exposure variables were available to analyse, based on the standard medical intake questionnaires in the clinics and substantiated by the literature (Chapter 1, paragraph 1.2.2). The variables were grouped according to the contemporary BPSM acknowledging that there might be overlap between categories for some variables. This is further discussed in Chapter 4.

- *Socio-cultural factors* - employment, relationship status, alcohol consumption, smoking, number of children, number of sexual partners, sexual orientation and exercise (Baraki & Thupayagale-Tshweneagae, 2023; Scott et al., 2017);
- *Psychological factor*s – concern about having a STI, concern about low sex drive, concern about orgasm;
- *Biomedical factors* – age, number of pregnancies, regularity of menstruation period, hormone replacement therapy, contraception, fertility treatment, pain, hysterectomy, menopausal status, previous infections, bladder and bowel symptoms, comorbidities, and menopausal status.

2.6.3 Data analysis plan

The chosen statistical methods were guided by expert opinions and previous studies done on this topic to ensure comparison of results (Adebusoye LA et al., 2020; Butt et al., 2019; Pourhoseingholi et al., 2012; Ranganathan et al., 2017; Tamhane et al., 2016).
The data analysis plan is outlined in Table 2.1 below.

Table 2.1. Data analysis plan.

Objectives	Null hypothesis	Exposure/factors	Outcome/response	Statistical analysis methods
1. To describe the biopsychosocial characteristics and period prevalence of the self-identified females (from Gauteng) per domain of sexual dysfunction for the period 2020-2023	1. n/a	1. Socio-cultural factors; Psychological factors; Biomedical factors (as specified under Data Management)	1. Sexual dysfunction	1. Frequencies and percentages were used to describe categorical data. Means and *SD* (or medians and interquartile ranges in the case of non-linearity) was used to describe continuous and discrete data. Variables were tabulated by outcome and exposure. Prevalence of the disease in the exposed vs non-exposed was determined by a/a+b versus c/c+d
2. To estimate the prevalence of sexual dysfunction by biopsychosocial factors in self-identified females in Gauteng, South Africa, during 2020-2023	2. n/a	2. Socio-cultural factors; Psychological factors; Biomedical factors (as specified under Data Management)	2. Sexual dysfunction	2. Prevalence of the disease in the exposed vs non-exposed was determined by a/a+b versus c/c+d (per biopsychosocial factor); Prevalence odds ratio = ad/bc; and Prevalence ratio = prevalence in exposed/prevalence in non-exposed was also determined.
3. To examine the association between the biopsychosocial factors and sexual dysfunction in women in Gauteng, South Africa, during 2020-2023.	3. There is no association between the biopsychosocial factors and sexual dysfunction	3. Socio-cultural factors; Psychological factors; Biomedical factors (as specified under Data Management)	3. Sexual dysfunction	3. Models were fitted with binomial logistic regression analysis to look for interactions between variables. The Likelihood-Ratio test was used to determine significance of inclusion of variables. A Goodness of Fit test of the final model was done to determine if any further improvements could be done. Confounding was investigated by looking at the effect on the odds ratios and the significance of the *p*-values when introducing new factors. Interactions were explored when confounding variables were identified. A Receiver Operating Characteristic (ROC) Curve and Analysis was used to determine the diagnostic performance of the final model.

For further analysis of the first objective and based on the recommendation of Meston et al. (2020), (Section 2.6.1), the normality of the distribution of the continuous outcome variable, total sexual dysfunction score, was explored by means of normal probability plots, kernel density and normal quantile plots, for the purpose of inferential statistics. To test for equal variances, an *sd* test was performed in STATA Version 18.0. Assuming normal distribution of data and equal variances, an independent *t* test was done to compare the means of the dichotomous variables. In the case of non-equal variances, and independent *t* test unequal was done. A One-way ANOVA was used to compare means of the total sexual dysfunction scores of the multilevel factors.

Following the epidemiological analysis focusing on prevalence (objective 2, Table 2.1), logistic regression analysis was conducted (objective 3, Table 2.1) including variables that suggested significant association with FSD based on the odds ratios, chi square values and *p* – value ($p < 0.05$).

Two possible models were explored with logistic regression. The first model (Model 1) excluded concern about sex drive due to multiple missing values. In the case of confounding (where adjustment for the factors improved the fit of the model), possible interactions were explored, but there was not enough evidence to reject the null hypothesis of no effect modification for any of the indicated variables in this model.

The second model (Model 2) included concern about sex drive as a factor but excluded observations with the missing values ($n = 976$).

Considering the common predictive factors among models 1 and 2, associated factors found in this study, as well as literature (variables that have previously been shown to be associated with FSD namely menopausal status, employment, and age (Chapter 1, paragraph 1.2)), a final third model (Model 3) was fitted. In the case of confounding (where adjustment for the factors improved the fit of the model), possible interactions were further explored and the results reported in Chapter 3.

In conclusion, a Receiver Operating Characteristic (ROC) Curve and Analysis was used to determine the diagnostic performance and the area under the curve (AUC) of the final fitted model.

2.7 Ethical considerations

Ethical approval was obtained from the Human Research Ethics Committee of the University of the Witwatersrand (M250243) (Addendum D). Permission from the clinical head of the sexual health clinics was obtained to use the patient information for analysis. Only anonymous data from discharged patients, who was de-identified, was included for analysis. All data was handled with confidentiality and stored on a password protected computer. Only the principal investigator had access to the original data set and electronically stored files. Sensitivity to the values, beliefs, and culture from whom the information was obtained was always demonstrated.

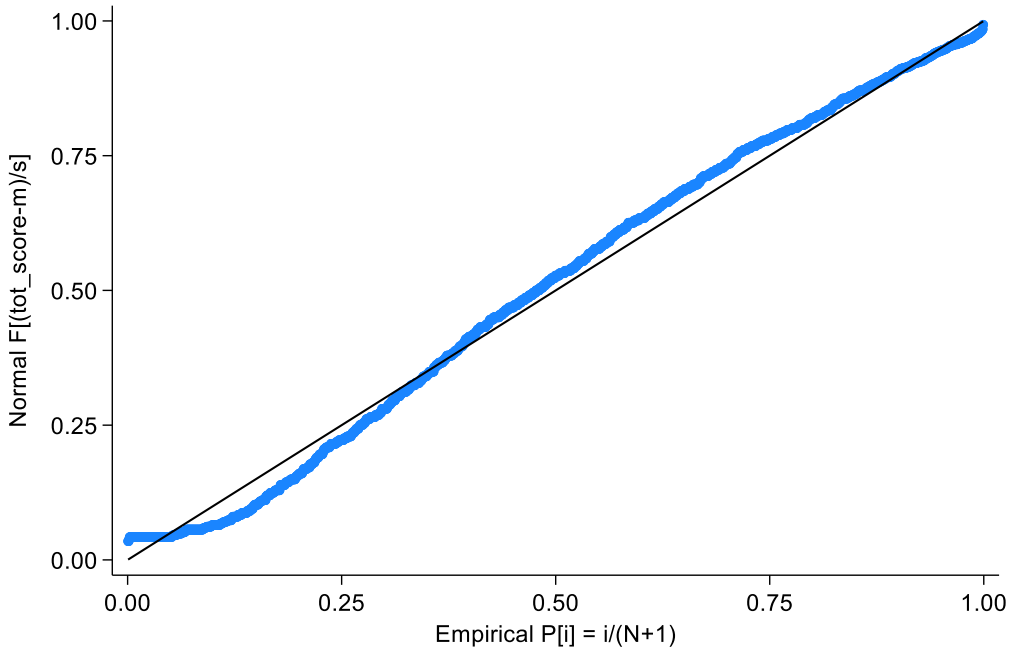
Chapter 3 Results

3.1 Introduction

This chapter will present the results derived from the statistical analysis of the data. It starts with an exploratory analysis of the data, followed by the summary statistics and inferential analysis, presented per study objective, as was outlined in Chapter 2, paragraph 2.6.3.

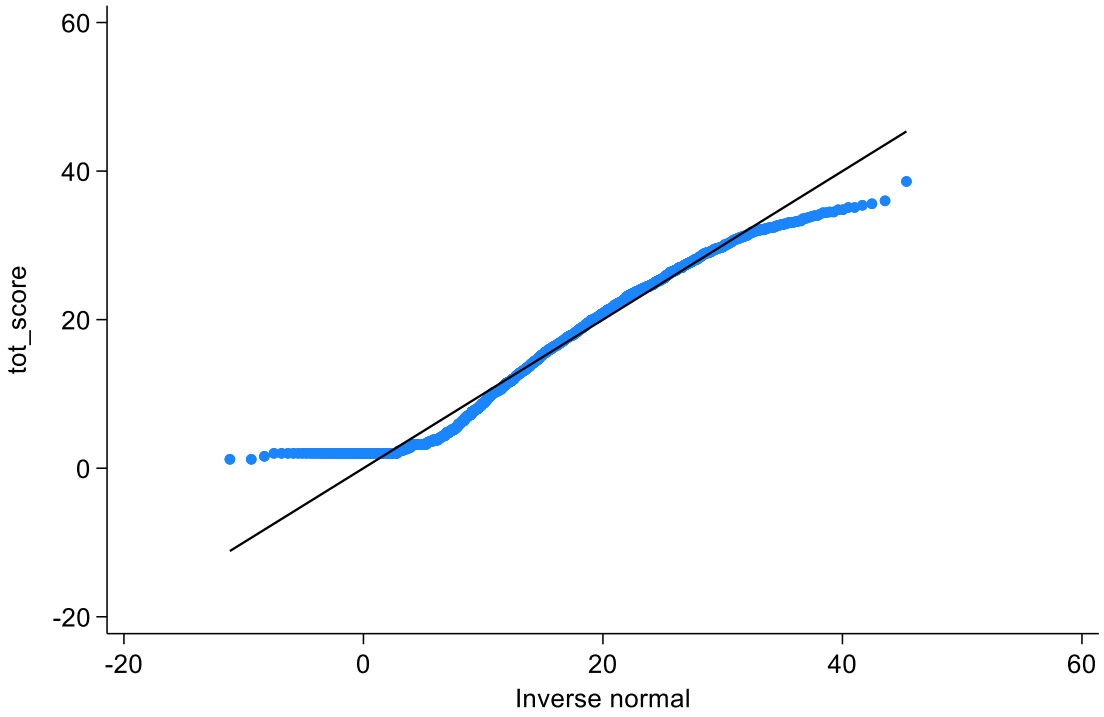
3.2 Exploratory analysis of the data

An exploratory analysis was also conducted (Chapter 2, paragraph 2.6.3) to determine the normality of the data (the total sexual dysfunction score) by means of normal probability plots, kernel density and normal quantile plots, for the purpose of inferential statistics (paragraph 3.2) and summary of the means of the FSFI domain scores. Little evidence of non-normality was found (Graphs 3.1-3.3).



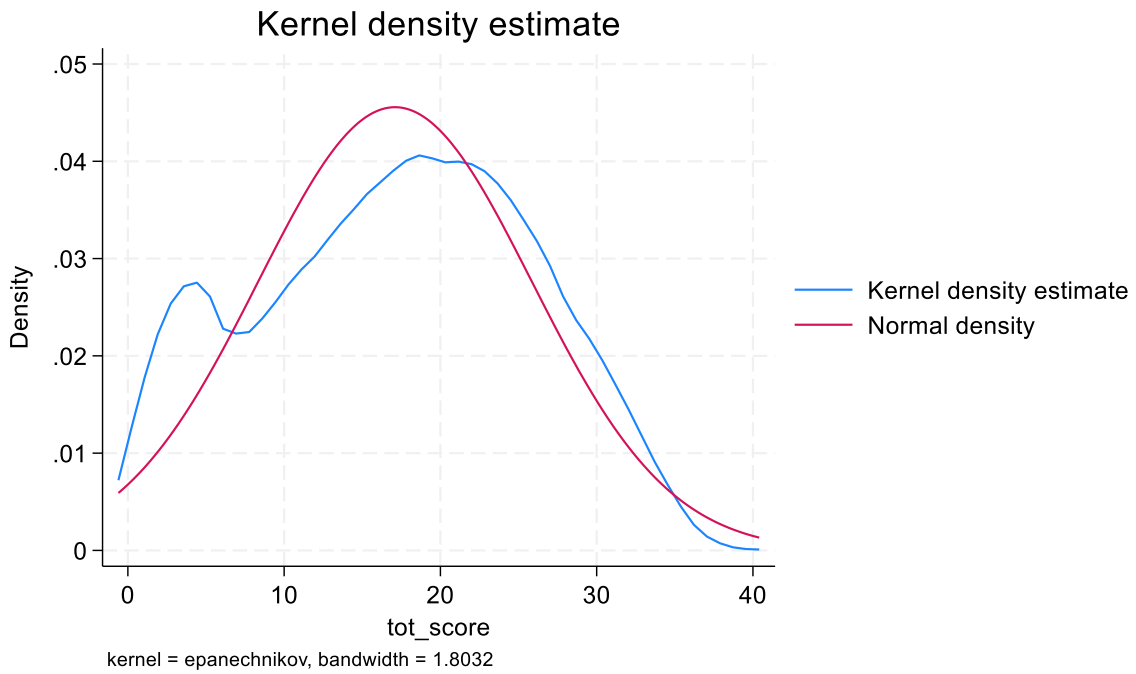
Graph 3.1. Normal probability plot of the total sexual dysfunction score.

The normal probability plot, which is more sensitive to deviations near the mean of the distribution, showed little evidence of non-normality.



Graph 3.2. Normal quantile plot of the residuals.

Other than deviations at the tails of the distribution, which the normal quantile plot is likely to pick up due to its sensitivity, little evidence of non-normality was also demonstrated by this curve.



Graph 3.3. Kernel density graph of the residuals.

Confirming the assumptions of the above two graphs, the Kernel density graph indicated only slight deviation from normality at low scores.

Values that seemed like outliers in the data set were checked and kept if there was no indication of incorrect data capturing or score calculation.

3.3 The biopsychosocial characteristics and prevalence of sexual dysfunction in the self-identified females visiting the clinics in Gauteng for the period 2013-2023.

3.3.1 Socio-demographic characteristics of the sample

Analysis of the data were preceded by a summary of the sample's socio-demographic characteristics, summarised per biopsychosocial factor (Table 3.1).

3.3.2 Summary statistics per biopsychosocial factor

The sample frequencies and percentages per biopsychosocial factor are presented in Table 3.1. The mean age of the sample under review (*N* = 1,595) was 37.18 years (*SD* = 11.00). Among the 1,595 self-identified females there were a median of one pregnancy (range 0-20) and the participants had a median of one child (range 0-20). Most of the patients in the reviewed sample identified as “straight” (*n* = 1506, 95.08%), while the “gay/lesbian” category had the second highest frequency (*n* = 39, 2.46%).

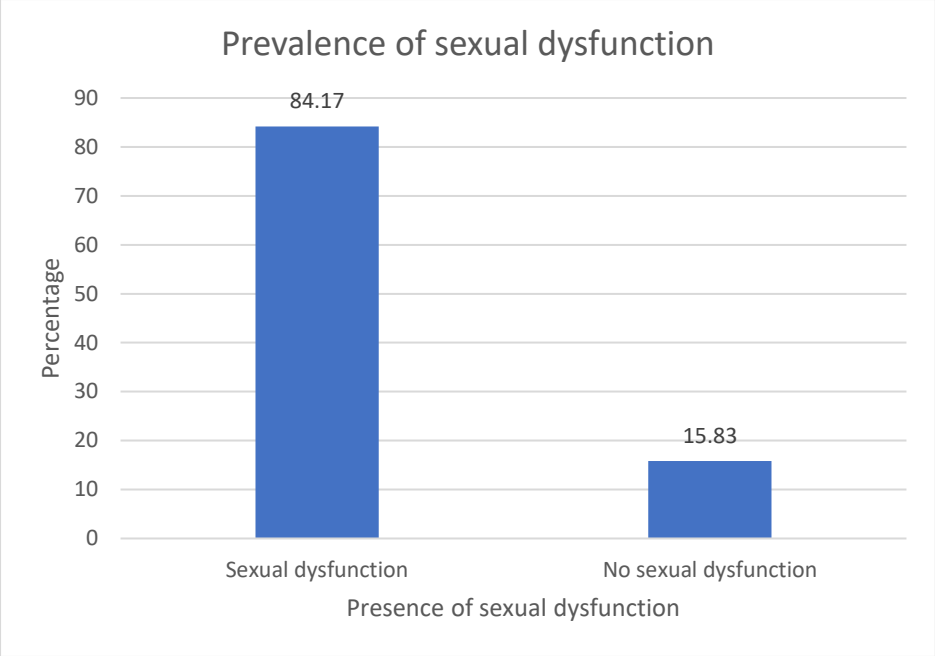
Table 3.1. Socio-demographic characteristics of the sample and summary statistics per biopsychosocial factor (*N* = 1595).

FACTORS	**Factor level**	***N*(%)**	**Mean±*SD***	**Median (range)**
Age (*N* = 1595)			37.18±11.00	
Number of pregnancies (*N* = 1595)				1.00 (0-20)
Biomedical factors				
Age (*N* = 1595)			37.18±11.00	
Number of pregnancies (*N* = 1595)				1.00 (0-20)
Regular menstruation	Yes	933 (58.50)		
	No	662 (41.50)		
Hormone replacement therapy	Yes	215 (13.48)		
	No	1380 (86.52)		
Contraception	Yes	601 (37.68)		
	No	994 (62.32)		
Fertility treatment received	Yes	48 (3.01)		
	No	1547 (96.99)		
Hysterectomy	Yes	180 (11.29)		
	No	1415 (88.71)		
Menopausal status	Pre-/Menopausal	1476 (92.54)		
	Post-menopausal	119 (7.46)		
Recurrent yeast infection	Yes	393 (24.64)		
	No	1202 (75.36)		
Previous infections	Yes	1024 (64.20)		
	No	571 (35.80)		
Pain during sex	Yes	1098 (68.84)		
	No	497 (31.16)		
Bothersome pain in pelvic/genital region	Yes	483 (30.23)		
	No	1115 (69.77)		
Menstrual pain	Yes	366 (22.95)		
	No	1229 (77.05)		
Urinary frequency	Yes	577 (36.18)		

	No	1018 (63.82)
Constipation	Yes	910 (57.05)
	No	685 (42.95)
Irritable bowel syndrome	Yes	501 (31.41)
	No	1094 (68.59)
Cholesterol	Yes	279 (17.49)
	No	1316 (82.51)
High blood pressure	Yes	109 (6.83)
	No	1486 (93.17)
Psychological factors		
Concern about having an STI	Yes	94 (5.89)
	No	1501 (94.11)
Concern about having a low sex drive	Yes	493 (79.26)
	No	129 (20.74)
Concern about orgasm	Yes	960 (60.00)
	No	638 (39.92)
Sociocultural factors		
Occupation	Student	71 (4.45)
	Employed	1356 (85.07)
	Unemployed	144 (9.03)
	Retired	23 (1.44)
Relationship status	Single	115 (7.20)
	Married	1124 (70.34)
	Longterm committed	316 (19.77)
	Casual	27 (1.69)
	Other	16 (1.00)
Alcohol consumption (units)	0	569 (35.67)
	1-7	910 (57.05)
	8-14	88 (5.52)
	15-21	21 (1.32)
	>21	7 (0.44)
Smoking	Yes	181 (11.35)
	No	1414 (88.65)
Number of children (*N* = 1595)		1.00 (0.-20)
Number of sexual partners	0	88 (5.51)
	1	1440 (90.11)
	2	37 (2.32)
	3	16 (1.00)
	4	4 (0.25)

	5	3 (0.19)
	6	4 (0.25)
	7	1 (0.06)
	10	1 (0.06)
	11	3 (0.19)
	26	1 (0.06)
Sexual orientation	Straight	1506 (95.08)
	Gay/lesbian	39 (2.46)
	Demisexual-hetero	0
	Bisexual	24 (1.52)
	Omnisexual-demi	0
	Queer	2 (0.13)
	Pansexual	2 (0.13)
	Asexual	1 (0.06)
	Other	10 (0.63)
Exercise	Yes	776 (48.65)
	No	819 (51.35)
SEXUAL DYSFUNCTION	Yes	1345 (84.17)
	No	253 (15.83)

Of the total sample, 1,345 (84.17%) presented with FSD, which was defined as a total sexual dysfunction score of $\leq$ 26.55 on the standardised FSFI (Graph 3.4).



Graph 3.4. Prevalence of sexual dysfunction (*N* = 1,595).

3.3.3 Biopsychosocial characteristics per domain of sexual dysfunction

As explained in Chapter 2, p.a. 2.6.1, a cut-off value has not been established for most of the domains of the FSFI, except for the desire domain and the total score. The mean values for the transformed scores of the domains, as suggested by Meston et al. (2020), are therefore summarised in Table 3.2 per biopsychosocial factor. The transformed scores allow for interpretation and comparison across the domains. The mean arousal score for the sample was 2.74 (*SD* = 1.79), for the lubrication domain it was 3.08 (*SD* = 2.07), for the orgasm domain 2.93 (*SD* = 2.09), for the satisfaction domain 2.98 (*SD* = 1.61), and for the pain domain 2.84 (*SD* = 2.29).

Table 3.2. Biopsychosocial factors per domain score of the FSFI.

		DOMAINS						
FACTORS	**Factor level**	**Desire score** mean± *SD (n)*	**Arousal score** mean± *SD (n)*	**Lubrication score** mean± *SD (n)*	**Orgasm score** mean± *SD (n)*	**Satisfaction score** mean± *SD (n)*	**Pain score** mean± *SD (n)*	**Total sexual dysfunction score** mean± *SD (n)*
Biomedical factors								
Regular menstruation	Yes	2.58±1.27 (933)	2.84±1.79 (933)	3.25±2.05 (933)	2.98±2.07 (932)	3.03±1.58 (932)	2.81±2.24 (930)	17.51±8.55 (930)
	No	2.43±1.34 (662)	2.60±31.77 (661)	2.82±2.07 (661)	2.84±2.11 (661)	2.90±1.63 (662)	2.87±2.35 (662)	16.47±9.00 (661)
Hormone replacement therapy	Yes	2.44±1.28 (215)	2.65±1.70 (215)	2.89±2.03 (215)	2.90±2.10 (215)	3.05±1.63 (215)	3.06±2.38 (215)	17.00±6.67 (215)
	No	2.54±1.30 (1380)	2.76±1.80 (1379)	3.10±2.08 (1379)	2.93±2.09 (1378)	2.96±1.60 (1379)	2.80±2.27 (1377)	17.09±8.77 (1376)
Contraception	Yes	2.48±1.26 (601)	2.82±1.68 (601)	3.20±1.99 (601)	2.93±2.00 (601)	3.04±1.53 (601)	2.90±2.18 (601)	17.38±8.36 (601)
	No	2.55±1.32 (994)	2.69±1.85 (993)	3.00±2.12 (993)	2.92±2.14 (992)	2.93±1.65 (993)	2.80±2.35 (991)	16.90±8.98 (990)
Fertility treatment received	Yes	2.39±1.10 (48)	2.64±1.57 (48)	3.01±2.07 (48)	3.11±2.16 (48)	2.76±1.43 (48)	2.84±2.00 (48)	16.75±7.68 (48)
	No	2.53±1.31 (1547)	2.74±1.79 (1546)	3.07±2.07 (1546)	2.92±2.08 (1545)	2.98±1.61 (1546)	2.84±2.30 (1544)	17.09±8.79 (1543)
Hysterectomy	Yes	2.35±1.26 (180)	2.57±1.74 (180)	2.64±1.94 (180)	2.89±2.09 (180)	2.92±1.63 (180)	3.06±2.32 (180)	16.42±8.84 (180)
	No	2.55±1.30 (1415)	2.76±1.79 (1414)	3.13±2.08 (1414)	2.93±2.09 (1413)	2.98±1.60 (1414)	2.81±2.28 (1412)	17.16±8.74 (1411)
Menopausal status	Pre-/Menopausal	2.55±1.30 (1476)	2.78±1.78 (1476)	3.13±2.06 (1476)	2.95±2.08 (1475)	2.99±1.59 (1475)	2.88±2.27 (1473)	17.28±8.69 (1473)
	Post-menopausal	2.26±1.23 (119)	2.31±1.80 (118)	2.30±2.07 (118)	2.58±2.11 (118)	2.81±1.72 (119)	2.31±2.38 (119)	14.61±9.24 (118)
Recurrent yeast infection	Yes	2.46±1.25 (393)	2.91±1.68 (393)	3.03±1.91 (393)	2.97±1.95 (393)	3.01±1.51 (393)	2.76±2.07 (393)	17.13±7.87 (393)
	No	2.54±1.32 (1202)	2.69±1.82 (1201)	3.09±2.12 (1201)	2.91±2.13 (1200)	2.96±1.63 (1201)	2.86±2.35 (1199)	17.06±9.03 (1198)

Previous infections	Yes	2.49±1.27 (1024)	2.77±1.80 (1024)	3.03±2.04 (1024)	2.94±2.07 (1023)	2.93±1.58 (1023)	2.89±2.25 (1021)	17.06±8.69 (1021)
	No	2.59±1.35 (571)	2.69±1.76 (570)	3.14±2.12 (570)	2.89±2.12 (570)	3.05±1.64 (571)	2.74±2.35 (571)	17.12±8.88 (570)
Pain during sex	Yes	2.39±1.21 (1098)	2.61±1.73 (1097)	2.80±1.94 (1097)	2.82±2.05 (1097)	2.82±1.52 (1098)	2.24±1.89 (1098)	15.68±8.02 (1097)
	No	2.82±1.44 (497)	3.03±1.88 (497)	3.68±2.22 (497)	3.16±2.15 (496)	3.32±1.73 (496)	4.17±2.52 (494)	20.19±9.49 (494)
Bothersome pain in pelvic/genital region	Yes	2.49±1.25 (483)	2.60±1.74 (483)	2.78±2.03 (483)	2.74±2.03 (483)	2.90±1.61 (483)	2.19±1.92 (483)	15.70±8.57 (483)
	No	2.54±1.32 (1115)	2.80±1.81 (1114)	3.20±2.08 (1114)	3.01±2.11 (1113)	3.01±1.60 (1114)	3.13±2.38 (1112)	17.71±8.77 (1111)
Menstrual pain	Yes	2.60±1.27 (366)	2.78±1.74 (366)	3.16±2.07 (366)	3.01±2.07 (366)	3.06±1.56 (366)	2.66±2.18 366	17.28±8.58 (366)
	No	2.50±1.31 (1229)	2.73±1.80 (1228)	3.05±2.07 (1228)	2.90±2.09 (1227)	2.95±1.62 (1228)	2.89±2.32 (1226)	17.02±8.81 (1225)
Urinary frequency	Yes	2.43±1.23 (577)	2.60±1.65 (577)	2.82±1.94 (577)	2.77±2.00 (577)	2.87±1.54 (577)	2.48±.2.09 (577)	15.97±8.12 (577)
	No	2.58±1.33 (1018)	2.82±1.86 (1017)	3.22±2.13 (1017)	3.02±2.13 (1016)	3.03±1.64 (1017)	3.04±2.37 (1015)	17.71±9.04 (1014)
Constipation	Yes	2.44±1.28 (910)	2.64±1.78 (910)	2.90±2.05 (910)	2.79±2.03 (910)	2.84±1.58 (910)	2.70±2.25 (909)	16.30±8.67 (909)
	No	2.64±1.32 (685)	2.88±1.79 (684)	3.30±2.07 (684)	3.11±2.15 (683)	3.16±1.62 (684)	3.01±2.33 (683)	18.12±8.76 (682)
Irritable bowel syndrome	Yes	2.39±1.30 (501)	2.68±1.85 (501)	2.90±2.05 (501)	2.80±2.04 (501)	2.86±1.60 (501)	2.75±2.22 (501)	16.40±851 (501)
	No	2.58±1.30 (1094)	2.77±1.76 (1093)	3.15±2.08 (1093)	2.98±2.10 (1092)	3.03±1.61 (1093)	2.87±2.32 (1091)	17.39±8.85 (1090)
Cholesterol	Yes	2.34±1.26 (279)	2.60±1.92 (279)	2.74±2.02 (279)	2.87±2.13 (279)	2.80±1.61 (279)	2.76±2.31 (279)	16.10±8.82 (279)
	No	2.56±1.31 (1316)	2.77±1.76 (1315)	3.14±2.08 (1315)	2.94±2.08 (1314)	3.01±1.60 (1315)	2.85±2.28 (1313)	17.29±8.73 (1312)
High blood pressure	Yes	2.21±1.20 (109)	2.42±1.76 (108)	2.54±2.03 (108)	2.73±2.17 (108)	3.04±1.73 (109)	2.84±2.37 (109)	15.82±9.33 (108)
	No	2.55±1.30 (1486)	2.76±1.79 (1486)	3.11±2.07 (1486)	2.94±2.08 (1485)	2.97±1.59 (1485)	2.83±2.28 (1483)	17.17±8.71 (1483)
Psychological factors								
Concern about having an STI	Yes	3.40±1.51 (94)	3.47±1.82 (93)	3.70±1.98 (93)	3.26±1.98 (93)	3.54±1.69 (94)	3.16±2.16 (93)	20.71±9.00 (92)
	No	2.47±1.27 (1501)	2.70±1.78 (1501)	3.03±2.07 (1501)	2.91±2.09 (1500)	2.94±1.59 (1500)	2.82±2.29 (1499)	16.86±8.69 (1499)

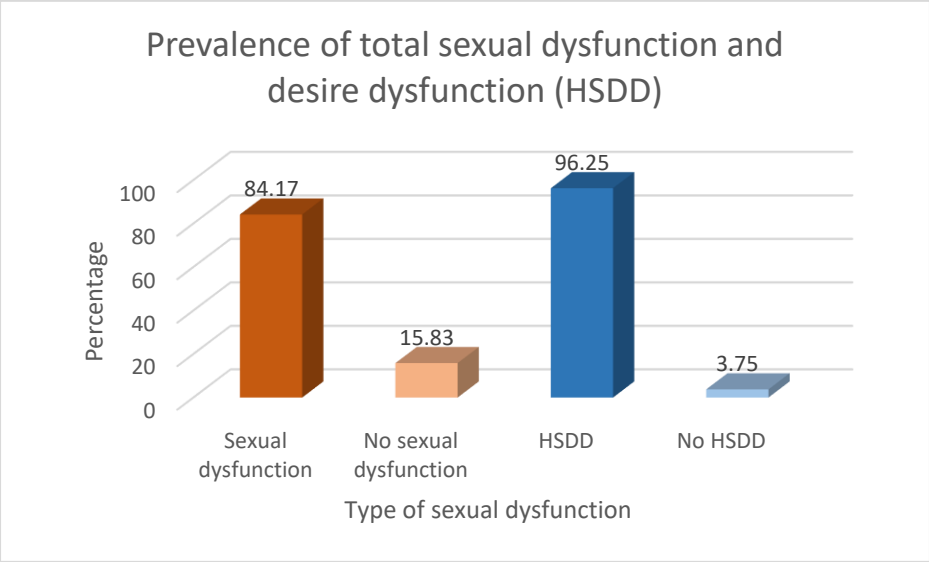
Concern about having a low sex drive	Yes	2.11±1.05 (493)	2.37±1.52 (493)	2.78±1.97 (493)	2.65±1.98 (493)	2.71±1.42 (493)	2.78±2.20 (493)	15.39±7.79 (493)
	No	3.84±1.43 (129)	3.52±2.19 (129)	3.73±2.36 (129)	3.33±2.36 (129)	3.52±1.89 (129)	2.86±2.49 (129)	20.80±10.73 (129)
Concern about orgasm	Yes	2.29±1.21 (960)	2.38±1.59 (959)	2.77±1.90 (959)	2.27±1.71 (959)	2.76±1.50 (960)	2.84±2.21 (960)	15.31±7.76 (959)
	No	2.88±1.34 (638)	3.29±1.93 (638)	3.54±2.22 (638)	3.92±2.21 (637)	3.31±1.70 (637)	2.84±2.41 (635)	19.79±9.47 (635)
Sociocultural factors								
Occupation	Student	3.06±1.37 (71)	2.83±1.80 (71)	3.27±2.12 (71)	2.65±1.90 (71)	3.27±1.58 (71)	2.46±2.24 (70)	17.67±8.51 (70)
	Employed	2.53±1.29 (1356)	2.79±1.79 (1355)	3.11±2.07 (1355)	2.99±2.10 (1354)	2.99±1.61 (1355)	2.85±2.29 (1354)	17.27±8.78 (1353)
	Unemployed	2.22±1.29 (144)	2.39±1.71 (144)	2.77±2.02 (144)	2.59±2.02 (144)	2.68±1.55 (144)	2.88±2.22 (144)	15.52±8.41 (144)
	Retired	2.24±1.22 (23)	1.96±1.57 (23)	1.93±1.86 (23)	2.02±1.84 (23)	2.94±1.79 (23)	2.75±2.70 (23)	13.83±8.89 (23)
Relationship status	Single	2.94±1.36 (115)	2.22±2.08 (114)	2.40±2.36 (114)	2.28±2.31 (113)	2.29±1.57 (114)	1.82±2.40 (113)	14.07±9.71 (112)
	Married	2.33±12.0 (1124)	2.70±1.74 (1124)	3.03±2.00 (1124)	2.95±2.06 (1124)	2.91±1.54 (1124)	2.91±2.24 (1123)	16.82±8.43 (1123)
	Longterm committed	2.93±1.40 (316)	3.01±1.77 (316)	3.40±2.10 (316)	3.03±2.07 (316)	3.40±1.71 (316)	2.91±2.32 (316)	18.69±9.07 (316)
	Casual	3.64±1.44 (27)	3.69±1.81 (27)	4.16±1.91 (27)	3.38±1.86 (27)	3.84±1.46 (27)	3.72±2.24 (27)	22.42±8.16 (27)
	Other	2.96±1.60 (16)	2.53±2.06 (16)	2.79±2.29 (16)	2.85±2.39 (16)	3.10±1.68 (16)	2.78±2.50- (16)	17.01±10.15 (16)
Alcohol consumption (units)	0	2.55±0.35 (569)	2.55±1.82 (568)	2.88±2.14 (568)	2.74±2.16 (567)	2.85±1.61 (568)	2.33±2.16 (567)	15.93±8.95 (566)
	1-7	2.50±1.26 (910)	2.82±1.76 (910)	3.14±2.00 (910)	3.02±2.03 (910)	3.04±1.59 (910)	3.03±2.28 (910)	17.56±8.49 (910)
	8-14	2.63±1.32 (88)	3.15±1.83 (88)	3.55±2.17 (88)	3.10±2.15 (88)	3.06±1.68 (88)	3.64±2.46 (87)	19.04±9.18 (87)
	15-21	2.49±1.42 (21)	2.77±1.91 (21)	3.43±2.03 (21)	3.20±2.19 (21)	3.20±1.74 (21)	4.21±2.17 (21)	19.30±9.48 (21)
	>21	1.97±1.08 (7)	2.31±1.28 (7)	2.83±2.31 (7)	2.57±2.32 (7)	3.14±1.69 (7)	3.89±2.73 (7)	16.71±10.55 (7)
Smoking	Yes	2.58±1.40 (181)	2.76±1.79 (181)	3.23±2.13 (181)	2.80±2.11 (181)	3.11±1.67 (181)	3.10±2.36 (181)	17.58±9.10 (181)
	No	2.52±1.29 (1414)	2.74±1.79 (1413)	3.05±2.06 (1413)	2.94±2.08 (1412)	2.96±1.60 (1413)	2.80±2.28 (1411)	17.02±8.71 (1410)
Sexual orientation	Straight	2.50±1.29 (1506)	2.72±1.78 (1505)	3.05±2.06 (1505)	2.91±2.08 (1504)	2.96±1.59 (1505)	2.82±2.29 (1504)	16.97±8.72 (1503)
	Gay/lesbian	2.57±1.37 (39)	3.05±1.81 (39)	3.30±2.06 (39)	3.25±2.23 (39)	3.06±1.73 (39)	2.90±2.29 (39)	18.13±8.81 (39)

	Demisexual-hetero	None						
	Bisexual	3.35±1.56 (24)	3.61±1.67 (24)	3.96±1.91 (24)	3.67±1.66 (24)	3.37±1.89 (24)	3.30±2.19 (23)	20.93±8.18 (23)
	Omnisexual-demi	None						
	Queer	2.70±2.12 (2)	3.0±2.55 (2)	2.70±3.82 (2)	2.60±3.68 (2)	2.80±2.83 (2)	1.40±1.98 (2)	15.20±16.97 (2)
	Pansexual	3.60±0 (2)	0.6±0.85 (2)	1.80±2.55 (2)	0.60±0.85 (2)	2.40±0 (2)	0.60±0.85 (2)	9.60±5.09 (2)
	Asexual	1.20‡	0	0	0	4.00	0	5.2
	Other	3.54±1.37 (10)	3.27±1.80 (10)	4.68±1.82 (10)	3.72±2.29 (10)	3.36±1.64 (10)	3.44±2.56 (10)	22.01±7.95 (10)
Exercise	Yes	2.67±1.35 (776)	2.92±1.81 (776)	3.25±2.05 (776)	3.08±2.06 (776)	3.10±1.62 (776)	3.03±2.27 (776)	18.04±8.7 (776)
	No	2.38±1.24 (819)	2.57±1.75 (818)	2.90±2.08 (818)	2.78±2.10 (817)	2.86±1.58 (818)	2.65±2.28 (816)	16.16±8.64 (815)

‡ Only one observation

† t-test unequal

According to the established cut-off value for the desire domain, 1538 participants from our sample presented with a score ≤ 5, and therefore with possible hypo-active sexual disorder (HSDD), (Graph 3.5), (paragraph 1.1.1). The mean transformed desire score was 0.96 (*SD* = 0.19) which is also indicating poor performance in this domain of the FSFI.



Graph 3.5. Prevalence of total sexual dysfunction and desire dysfunction (HSDD).

3.3.3.1 Biomedical factors and sexual dysfunction

The mean FSFI total score for sexual dysfunction was 17.66 (*SD* = 8.76), which is far below the cut-off value of 26.55. The *t* test (Table 3.3) showed the following biomedical factors to have higher FSFI scores (therefore less FSD) when compared to their dichotomous categories respectively: those with regular menstruation ($t(1,589) = -2.34$, $p = 0.019$), those who were pre- or menopausal ($t(1,589) = 3.20$, $p = 0.001$), those who had no pain during sex ($t(822.48) = 9.21$, $p = 0.000$), those who did not have bothersome pain in the pelvic or genital region ($t(1592) = 4.23$, $p = 0.000$), those who had no urinary frequency ($t(1,305.35) = 3.93$, $p = 0.000$), no constipation ($t(1,589) = 4.13$, $p = 0.000$), no complaints of irritable bowel syndrome ($t(1,589) = 2.12$, $p = 0.034$), and those who had no cholesterol ($t(1,589) = 2.05$, $p = 0.040$).

Table 3.3. Independent *t* test comparing total FSFI score means per dichotomous biopsychosocial factor.

FACTORS	Factor level	Total sexual dysfunction score mean± *SD (n)*	*t(df)*	*SE*	95% *CI* [UL, LL]	*p*
Biomedical factors						
Regular menstruation	Yes	17.51±8.55 (930)	-2.34(1589)	0.45	-1.91,-0.17	0.019*
	No	16.47±9.00 (661)				
Hormone replacement therapy	Yes	17.00±6.67 (215)	0.15(1589)	0.64	-1.16,1.36	0.880
	No	17.09±8.77 (1376)				
Contraception	Yes	17.38±8.36 (601)	-1.07(1589)	0.45	-1.37,0.40	0.286
	No	16.90±8.98 (990)				
Fertility treatment received	Yes	16.75±7.68 (48)	0.27(1589)	1.28	-2.17,2.86	0.788
	No	17.09±8.79 (1543)				
Hysterectomy	Yes	16.42±8.84 (180)	1.07(1589)	0.69	-0.62,2.10	0.285
	No	17.16±8.74 (1411)				
Menopausal status	Pre-/Menopausal	17.28±8.69 (1473)	3.20(1589)	0.84	1.03,4.31	0.001*
	Post-menopausal	14.61±9.24 (118)				
Recurrent yeast infection	Yes	17.13±7.87 (393)	-0.15(757.59)†	0.47	-1.00,0.86	0.881
	No	17.06±9.03 (1198)				
Previous infections	Yes	17.06±8.69 (1021)	0.12(1589)	0.46	-0.84,0.95	0.903
	No	17.12±8.88 (570)				
Pain during sex	Yes	15.68±8.02 (1097)	9.21(822.48)†	0.49	3.56,5.49	0.000*
	No	20.19±9.49 (494)				
Bothersome pain in pelvic/genital region	Yes	15.70±8.57 (483)	4.23(1592)	0.47	1.08,2.94	0.000*
	No	17.71±8.77 (1111)				
Menstrual pain	Yes	17.28±8.58 (366)	-0.49(1589)	0.52	-1.28,0.77	0.626
	No	17.02±8.81 (1225)				
Urinary frequency	Yes	15.97±8.12 (577)	3.93(1305.36)†	0.44	0.67,2.60	0.000*
	No	17.71±9.04 (1014)				
Constipation	Yes	16.30±8.67 (909)	4.13(1589)	0.44	0.95,2.69	0.000*
	No	18.12±8.76 (682)				
Irritable bowel syndrome	Yes	16.40±851 (501)	2.12(1589)	0.47	0.07,1.93	0.034*

	No	17.39±8.85 (1090)				
Cholesterol	Yes	16.10±8.82 (279)	2.05(1589)	0.58	0.05,2.31	0.040*
	No	17.29±8.73 (1312)				
High blood pressure	Yes	15.82±9.33 (108)	1.55(1589)	0.87	-0.36,3.06	0.121
	No	17.17±8.71 (1483)				
Psychological factors						
Concern about having an STI	Yes	20.71±9.00 (92)	-4.12(1589)	0.94	-5.69,-2.02	0.000*
	No	16.86±8.69 (1499)				
Concern about having a low sex drive	Yes	15.39±7.79 (493)	5.37(164.92)†	1.01	3.42,7.39	0.000*
	No	20.80±10.73 (129)				
Concern about orgasm	Yes	15.31±7.76 (959)	9.22(1169.62)†	0.45	3.59,5.37	0.000*
	No	19.79±9.47 (635)				
Sociocultural factors						
Smoking	Yes	17.58±9.10 (181)	-0.81(1589)	0.69	-1.92,0.80	0.418
	No	17.02±8.71 (1410)				
Exercise	Yes	18.04±8.7 (776)	-4.31(1589)	0.44	-2.74,-1.02	0.000*
	No	16.16±8.64 (815)				

† t-test unequal
*Significant at p < 0.05

A one-way ANOVA (Table 3.4) demonstrated that the total FSFI scores were significantly different amongst the age groups ($F(1539) = 3.20$, $p = 0.002$). The Bonferroni adjustment revealed that this difference was between the groups of 21-30 and 51-60 years, the younger age group presenting with a higher FSFI score (mean difference = -2.41, $p = 0.014$).

Table 3.4. One-way ANOVA comparing total FSFI score means per multilevel biopsychosocial factor.

FACTORS	Factor level	Total sexual dysfunction score mean± *SD (n)*	ANOVA *F(df)*	Total scores *p*	Bonferroni
Biomedical factors					
Age (Age group)	<=20	16.06± 10.38 (22)	3.20(1593)	0.004*	Between the groups of 21-30 and 51-60 years: -2.41 (*p* = 0.014)
	21-30	17.86± 8.74 (508)			
	31-40	17.05± 8.29 (526)			
	41-50	17.52± 9.24 (296)			
	51-65	15.45± 8.72 (217)			
	66-80	12.36± 9.61 (16)			
	>80	13.13± 8.33 (9)			
Number of pregnancies	0	16.97± 8.84 (714)	1.03 (1590)	0.417	
	1	16.36± 9.18 (204)			
	2	17.34± 8.46 (364)			
	3	17.43±8.68 (202)			
	4	18.52±8.27 (74)			
	5	17.22±9.34 (20)			
	6	17.15±6.41 (6)			
	8	15.15±6.86 (2)			
	10	2.60 (1)			
	11	12.40 (1)			
	20	10.6±13.29 (2)			
Sociocultural factors					
Employment	Student	17.67±8.51 (70)	2.19 (1590)	0.068	
	Employed	17.27±8.78 (1353)			
	Unemployed	15.52±8.41 (144)			

	Retired	13.83±8.89 (23)			
Relationship status	Single	14.07±9.71 (112)	8.91 (1593)	0.000*	Most significant differences between Single vs Long-term and Casual relationship *(p* = 0.000)
	Married	16.82±8.43 (1123)			
	Long-term committed	18.69±9.07 (316)			
	Casual	22.42±8.16 (27)			
	Other	17.01±10.15 (16)			
Alcohol consumption (units)	0	15.93±8.95 (566)	4.58 (1590)	0.001*	Significant difference when None is compared to up to use of 14 units (*p* = 0.005 and 0.020 respectively for the increasing unit categories)
	1-7	17.56±8.49 (910)			
	8-14	19.04±9.18 (87)			
	15-21	19.30±9.48 (21)			
	>21	16.71±10.55 (7)			
Number of children	0	17.02±8.89 (762)	1.60 (1590)	0.132	
	1	15.78±8.67 (194)			
	2	17.54±8.60 (458)			
	3	17.51±8.28 (148)			
	4	19.58±9.87 (24)			
	5	8.55±3.61 (2)			
	10	12.40 (1)			
	20	10.60±13.29 (2)			
Number of sexual partners	0	11.62±9.25 (85)	5.53 (1593)	0.000*	Most significant between the groups of None versus one or two partners (p = 0.000)
	1	17.23±8.58 (1439)			
	2	19.66±9.37 (37)			
	3	19.86±8.44 (16)			
	4	22.10±7.47 (4)			
	5	27.53±3.58 (3)			
	6	21.83±12.75 (4)			

	7	30.10 (1)		
	10	33.60 (1)		
	11	24.30±6.15 (3)		
	26	25.30 (1)		
Sexual orientation	Straight	16.97±8.72 (1503)	1.99 (1579)	0.065
	Gay/lesbian	18.13±8.81 (39)		
	Demisexual-hetero	0		
	Bisexual	20.93±8.18 (23)		
	Omnisexual-demi	0		
	Queer	15.20±16.97 (2)		
	Pansexual	9.60±5.09 (2)		
	Asexual	5.20 (1)		
	Other	22.01±7.95 (10)		

‡ Only one observation

*Significant at $p < 0.05$

3.3.3.2 Psychological factors and sexual dysfunction

When comparing the total FSFI scores of the categories (yes versus no) of the psychological factors, there were overwhelming evidence that those who had no concern about a low sex drive ($t(164.92) = 5.37$, $p = 0.000$) and no concern regarding orgasm ($t(1169.62) = 9.22$, $p = 0.000$), presented with higher FSFI scores (Table 3.4). This was in contrast with participants who were concerned about having an STI, and presented with a higher FSFI score, and therefore less FSD, when compared to those who were not concerned about an STI ($t(1589) = -4.12$, $p = 0.000$).

3.3.3.3 Sociocultural factors and sexual dysfunction

Regarding the sociocultural factors, the one-way ANOVA (Table 3.5) demonstrated significant differences amongst the FSFI scores for relationship status ($F(1539) = 8.91$, $p = 0.000$), with the Bonferroni adjustment indicating that significant differences existed amongst the FSFI scores of those who were single, compared to those who were in a long-term or casual relationship respectively ($p = 0.000$). Those who were single presented with the lower FSFI scores.

The one-way ANOVA also rejected the null hypothesis of no difference between the FSFI scores when comparing units of alcohol consumption ($F(1590) = 4.58$, $p = 0.001$). The Bonferroni adjustment demonstrated that those who used no alcohol, had lower FSFI scores when compared to those who used 1-7 units ($p = 0.005$) and 8-14 units ($p = 0.020$) respectively.

The hypothesis of no difference in FSFI scores when comparing number of sexual partners, was also rejected ($F(1593) = 5.53$, $p = 0.000$). The Bonferroni adjustment indicated that these differences existed when comparing those who had one ($p = 0.000$), two ($p = 0.000$) or three ($p = 0.026$) partners, to those who had no partners respectively. Those with more partners, had a higher FSFI score.

The *t* test also demonstrated that those who did exercise ($t(1,589) = -4.12$, $p = 0.000$) had a higher FSFI score compared to those who did not do exercise.

3.4 The prevalence of sexual dysfunction by biopsychosocial characteristics in self-identified females in Gauteng, South Africa, during 2013-2023.

Referring to Table 3.5, the highest prevalence of FSD were in the higher age groups (51-65 years and > 80 years). Regardless of the number of pregnancies, the prevalence of FSD remained above 80%. The same trend was observed in the rest of the biomedical factors, whether exposed or not exposed to the factor, the prevalence of FSD remained above 80%. For those who experienced pain during sex and complained of urinary frequency, the prevalence was > 90%.

Table 3.5. Prevalence of sexual dysfunction by biopsychosocial characteristics.

		Sexual dysfunction						
FACTORS	**Factor level**	**Absent** *n* **(%)**	**Present** *n* **(%)**	***N*** **(%)**	X^2	***p***	**Prevalence ratios**	**Comments**
Biomedical factors								
Age (Age group)	<=20	5 (21.74)	18 (78.26)	23 (100.00)	8.10	0.231	0.96	Comparing the unexposed 0-40 years, to the exposed > 41 years.
	21-30	88 (17.32)	420 (82.68)	508 (100.00)				
	31-40	73 (13.85)	454 (86.15)	527 (100.00)				
	41-50	57 (19.13)	241 (80.87)	298 (100.00)				
	51-65	26 (11.98)	191 (88.02)	217 (100.00)				
	66-80	3 (18.75)	13 (81.25)	16 (100.00)				
	>80	1 (11.11)	8 (88.89)	9 (100.00)				
Number of pregnancies	0	112 (15.62)	605 (84.38)	717 (100.00)	2.38	0.997	1.00	Taking no pregnancies as the unexposed, and > 1 pregnancy as the exposed
	1	32 (15.69)	172 (84.31)	204 (100.00)				
	2	55 (15.07)	310 (84.93)	365 (100.00)				
	3	36 (17.82)	166 (82.18)	202 (100.00)				
	4	12 (20.00)	62 (83.72)	74 (100.00)				
	5	4 (20.00)	16 (80.00)	20 (100.00)				
	6	1 (16.67)	5 (83.33)	6 (100.00)				
	8	0 (0.00)	2 (100.00)	2 (100.00)				
	10	0 (0.00)	1 (100.00)	1 (100.00)				
	11	0 (0.00)	1 (100.00)	1 (100.00)				
	20	0 (0.00)	2 (100.00)	2 (100.00)				
Regular menstruation	No	109 (16.47)	553 (83.53)	662 (100.00)	0.38	0.539	1.01	
	Yes	143 (15.33)	790 (84.67)	933 (100.00)				
Hormone replacement therapy	No	218 (15.80)	1,162.00 (84.20)	1,380 (100.00)	0	1.00	1.00	
	Yes	34 (15.81)	181 (84.19)	215 (100.00)				

Contraception	No	171 (17.20)	823 (82.80)	994 (100.00)	3.91	0.048*	1.01
	Yes	81 (13.48)	520 (86.52)	601 (100.00)			
Fertility treatment received	No	248 (16.03)	1,299 (83.97)	1,547 (100.00)	2.07	0.150	1.13
	Yes	4 (8.33)	44 (94.67)	48 (100.00)			
Hysterectomy	No	225 (15.90)	1,190 (84.10)	1,415 (100.00)	0.10	0.755	1.01
	Yes	27 (15.00)	153 (85.00)	180 (100.00)			
Menopausal status	Pre-/Menopausal	235 (15.92)	1,241 (84.08)	1,476 (100.00)	0.22	0.638	1.02
	Post-menopausal	17 (14.29)	102 (85.71)	119 (100.00)			
Recurrent yeast infection	No	209 (17.39)	993 (82.61)	1,202 (100.00)	9.25	0.002*	1.08
	Yes	43 (10.94)	350 (89.06)	393 (100.00)			
Previous infections	No	98 (17.16)	473 (82.84)	571 (100.00)	1.24	0.265	1.03
	Yes	154 (15.04)	870 (84.96)	1,024 (100.00)			
Pain during sex	No	157 (31.59)	340 (68.41)	497 (100.00)	135.31	0.000*	1.34
	Yes	95 (8.65)	1,003 (91.35)	1,098 (100.00)			
Bothersome pain in pelvic/genital region	No	197 (17.67)	918 (82.33)	1,115 (100.00)	9.33	0.002*	1.07
	Yes	56 (11.59)	427 (88.41)	483 (100.00)			
Menstrual pain	No	195 (15.87)	1,034 (84.13)	1,229 (100.00)	0.02	0.893	1.00
	Yes	57 (15.57)	309 (84.43)	366 (100.00)			
Urinary frequency	No	196 (19.25)	822 (80.75)	1,018 (100.00)	25.24	0.000*	1.13
	Yes	56 (9.71)	521 (90.29)	577 (100.00)			
Constipation	No	131 (19.12)	554 (80.88)	685 (100.00)	9.98	0.002*	1.07
	Yes	121 (13.30)	789 (86.70)	910 (100.00)			
Irritable bowel syndrome	No	190 (17.37)	904 (82.63)	1,094 (100.00)	6.44	0.011*	1.06
	Yes	62 (12.38)	439 (87.62)	501 (100.00)			
Cholesterol	No	216 (16.41)	1,100 (83.59)	1,316 (100.00)	2.13	0.144	1.04
	Yes	36 (12.90)	243 (87.10)	279 (100.00)			
High blood pressure	No	234 (15.75)	1,252 (84.25)	1,486 (100.00)	0.04	0.832	1.00
	Yes	18 (16.51)	91 (83.49)	109 (100.00)			

Psychological factors								
Concern about having an STI	No	222 (14.79)	1,279 (85.21)	1,501 (100.00)	19.50	0.000*	1.15	
	Yes	30 (31.91)	64 (98.09)	94 (100.00)				
Concern about having a low sex drive	No	54 (41.86)	75 (58.14)	129 (100.00)	100.76	0.000*	1.60	
	Yes	35 (7.10)	458 (92.90)	493 (100.00)				
Concern about orgasm	No	177 (27.74)	461 (72.26)	638 (100.00)	113.06	0.000*	1.27	
	Yes	76 (7.92)	884 (92.08)	960 (100.00)				
Sociocultural factors								
Employment	Student	13 (18.31)	58 (81.69)	71 (100.00)	9.03	0.387	0.97	Exposed = employed and unexposed = students + unemployed + retired
	Employed	220 (16.22)	1,136 (83.78)	1,356 (100.00)				
	Unemployed	16 (11.11)	128 (88.89)	144 (100.00)				
	Retired	3 (13.04)	20 (86.96)	23 (100.00)				
Relationship status	Single	19 (16.52)	96 (83.48)	115 (100.00)	30.52	0.000*	1.01	Exposed = married + longterm committed + casual + other and unexposed = single
	Married	150 (13.35)	974 (86.65)	1,124 (100.00)				
	Long-term committed	68 (21.52)	248 (78.48)	316 (100.00)				
	Casual	12 (44.44)	15 (55.56)	27 (100.00)				
	Other	4 (25.00)	12 (75.00)	16 (100.00)				
Alcohol consumption (units)	0	83 (14.59)	486 (85.41)	569 (100.00)	9.76	0.045*	0.98	Exposed = consumption of > 0 units, and unexposed = 0 units
	1-7	139 (15.27)	771 (84.73)	910 (100.00)				
	8-14	23 (26.14)	65 (73.86)	88 (100.00)				
	15-21	5 (23.81)	16 (76.19)	21 (100.00)				
	>21	2 (28.57)	5 (71.43)	7 (100.00)				
Smoking	No	215 (15.21)	1,199 (84.79)	1,414 (100.00)	3.31	0.069	0.94	
	Yes	37 (20.44)	144 (79.56)	181 (100.00)				

Sexual orientation	Straight	227 (15.07)	1,279 (84.93)	1,506 (100.00)	11.59	0.072	0.87	Exposed included all orientations, other than straight and the unexposed were those who classified as straight
	Gay/lesbian	9 (23.08)	30 (76.92)	39 (100.00)				
	Demisexual-hetero	0	0	0				
	Bisexual	8 (33.33)	16 (66.67)	24 (100.00)				
	Omnisexual-demi	0	0	0				
	Queer	1 (100.00)	1 (100.00)	1 (100.00)				
	Pansexual	0 (0.00)	2 (100.00)	2 (100.00)				
	Asexual	0 (0.00)	1 (100.00)	1 (100.00)				
	Other	3 (30.00)	7 (70.00)	10 (100.00)				
Number of children	0	122 (15.95)	643 (84.05)	765 (100.00)	3.02	0.883	1.00	Exposed were those with > 0 children, and the unexposed = 0 children
	1	27 (13.92)	167 (86.08)	194 (100.00)				
	2	73 (15.90)	386 (84.10)	459 (100.00)				
	3	24 (16.22)	124 (83.78)	148 (100.00)				
	4	6 (25.00)	18 (75.00)	24 (100.00)				
	5	0 (0.00)	2 (100.00)	2 (100.00)				
	10	0 (0.00)	1 (100.00)	1 (100.00)				
	20	0 (0.00)	2 (100.00)	2 (100.00)				
Number of sexual partners	0	12 (13.64)	76 (86.36)	88 (100.00)	36.90	0.000*	0.97	Exposed were those with > 0 partners, and the unexposed those with 0 partners.
	1	216 (15.00)	1,224 (85.00)	1,440 (100.00)				
	2	11 (29.73)	26 (70.27)	37 (100.00)				
	3	4 (25.00)	12 (75.00)	16 (100.00)				
	4	2 (50.00)	2 (50.00)	4 (100.00)				
	5	2 (66.67)	1 (33.33)	3 (100.00)				
	6	2 (50.00)	2 (50.00)	4 (100.00)				
	7	1 (100.00)	0 (0.00)	1 (100.00)				

	10	1 (100.00)	0 (0.00)	1 (100.00)			
	11	2 (66.67)	1 (33.33)	3 (100.00)			
	26	0 (0.00)	1 (100.00)	1 (100.00)			
Exercise	No	99 (12.09)	720 (87.91)	819 (100.00)	17.43	0.000*	0.91
	Yes	153 (19.72)	623 (80.28)	776 (100.00)			

* Significant at 5% level of significance

Presence of factors classified as psychological factors, had a prevalence of FSD of > 90%. These included the patients' concern about having an STI, concern about sexual drive, and concern about orgasm respectively.

Some prevalences amongst the sociocultural factors were interesting to note. Those who were single or married had a higher prevalence of FSD amongst them (> 80%), when compared to other relationship statuses. It was also interesting to note that those who used less units of alcohol (0 and 1-7 units), had a higher prevalence of FSD (> 80%). Non-smokers also showed a higher prevalence of FSD (> 80%), while those patients who classified themselves as "straight", also showed a higher prevalence of FSD (> 80%). It must however be noted that the other categories under sexual orientation (and other multilevel factors), had much smaller frequencies to use for calculations of prevalence. Those with one or two sexual partners, also showed a prevalence of > 80%.

The categories of patients who had 0-3 children, all had a prevalence of FSD of > 80% respectively.

With other factors the prevalence of FSD remained above 80% irrespective of the level of the factor, such as employment and engaging in regular exercise.

The prevalence ratios ranged from 0.87 to 1.34, with most ratios equalling an approximate ratio of one. In the case of multilevel factors, the exposed and the unexposed were defined as noted in Table 3.6. In the case of dichotomous variables, the "yes" response was taken as the exposure and the "no" response as the unexposed. The 'pain during sex' variable showed the highest ratio of 1.34.

3.5 The association between the biopsychosocial factors and sexual dysfunction in women in Gauteng, South Africa, during 2013-2023.

All biopsychosocial factors were analysed to determine possible association with FSD. Standard epidemiological analysis of the data indicated evidence of association between FSD and several biomedical factors namely: use of contraception (OR = 1.33, χ^2 = 3.91, p = 0.048); recurrent yeast infections (OR = 1.71, χ^2 = 9.25, p = 0.002); pain during sex (OR = 4.88, χ^2 = 135.31, p = 0.000); bothersome pain in the pelvic or genital region (OR = 1.64, χ^2 =

9.33, p = 0.002); urinary frequency (OR = 2.22, χ^2 = 25.24, p = 0.000); constipation (OR = 1.54, χ^2 = 9.98, p = 0.002); and irritable bowel syndrome (OR = 1.49, χ^2 = 6.44, p = 0.011).

Evidence was strong for the association of FSD with psychological factors such as concern about having a low sex drive (OR = 9.42, χ^2 = 100.76, p = 0.000), concern about orgasm (OR = 4.47, χ^2 = 113.06, p = 0.000), and concern about having an STI (OR = 0.37, χ^2 = 19.50, p = 0.000).

Strong evidence of association of sociocultural factors with FSD were also found. These factors included exercise (OR = 0.56, χ^2 = 17.43, p = 0.000), relationship status (χ^2 = 30.52, p = 0.000), alcohol consumption (χ^2 = 9.75, p = 0.045), and number of sexual partners (χ^2 = 36.90, p = 0.000). The latter three factors included several levels of the factor that needed to be further explored during the regression analysis, to determine odds ratios at each level.

Table 3.5 summarises the chi-square values and the p values for all biopsychosocial factors referred to in the above.

Model 1 (Chapter 2 Section 2.6) was found to be statistically significant with χ^2 = 268.34, p = 0.000 and included the following variables: contraception, recurrent yeast infections, pain during sex, urinary symptoms, concern about having an STI, concern about orgasm, relationship status, number of partners, and exercise. The statistical values are depicted in Table 3.6 below.

Table 3.6. Model 1: Logistic regression analysis excluding the factor "Concern about sex drive".

Variable	AOR	*p*	95% CI
Biomedical factors			
Contraception	1.3	0.118	0.93, 1.80
Recurrent yeast infections	1.38	0.117	0.92, 2.05
Pain during sex	3.84	0.000*	2.81, 5.24
Urinary symptoms	1.54	0.019*	1.07, 2.20
Psychological factors			
Concern about STI	0.37	0.001*	0.21, 0.66
Concern about orgasm	3.91	0.000*	2.86, 5.34
Sociocultural factors			
Relationship status:			
Single	Base		
Married	0.53	0.034*	0.29, 0.95
Long-term committed	0.36	0.002*	0.19, 0.69
Casual relationship	0.17	0.001*	0.06, 0.47
Other	0.48	0.287	0.12, 1.85
Exercise	0.6	0.001*	0.44, 0.81
Partners	0.85	0.037*	0.72, 0.99

*Significant at $p < 0.05$

The Goodness of Fit test indicated that there was no lack of fit ($\chi^2(8) = 5.12$, $p = 0.744$), and that we did not add more terms to the model. As the model did not include interaction terms, further investigation was not indicated.

According to this model, pain during sex, urinary symptoms, concern about STI, concern about orgasm, relationship status, doing exercise, and the number of partners were found to be significantly associated with FSD (Table 3.7).

Model 2 (Chapter 2 Section 2.6) led to a slightly different model. This model was also significant ($\chi^2(12) = 177.80$, $p = 0.000$) and included the following variables: concern about sex drive, concern about orgasm, pain during sex, recurrent yeast infections, relationship status, number of partners and employment (Table 3.7). Adjusting for possible interactions, did not improve the fit of the model.

Table 3.7. Model 2: Logistic regression analysis including the factor "Concern about sex drive".

Variable	AOR	*p*	95% CI
Biomedical factors			
Recurrent yeast infections	1.41	0.359	0.67, 2.98
Pain during sex	6.20	0.000*	3.44, 11.18
Psychological factors			
Concern about sex drive	7.22	0.000*	3.88, 13.45
Concern about orgasm	5.14	0.000*	2.73, 9.68
Sociocultural factors			
Relationship status:			
Single	Base		
Married	0.174	0.004*	0.05, 0.58
Long-term committed	0.12	0.001*	0.04, 0.42
Casual relationship	0.03	0.001*	0.00, 0.24
Other	0.27	0.153	0.04, 1.64
Number of partners	0.60	0.011*	0.41, 0.89
Employment*:*			
Student	Base		
Employed	0.12	0.017*	0.02, 0.69
Retired	0.64	0.756	0.04, 10.51
Unemployed	0.06	0.008*	0.01, 0.48

**Significant at $p < 0.05$*

Model 2 also indicated no lack of fit ($X^2(7) = 1.82$, $p = 0.969$) based on 622 observations.

The factors, significantly associated with FSD, according to Model 2, was: concern about sex drive, concern about orgasm, relationship status, number of partners, employment status and experiencing pain during sex (Table 3.7).

Common variables included in both models 1 and 2 were pain during sex, recurrent yeast infections, concern about orgasm, relationship status, and number of partners.

The concern about orgasm, pain during sex, and number of partners seemed to be the common four significant factors amongst both models.

3.5.1 A final model

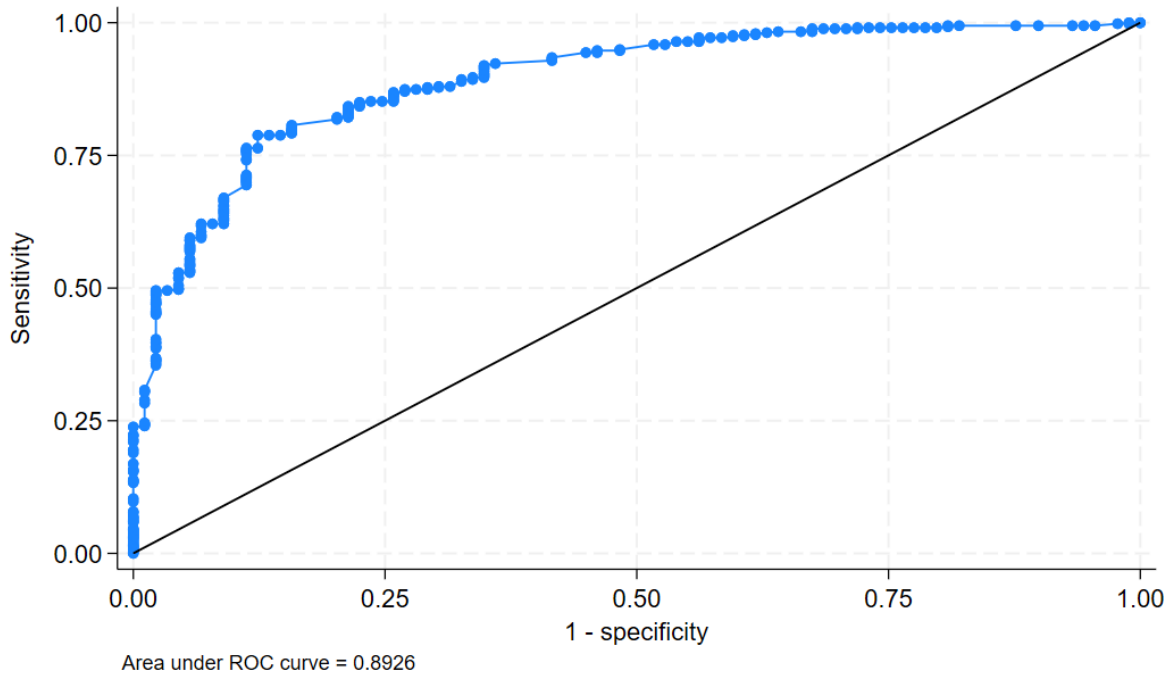
Model 3 (Chapter 2 Section 2.6), based on 622 observations, indicated no lack of fit ($X^2(8) = 4.67$, $p = 0.792$) and is shown in Table 3.8 below.

Table 3.8. Model 3: Logistic regression analysis including factors derived from different models.

Variable	AOR	*p*	95% CI
Biomedical factors			
Urinary frequency	1.09	0.809	0.55, 2.15
Contraception	1.91	0.059	0.98, 3.74
Recurrent yeast infections	1.38	0.424	0.62, 3.02
Pain during sex	6.02	0.000*	3.27, 11.06
Psychological factors			
Concern about STI	0.71	0.613	0.19, 2.67
Concern about sex drive	6.48	0.000*	3.45, 12.18
Concern about orgasm	5.22	0.000*	2.75, 9.89
Sociocultural factors			
Exercise	0.78	0.391	0.44, 1.38
Relationship status:			
Single	Base		
Married	0.174	0.005*	0.05, 0.59
Long-term committed	0.12	0.001*	0.03, 0.41
Casual relationship	0.03	0.002*	0.00, 0.28
Other	0.25	0.136	0.04, 1.55
Number of partners	0.61	0.012*	0.41, 0.90
Employment:			
Student	Base		
Employed	0.13	0.023*	0.02, 0.75
Retired	0.75	0.844	0.04, 12.69
Unemployed	0.07	0.011*	0.01, 0.53

**Significant at p < 0.05*
STI = sexually transmitted infections

The area under the ROC curve (AUC) for the final model equalled 0.893 and is demonstrated in Graph 3.6 below. The likelihood that a randomly selected participant would be categorised as having FSD according to this model, is therefore bordering between considerable and excellent (where 0.8 ≤ AUC < 0.9 is considerable, and AUC ≥ 0.9 is excellent) (Çorbacıoğlu & Aksel, 2023).



Graph 3.6. ROC curve for the final proposed model.

3.6 Summary

The data from the patient records indicated a high prevalence of FSD in the analysed sample. Biomedical, psychological and socio-cultural factors were associated with FSD in this sample, but no specific interactions were found exploring odds ratios. There were significant differences in the mean scores of total sexual dysfunction when comparing the different categories, by the biopsychosocial factor.

Based on three different logistic regression models concern about orgasm, pain during sex, and number of partners seemed to be predictive factors of FSD in all three models. Each model should however be interpreted within the context it was analysed. A final model was fitted to determine the effect of inclusion of all predictive variables among the different models.

These and other interpretations will be further discussed in Chapter 4.

Chapter 4 Discussion

The study found a high prevalence of FSD in the selected sample, as well as high estimates of FSD stratified by biopsychosocial factor. The prevalence estimate of FSD was 84.17% (N = 1595) while 96.25% of the sample were indicated to have HSDD according to the FSFI domain. This was interesting to note, as the sample characteristics indicated the self-identified females to be in a generally good health state, relatively young (37.18 ± 11.00 years), in committed relationships, and following a healthy lifestyle (paragraph 4.1). Stratified prevalence estimates of FSD by factors such as concern about sex drive, orgasm, or sexually transmitted infections, were > 90%, while other estimates were, on average, above 80% for most factors. Prevalence ratios amongst all factors varied between 0.87-1.34. The multivariate regression model indicated that pain during sex (AOR = 6.02, p = 0.000), concern about sex drive (AOR = 6.48, p = 0.000) and orgasm (AOR = 5.22, p = 0.000), number of sexual partners (AOR = 0.61, p = 0.000) and relationship status (AOR = 0.17, p = 0.005) were significantly associated with FSD. In addition, factors such as contraception use (OR = 1.33, p = 0.048), urinary symptoms (OR = 2.22, p = 0.000), concern about STI (OR = 0.37, p = 0.000), and doing exercise (OR = 0.56, p = 0.000) were also associated with FSD, as found with standard epidemiological analysis. These factors were included and adjusted for in the final regression model as explained in Chapter 2, paragraph 2.6.

4.1 The biopsychosocial characteristics and prevalence of sexual dysfunction in the self-identified females

The past couple of years there has been a concern regarding the increased prevalence of FSD posing a public health concern (Alidost et al., 2021). Even though this might be contributed to increased awareness or improved screening during medical examinations, the concern remains the effect it might have on wellness and quality of life of the patients. The high period prevalence of clinically relevant FSD in our sample is however higher than many reported prevalence rates for FSD. For example, the study by Adebusoye et al. (2020) reported a point prevalence of 80% among 566 Nigerian women (Adebusoye et al., 2020), while the study by Butt et al. (2019) reported a prevalence of 38.7% among 480 Nairobian

women (Butt et al., 2019). A systematic review and meta-analysis by Alidost et al. (2021) reported a pooled prevalence of FSD, as measured with the FSFI, of 50.75% (41.73–59.78). Their review included populations from Asia (*n* = 17), Africa (*n* = 3) and South America (*n* = 1), which might have more comparable socio-economic circumstances to South Africa, when compared to studies conducted in other European countries. No study on a South African population were however included in the review. The prevalences ranged between 4%-73%, with only one study reporting a 95% prevalence of FSD (Alidost et al., 2021). This study was done in a hospital-based Nigerian setting, which might implicate sampling bias with inclusion of participants with perhaps a higher prevalence of chronic disease or other factors that may predispose FSD (Chapter 1, paragraph 1.2.2.1).

Several reasons can be considered for the difference in prevalence rates among studies. Our study determined period prevalence over a time of ten years, contrary to determining point prevalence in the case of the abovementioned studies. Sampling over a period may depict a more representative or comprehensive picture of the prevalence, as it may rule out transient factors that could affect point prevalence. However, Zingg et al. (2013) indicated that period prevalence may again overestimate conditions of short duration, as well as in sub-acute and long-term care settings (Zingg et al., 2013).

When comparing prevalence rates and associated factors across studies, the use of different measuring tools complicate comparison. Different instruments include different domains and weighting to calculate FSD, and comparison would therefore need to be limited or at least cautious. It was however interesting to note, that most studies investigating FSD, sample their participants from outpatient clinics, gynaecology, family medicine, and sexual and reproductive health clinics. This phenomenon helps with comparing results across studies, as one would expect that patients presenting at these types of clinics, would most likely have certain sexual complaints or concerns, and perhaps contribute to a higher observed prevalence than one would find amongst the broader public.

One of the most prevalent complaints or subtypes of FSD seems to be desire dysfunction (Li et al., 2022). Alidost et al. (2021) reported in their systematic review a pooled prevalence of 50.7% in the desire domain, as measured with the FSFI. A similar prevalence (49.4%) was noted by Maaita et al. (2018) in a sample of Jordanian women. Of concern is however that Maaita et al.'s (2018) study excluded participants who were ill, divorced or widowed.

In contrast, our study found a much higher prevalence, namely 96% of HSDD (desire dysfunction). This is more comparable to the prevalence of desire dysfunction in a sample of Nigerian women reported by Adebusoye et al. (2020). They found a high prevalence namely, 99.4%, of their sample presenting with desire dysfunction. It must however be noted that they used the 28-item Sexual Function Questionnaire to determine FSD, opposed to the FSFI which was used in our study.

The differences in reported prevalence rates supports the postulation that prevalence of FSD may vary based on the population investigated, the country, differences in ethnicity and related biopsychosocial factors (Salari et al., 2023).

Considering the sample characteristics, the self-identified females included in our study was generally of good health. Regarding sexual orientation, 95.08% (*n* = 1506) identified as straight, while 2.46% (*n* = 39) identified as lesbian. Majority (> 50%) had regular menstruation, did not receive hormone replacement therapy or fertility treatment, have not had a hysterectomy, did not complain of recurrent yeast infections, did not complain of genital or menstrual pain, urinary frequency or irritable bowel syndrome, and did not experience problems with cholesterol or high blood pressure (Table 3.1). They also seemed to have an acceptable lifestyle based on the 88.65% (*n* = 1414) that were non-smokers, and majority (92.72%, *n* = 1479) using between 0-7 units of alcohol. This is contradicting the increased trend in number of female smokers in South Africa that has been seen the past 13 years (Statista, South Africa: number of female smokers 2001-2029 | Statista). The 51.35% (*n* = 819) that did not engage in regular exercise, did however not support the assumption of a healthy lifestyle.

The good health state of the included self-identified females could be related to the relatively young mean age. The mean age of the self-identified females (37.18 ± 11.00) included in the analysis was similar to previous studies (35.4 ± 7.2), such as done by Adebusoye et al. (2020), who also investigated factors associated with sexual dysfunction in women attending an outpatient clinic in Nigeria. This age falls within the reproductive age category of 15-49 years, as defined by the World Health Organisation (The Global Health Observatory, 2024). It also aligns with studies such as the systematic review by Alidost et al.

(2021) and Zeleke et al. (2023) which only included women of reproductive age (Alidost et al., 2021; Zeleke et al., 2023).

Aligned with the age category, is the finding that majority of self-identified females in our study were in the pre- or menopausal state (92.54%, *n* = 1476). Menopause is defined by most literature to occur between the ages of 45 and 55 years (World Health Organisation, 2022).

The women in our study had median one child or pregnancy, which is slightly lower than the 2.3 fertility rate reported in South Africa in 2021 (Department: Statistics South Africa, 2021) and other African studies. The majority women included in the study by Adebusoye et al. (2020) had three to four children.

The lower fertility rate (operationally defined as number of pregnancies and/or children in this study) is noteworthy as there were no other measured demographic factors that could explain the lower rate. Most of the self-identified females in the sample did not use contraception, did not seem to have fertility problems, and have not had a hysterectomy (Table 3.1-3.2). Most of the self-identified females were married (70.34%, *n* = 1124) or in a long term committed relationship (19.77%, *n* = 316), suggesting perhaps a stable environment when considering having children. Ninety percent also reported having only one sexual partner. Eighty four percent of the sample did however present with clinically relevant FSD, 68.84% (*n* = 1098) with pain during sex, and there was a high concern amongst the sample regarding having a low sex drive (79.26%, *n* = 493) and orgasm (60%, *n* = 960). These factors could directly or indirectly contribute to less intercourse and therefore affect fertility rate, contributing to a wider public health concern. The latter factors and associations could be investigated further in future research as more extensive analysis was beyond the scope of this study. The following discussion sections elaborate further on the factors such as number of children, pregnancies, concern about sexual function, sexual pain, amongst other factors, and its association with FSD.

4.2 The prevalence of sexual dysfunction by biopsychosocial characteristics in self-identified females

The stratified prevalence estimates were above 80% in most instances, with some notable deviations in some biopsychosocial characteristics.

Per biomedical factor, some of the highest prevalences of FSD was noted in those who experienced pain during sex (91.35%, *n* = 1098) and in those who experienced urinary frequency (90.29%, *n* = 577). In Chapter 1, paragraph 1.2.2.1, it was explained how these factors can contribute to the development of FSD. The concern is that approximately 25-45% of women will experience some form of urinary incontinence symptoms in their lifetime (Pinheiro Sobreira Bezerra et al., 2020). The prevalence of FSD amongst self-identified females complaining of urinary frequency in our study were higher than the 82.5% and the 87.5% (as related to incontinence and double incontinence respectively) prevalence that Koparal et al. (2024) found among a sample of Turkish women with and without urinary symptoms. Their sample size was however quite small consisting of 40 age-matched participants (Koparal et al., 2024). Unfortunately, only a limited number of studies investigating factors associated with FSD, include urinary incontinence as a single variable; in most instances it is classified under an umbrella term "urogenital dysfunction", which makes comparison across studies difficult.

As reported by Koparal et al. (2024), different types of incontinence may affect different stages of sexual functioning, suggesting differences in severity of pelvic floor muscle function causing the incontinence. Such a hypothesis may help to explain the high prevalence of FSD in patients with irritable bowel syndrome (87.62%, *n* = 439, prevalence ratio = 1.06), and constipation (86.7%, *n* = 789, prevalence ratio = 1.07) in our study. Patients with irritable bowel syndrome and constipation may present with overactive pelvic floor muscles or pelvic floor dyssynergy (Baffy et al., 2017). It might be hypothesised that FSD could be indirectly related to the severity of pelvic floor muscle dysfunction, but this will need to be explored further before any conclusions can be made.

Some types of urinary incontinence may even contribute to the development of urinary infections, especially in cases of incomplete bladder emptying. Urinary tract infections, yeast infections or sexually transmitted diseases may in turn be a cause of dyspareunia, also known as pain during or after sexual intercourse, as referred to in the above discussion (LeWine, 2024). Women with dyspareunia may feel pain at the entrance (or deeper) of the vagina or tightening of the vaginal wall (vaginismus), with penetration. Other causes may include vaginal dryness, atrophic vaginitis, side effects of antihistamines or tamoxifen,

allergic reactions, endometriosis, inflammation, skin disease or psychological trauma (LeWine, 2024).

Some of these factors, such as endometriosis and inflammation, can also contribute to chronic pain states which has a specific neurophysiological effect, and in that way also be associated with FSD (Chapter 1, paragraph 1.2). There was quite a high prevalence of FSD in our study in patients complaining of genital or pelvic pain (88.41%, *n* = 427, prevalence rate = 1.07). Considering the definition of dyspareunia, which includes experiencing pain in the genital region, it might be expected that patients with already existing genital pain, will experience pain during penetration as well. Flegge et al. (2023) investigated sexual dysfunction in adults with general chronic pain and found that 68.1% (*n* = 92) experienced sexual dysfunction in at least one domain. Their cohort however included both male and female participants and the experience of pain was not limited to area or type of pain.

Like FSD, chronic pain is a complex pathophysiological process, involving several biopsychosocial factors. It has similar public health consequences when compared to FSD, and may inflate the effect on socio-economic factors, quality of life and well-being of the patient suffering from FSD. Complicating this interrelationship and creating a chain reaction, is the fact that inflated socio-cultural factors may predispose to FSD in turn.

A systematic review by McCool-Myers et al. (2018) however stated that there is still a lack of research on several socio-cultural factors to determine whether they play a role in FSD. Some of these factors include employment, relationship, age, parity, alcohol use and smoking.

We found the prevalence of FSD in the unemployed category to be the highest (88.89%, *n* = 128, prevalence ratio = 0.97), compared to other forms of employment. It is also important to view this contextually as a wider public health concern, as the female unemployment rate in South Africa was predicted to be 33% in 2023, compared to a 29.5% male unemployment rate (Statista, Southern Africa: unemployment rate by gender 2010-2023 | Statista). Similar to the findings of Butt et al. (2019), who investigated factors associated with FSD among Nairobian women, prevalence of FSD did not differ regarding other employment categories. The prevalence in our study was however almost double the prevalence they reported per

employment category (approximately 40% prevalence in their study compared to the > 80% in the current study) (Butt et al., 2019).

As noted in paragraph 4.1 above, majority of participants were non-smokers. It was interesting to note that the prevalence of FSD was 84,79% (*n* = 1199, prevalence rate = 0.94) in the non-smoking group of females. Smoking has serious health consequences (Dai et al., 2022), of which several chronic conditions that have previously been associated with FSD (Chapter 1, paragraph 1.2.2.1). In addition, the direct physiological effects of smoking on sexual function may be numerous. Proposed pathophysiological mechanisms include: disruption of vascular endothelium, high reactive oxygen species levels, reduced nitric oxide synthesis, arteriosclerosis, effects on the nervous system, and hormonal disorders (Salari et al., 2023). Our findings are therefore in contrast with literature and with the systematic review by Salari et al. (2023) which indicated significantly higher prevalence and odds of having FSD in female smokers.

When we look at factors that are more related to family planning and relationships, prevalence of FSD by number of pregnancies and children were very similar and supported by the prevalence ratios of one respectively (Table 3.6). Comparing the mean FSFI scores of the categories of these variables also did not indicate any evidence that there was a difference in the total FSFI scores (Table 3.4). We therefore also did not anticipate finding an association with FSD (paragraph 4.3). This finding differs from the higher prevalence of FSD (30.3%, *n* = 54) that was found in Nigerian women who had three to four children, when compared to having fewer children.

The prevalence of FSD decreased with an increased number of reported sexual partners in our study (Table 3.6). This trend could be expected as self-identified females with FSD would most likely be less willing to engage in sexual activities or relationships, due to the physical, psychological or emotional factors related to it. This observation aligns with the noted prevalence of FSD that was the highest among married participants (86.65%, *n* = 974). It has also been reported that FSD is more common in marriages with a longer duration (Alidost et al., 2021). In the broader public health context, we should consider that, according to Park et al. (2023), sexual frequency and communication quantity is in turn related to marital satisfaction and healthy relationships.

Ninety three percent (*n* = 458) and 92.08% (*n* = 884) of participants who had a concern about low sex drive and orgasm respectively, had clinically relevant FSD, which in turn could affect sexual frequency and marital satisfaction as introduced in the above section. Inclusion of these factors are unique to our study, and comparison to other literature therefore limited.

It was clear that there was a high prevalence of FSD related to several biopsychosocial factors with a theoretical overlap amongst factors, that would need to be explored for possible associations. The observations made regarding prevalence per biopsychosocial factor did however speak to the complex nature of FSD and the movement away from a compartmentalised approach when interpreting FSD (Chapter 1, paragraph 1.1.3). This trend aligns with literature describing FSD as multidimensional and multifactorial, affecting the emotional well-being and physical health of women (Salari et al., 2023).

4.3 The association between the biopsychosocial factors and sexual dysfunction in self-identified females

Evident from the logistic regression analysis, and elaborating on the discussion in paragraph 4.2, several factors were included in the final regression model to adjust for confounding and reflect the relationship among the factors being investigated (Pourhoseingholi et al., 2012).

Common factors that were included in the models (model 1 and 2) included pain during sex, recurrent yeast infections, concern about orgasm, relationship status, and number of partners. Adjustment of the sample size to drop missing values for concern about sex drive (to be able to include this variable in the analysis), led to a slightly different model as opposed to fitting a model without this variable (model 1). Some variables that were included in model 1 (fitted without concern about sex drive), did not improve the fit of model 2. These factors included contraception use, urinary symptoms, concern about STI, and doing exercise.

Inclusion of concern about sex drive, led to much higher AORs of pain during sex, and concern about orgasm in model 2, when compared to model 1. Looking at the literature, there is however a close relationship among the following variables. The terms libido, sex drive, sexual desire, and hypoactive sexual disorder (HSDD) are often incorrectly and interchangeably used in sexual health literature. HSDD is defined as the absence of sexual fantasies/thoughts and/or desire for sexual activity and is one type of FSD (Sharma & Kalra, 2016). As mentioned in Chapter 1 (paragraph 1.1), to make a diagnostic classification of any form of FSD, a form of distress related to sexual function must also be present. This distress could perhaps have been in the form of concern such as concern about sex drive, orgasm or STI in our study (Sharma & Kalra, 2016). Approximately 92% of the patients who complained of concern regarding low sex drive in our study, were classified with clinically relevant FSD (Table 3.6). It is also worth noting that 96.25% (n = 1538) of the patients whose records were analysed in this study, were classified as having clinically relevant HSDD according to the FSFI (Chapter 3, paragraph 3.3.1).

Considering the association that was found in our study between contraception, urinary frequency, concern about STI and exercise with FSD respectively, as well as the fact that these variables improved the fit of model 1, it was decided to adjust for these factors in a third model. Inclusion of these variables are also supported by previous studies that found significant associations between these factors and FSD. As indicated above, the systematic review by McCool-Myers et al. (2018) found exercise to be a protective factor to FSD. A cross-sectional study done by Butt et al. (2019) on a sample of 566 Nairobian women, indicated a strong association of FSD with hormonal contraception with an AOR of 2.695 (p < 0.0001) (Butt et al., 2019). In 2020 a systematic review was published, authored by Bezerra et al. (2020), that indicated that urinary incontinence could affect sexual function in different ways, depending on the type of incontinence (Pinheiro Sobreira Bezerra et al., 2020).

Including these variables in a final model, did not change the fit of the model significantly (Chapter 3, paragraph 3.5). Based on evidence and clinical value, it was therefore retained in the final model.

The factors that were included in the final regression model in our study are summarised in an adapted Biopsychosocial framework (Figure 4.1). The framework is slightly different from the proposed or hypothesized framework in Chapter 1, Figure 1.2, by depicting only the

variables that were identified in this study and population, that need to be adjusted for in a regression model.

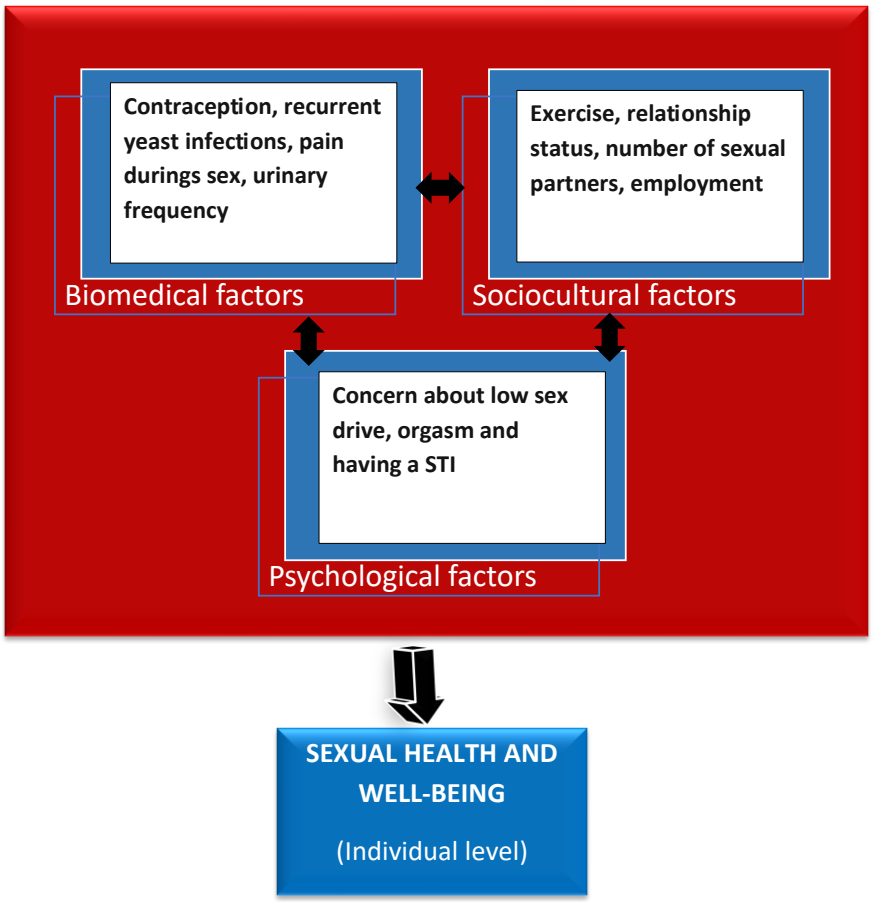


Figure 4.1. The Biopsychosocial Framework: results from regression modelling.

STI = sexually transmitted infection

The two factors in the final regression model with the highest AORs were pain during sex and concern about low sex drive (Table 3.9). The integrated mechanism of pain and sexual function was discussed in Chapter 1, paragraph 1.2.2.1. Interesting to note in the literature is the connection between sexual pain and desire, as it has been reported that patients with chronic sexual pain, may demonstrate a lack of sexual desire (Nappi & Lachowsky, 2009). This also aligns with the findings that the AOR of pain during sex increased when concern about low sex drive was included in the model.

The systematic review done by McCool-Myers et al. (2018), including 135 studies from 41 countries, also found biomedical factors such as genitourinary problems and poor physical health to be risk factors for developing FSD, but it did not include any form of pain as exposure variable. It is unclear which factors are included under the variable categories from the included studies, which makes comparison difficult. Factors, identified in the review, that had an unclear effect, included age, smoking, alcohol consumption, employment, parity, and being in a relationship. Exercise was also found to be a protective factor, a similar finding to our study, although not significant when adjusted for in the regression model (McCool-Myers et al., 2018). We had the opportunity to investigate these factors and contribute to filling the gaps in research with our findings.

Our study showed different findings in some instances from the above systematic review which might be contributed to the fact that only 14 of the 135 included studies in the systematic review, investigated low to medium human development populations (McCool-Myers et al., 2018).

Alcohol consumption and relationship status were shown to be associated with FSD in our study (Table 3.6). South Africa's alcohol consumption is the highest in Africa, and the fifth highest in the world (World Health Organisation, 2022). In our study patients consuming 0 units of alcohol and patients consuming 1-7 units of alcohol, had a similar prevalence of FSD (85,41% and 84.73% respectively). It was therefore not surprising that alcohol consumption was not found to be a significantly associated factor with FSD in the regression models (Chapter 3, paragraph 3.5).

Although employment status was found to be a significantly associated factor in our study, closer analysis indicated that both being employed and unemployed was associated with FSD (Tables 3.8-3.9). However, looking at the comparison of the mean FSD scores when comparing different employment statuses (Table 3.4), no significant differences were found amongst the different employment categories. It is therefore a similar finding than the mentioned systematic review where the association that employment has with FSD, is not clear.

Relationship status was however a significantly associated factor in our study, with the odds of having sexual dysfunction decreasing with traditionally less committed relationships. A

study by Park et al. (2023) showed that frequent sex was associated with an increased perception of being cared for and relied upon by the spouse in a committed relationship. In turn, these outcomes predicted greater satisfaction with marriage or the relationship (Park et al., 2023). Of public health concern is that metrics have shown a steady increase in divorce rates in South Africa, with sexual incompatibility (physically or emotionally) being listed as one of the top ten reasons for filing for divorce ("10 Most Common Reasons South Africans Get Divorced," 2022).

Age was not associated with FSD in our study, possibly due to the reasons discussed in paragraph 4.1. As women age however, several factors may contribute to the development of FSD such as GSM, increased use of medication, chronic medical conditions and even the partner's deteriorating health (Kuhle et al., 2021).

No significant differences were found between the mean FSFI scores of smokers compared to the non-smoking participants in our study (Table 3.4). The Chi-square test also did not indicate any significant association between smoking and FSD (Table 3.6). This finding contradicts the physiological effects of smoking, such as causing a fluctuation in sexual hormones, as well as the finding by Salari et al. (2022) who found female smokers to be 48% more susceptible to FSD when compared to non-female smokers (Chapter 1, paragraph 1.2.2.1). A reason for differences in the regression findings when compared with this review might be the lack of adjusting for a range of biopsychosocial factors, as was clear when the analyses from some of the included studies in the review, were explored (Amidu et al., 2010).

Comparing significantly associated factors found in our study, with the pooled results of predictive factors from two systematic reviews (Alidost et al., 2021; McCool-Myers et al., 2018), yielded the following summary (Table 4.1).

Table 4.1. Predictive factors from two systematic reviews and the significantly associated factors from the current study.

	McCool-Myers et al. (2018)	Alidost et al. (2021)	Current study (2024)
Age	X		
Depression	X		
Low education level	X		
Increased duration of marriage	X		
Chronic disease	X		
Poor physical health		X	
Poor mental health		X	
Stress		X	
Abortion		X	
Genito-urinary problems		X	
Female genital mutilation		X	
Sexual abuse		X	
Relationship dissatisfaction		X	
Religion		X	
Pain during sex			X
Concern about sex drive			X
Concern about orgasm			X
Relationship status			X
Number of sexual partners			X
Employment			X

The above table raises questions relevant for further investigations in this field. Firstly, there seem to be an inconsistency on how factors are grouped, described or classified, which makes comparison of results difficult. Secondly, differences in the findings may speak to the complexity and biopsychosocial specificity of factors related to FSD, depending on the population investigated.

4.4 Strengths and Limitations

The major strength and value of this study was that it is possibly the first study of its kind to be done on a South African population. The aim of this section is to guide and strengthen future research on this topic, to create clinically relevant evidence for clinical decision making and addressing public health concerns.

The factors that were investigated in this study, were limited to the availability of data captured in the original patient records. Since it was a retrospective analysis, the principal investigator acknowledged during the planning phase the possibility of missing data and that the quality of the data might be questioned. Enquiry regarding these possible challenges before commencement of the study (consulting with the clinic head), yielded that the majority electronic records were complete with limited missing values, and that the information captured from patients, included important exposure variables, as well as additional variables, not previously described in the literature. As follow-up records were not available for majority of patients, the type of study design (namely cross-sectional) would limit any establishment of causal relationships.

Several factors may play a role during routine clinical assessment, such as incomplete capturing of information, wrong interpretation by the patient to the information requested, or wrong documentation of the patient findings. This may introduce error in data being analysed from records which would be difficult to pick up. Missing data though, can still be dealt with during data analysis. In the case of this study, it seemed as if the question regarding concern about sex drive, was only introduced later in the routine assessment and period of the records that this study included. This was described in Chapter 2, paragraph 2.6, and in Chapter 3, paragraph 3.5. However, removing the missing data from the sample, still yielded a large enough sample to do a regression analysis and generated an alternative model. Having a very large initial sample (N = 1598), made this alternative analysis possible.

In the case of this study, we were fortunate that all patients were assessed by the same clinician who was a sexual health expert with 20 years of clinical experience. This increased the validity of the data and might have been the reason why important components as well

as a standardised sexual function questionnaire was included in the patient records. More specific details in the patient files could have improved the value of the study and analysis. Examples of specific factors include to differentiate between the types of incontinence during routine patient assessment, differentiate between acute and chronic pain, as well as lifetime and current number of sexual partners; include data about ethnicity and culture, and including a standardised questionnaire such as the Female Sexual Distress Scale (FSDS) (DeRogatis et al., 2008), to assess distress. As explained in Chapter 1, paragraph 1.2.3.1, sexual distress should ideally be assessed together with the FSFI. However, factors that are indicators of distress (Chapter 1, paragraph 1.2.3.1), were included in the patient records that we used for analysis. These included the questions that were asked about concern about sex drive, concern about desire, and concern about reaching orgasm. However, considering that these were medical and not psycho-sexual clinics, it is understandable that the focus of assessment was more focused on biomedical factors than psycho-social factors.

Contrary to the above limitations, the patient records and analysis included factors that have not been researched extensively and could contribute to the understanding of the complexity of FSD (Chapter 1, paragraph 1.1.1). Some of these factors included exercise and gender identification. There were a variety of biopsychosocial factors to analyse and fit into a regression model and posed the opportunity to investigate for interactions between biomedical, psychological, and sociocultural factors that has not previously been investigated.

Sociocultural factors may even vary amongst different provinces in the country. Although there are clinics in the Western Cape district, permission was only granted to access the patient records in the Gauteng district. The principal investigator therefore delineated the scope of the study to Gauteng and any generalisation of results to the whole of the South African population should be limited with interpretation.

Using records from clinics or hospitals may introduce sampling bias due to the possibility of excluding patients who for example do not have access to the clinics (due to reasons such as lack of transport, lack of referral, cultural or other financial reasons). These settings might also reflect a prevalence estimate that is higher than when compared to the general population not seeking medical treatment, especially those in rural communities having to travel far distances to clinics, and where there is still stigma attached to seeking care for

sexual and reproductive health (Weaver, 2022). The fact that these clinics are privately managed and located in city centres, could also have introduced a patient population that are reflective of a higher socio-economic status when compared to the socio-economic status that would be found in more rural areas.

Although there were factors that might have limited this study in certain instances, it did unmask what is needed to improve clinical practice and assessment of patients, to ensure accurate and evidence-based management of FSD and improvement of public health concerns.

4.5 Recommendations

Clinically it can be recommended that practitioners include screening and management of biopsychosocial factors that has been identified to contribute to FSD. Attention should be given to use standardised outcome measures, such as the FSFI and FSDS, that can be used to help make a diagnosis of clinically relevant FSD. Knowledge about and early identification and treatment of factors such as medication, chronic conditions, relationship status, age-related gynaecological and hormonal changes, and abuse, that can contribute to FSD, can help to improve the wellbeing and overall physical health of women. It is however important to distinguish between and have knowledge about factors that may contribute to different extents to FSD, depending on the context of the population served.

Future research in Africa and globally needs to focus on population-based investigations to determine to which extent different biopsychosocial factors contribute to FSD (Chapter 1, paragraph 1.1.3). Depending on for example, the socio-economic status of the population, or the specific cultural characteristics and beliefs of the population, the contribution of the factors may differ. This has been discussed in Chapter 1 (paragraph 1.2.2) and it is also explained by the fact that different biomedical, psychological, and sociocultural factors were seen to contribute to FSD, depending on the populations, geographical and cultural context in existing literature. Researchers also need to identify and focus on factors not previously investigated, or investigated to a lesser extent, such as presence of general musculoskeletal pain or conditions, lower back pain, the function of the pelvic floor muscles, gender identification, among others, when investigating FSD. Sociocultural factors, such as personal beliefs and religion should also be further explored (qualitatively) within the context of FSD.

4.6 Conclusion

FSD is clinically a complex dysfunction to address, as multiple biopsychosocial factors have been identified to be related to it. In addition, it has become a major public health concern globally, due to several physical, emotional and socio-economic consequences that may stem from it. Despite these concerns and acknowledgement of complexity, very little research has been done up to date within the South African context to determine contributing factors to FSD.

Our study therefore aimed to examine the biopsychosocial factors associated with sexual dysfunction in self-identified females in Gauteng, South Africa, during 2013-2023. A cross-sectional design, using 1,595 patient records as a data source, yielded interesting findings as applicable to a South African population. Pain during sex, recurrent yeast infections, concern about sex drive and orgasm, number of sexual partners and relationship status were found to be predictive factors of FSD. In addition, factors such as contraception use, urinary symptoms, concern about STI, and doing exercise were also associated with FSD and included in a final regression model.

The association of biopsychosocial factors with FSD seems to vary among different populations and literature, and perhaps emphasise the complexity of FSD and that it should be addressed (clinically as well as being investigated) within the specific public health context it is being dealt with.

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Addenda

Addendum A: Search strategy

	Clusters (sub-headings)	**Sources**	**Keywords and search terms**
Aim	Biopsychosocial factors associated with sexual dysfunction -Biological factors -Psychological factors -Social factors	Peer reviewed publications Health databases	sexual dysfunction; sexual health; biopsychosocial; biological; psychological; social; factors; predictors; association E.g. (sex*) AND (health OR dysfunction) AND (biopsychosocial OR biological OR biomedical OR psychological OR social) AND (factors OR predictors OR association*)

Objective 1	Prevalence of sexual dysfunction by biopsychosocial characteristic -Prevalence of sexual dysfunction by biological factors -Prevalence of sexual dysfunction by psychological factors -Prevalence of sexual dysfunction by social factors		prevalence; sexual dysfunction; sexual health; biopsychosocial; biological; psychological; social; factors; orgasmic; arousal; lubrication; desire; satisfaction E.g. (prevalence) AND (sex* OR orgasmic OR arousal OR lubricate* OR desire) AND (health OR dysfunction OR satisfaction) (prevalence) AND (sex* OR orgasmic OR arousal OR lubricate* OR desire) AND (biopsychosocial OR biological OR biomedical OR psychological OR social) AND (factors OR predictors OR association*)

Objective 2	Biopsychosocial factors associated with the different domains of sexual health -Biological factors -Psychological factors -Social factors	Peer reviewed publications Health databases	sexual dysfunction; sexual health; biopsychosocial; biological; psychological; social; factors; predictors; association; orgasmic; arousal; lubrication; desire; satisfaction E.g. (sex*) AND (health OR dysfunction) AND (biopsychosocial OR biological OR biomedical OR psychological OR social OR orgasmic OR arousal OR lubrate* OR desire OR satisfaction) AND (factors OR predictors OR association*)

Addendum B: Data dictionary

Variables	Definition	Type of data	Coding/Level	Recoding	Variable name
Biomedical factors					
Age	"Submission Date" – "Date of birth"	Continuous	None	"Age"	age
Number or pregnancies	"Number of pregnancies"	Discrete	None	None (replace missing data=0)	preg
Regularity of menstruation period	"Are you menstruating regularly?"	Dichotomous	Yes/No	Yes=1, No=0	menstr
Hormone replacement therapy	"Are you using any form of hormone replacement therapy, including testosterone?"	Dichotomous	Yes/No	Yes=1, No=0	hrt
Contraception	"Are you using any form of contraception?"	Dichotomous	Yes/No	Yes=1, No=0	contrac
Fertitility treatment	"Please write down any fertility treatment you have had in the past"	Nominal	None	Yes=1, No=0	fert
Hysterectomy	"Why did you have a hysterectomy?"	Nominal	None	Yes=1, No or missing=0	hyst
Menopausal status	"How many years have you been post-menopausal?"	Discrete	None	Missing or 0=premenopausal; others will be coded postmenopausal=1	meno

Previous infections	Presence of any previous infection; recurrent yeast infections	Nominal	Yes/No	Yes=1, No=0 Create new variable combining presence of any previous infection and recurrent yeast infections	inf
Pain	Menstrual pain, bothersome pain in pelvis/genitals, pain during sex	Dichotomous	Yes/No	Yes=1, No=0 Create new variable combining menstrual pain, bothersome pain in pelvic/genitals, pain during sex	pain
Bladder and bowel symptoms	Constipation, IBS, urinary frequency	Dichotomous	Yes/No	Yes=1, No=0	urinary
Comorbidities	Cholesterol, high BP, other identified	Dichotomous	Yes/No	Yes=1, No=0 Create new variable combining cholesterol and high BP	comorb
Exercise	"Do you get 30 minutes of exercise five times a week (or the equivalent)?"	Dichotomous	Yes/No	Yes=1, No=0	exerc
Psychological factors					
Concern about having an STI	"Are you concerned about having a possible sexually transmitted infection?"	Dichotomous	Yes/No	Yes=1, No=0	sti
Concern about low sex drive	"Are you concerned about having a low sex drive?"	Dichotomous	Yes/No	Yes=1, No=0	sexdrive

Concern about orgasm	"Are you concerned about how difficult it is for you to achieve and orgasm?"	Dichotomous	Yes/No	Yes=1, No=0	orgasm
Sociocultural factors					
Occupation	"What is your occupation?"	Nominal	None	"Occupation" with levels of Student=1, Professional=2, Retired=3, Unemployed=4	occup
Relationship status	"Please indicate your current relationship status"	Categorical	Single, Married, In a long term committed relationship, In a casual relationship, Other	Single=1, Married=2, In a long term committed relationship=3, In a casual relationship=4, Other=5	relationship
Alcohol consumption	"How many units of alcohol do you use per week? (One unit equals a small glass of wine, a small bottle of beer or one tot of hard liquor)"	Categorical	0; 1-7; 8-14; 14-21 *(Limitation: there is an overlap between the last two categories)*	0=0; 1-7=1; 8-14=2; 14-21=3	alc
Smoking	"Do you smoke?"	Categorical	No never; No, I have stopped more than a year ago; No, I have stopped within the last year; Yes, less than 20 per day; Yes, more than 20 per day;	No never=1; No, I have stopped more than a year ago=2; No, I have stopped within the last year=3; Yes, less than 20 per day=4; Yes, more than 20 per day=5	smoke
Number of children	"Number of children"	Discrete	None	Set missing data=0	children
Number of sexual partners	"How many sexual partners did you have in the last year?"	Discrete	None	None	partners

Sexual orientation	“What is your sexual orientation?”	Nominal	Straight, gay, demisexual heteroromantic, bisexual, omnisexual demiromantic, queer, pansexual, asexual	Straight=1, gay=2, demisexual heteroromantic=3, bisexual=4, omnisexual demiromantic=5, queer=6, pansexuala=7, asexual=8	sexorient

Addendum C: The Female Sexual Function Index

Question	Response Options
Q1: Over the past 4 weeks, how **often** did you feel sexual desire or interest?	5 = Almost always or always 4 = Most times (more than half the time) 3 = Sometimes (about half the time) 2 = A few times (less than half the time) 1 = Almost never or never
Q2: Over the past 4 weeks, how would you rate your **level** (degree) of sexual desire or interest?	5 = Very high 4 = High 3 = Moderate 2 = Low 1 = Very low or none at all
Q3. Over the past 4 weeks, how **often** did you feel sexually aroused ("turned on") during sexual activity or intercourse?	0 = No sexual activity 5 = Almost always or always 4 = Most times (more than half the time) 3 = Sometimes (about half the time) 2 = A few times (less than half the time) 1 = Almost never or never
Q4. Over the past 4 weeks, how would you rate your **level** of sexual arousal ("turn on") during sexual activity or intercourse?	0 = No sexual activity 5 = Very high 4 = High 3 = Moderate 2 = Low 1 = Very low or none at all
Q5. Over the past 4 weeks, how **confident** were you about becoming sexually aroused during sexual activity or intercourse?	0 = No sexual activity 5 = Very high confidence 4 = High confidence 3 = Moderate confidence 2 = Low confidence 1 = Very low or no confidence
Q6. Over the past 4 weeks, how **often** have you been satisfied with your arousal (excitement) during sexual activity or intercourse? Response Options	0 = No sexual activity 5 = Almost always or always 4 = Most times (more than half the time) 3 = Sometimes (about half the time) 2 = A few times (less than half the time) 1 = Almost never or never

Question	Response Options
Q7: Over the past 4 weeks, how **often** did you become lubricated ("wet") during sexual activity or intercourse?	0 = No sexual activity 5 = Almost always or always 4 = Most times (more than half the time) 3 = Sometimes (about half the time) 2 = A few times (less than half the time) 1 = Almost never or never
Q8. Over the past 4 weeks, how **difficult** was it to become lubricated ("wet") during sexual activity or intercourse?	0 = No sexual activity 1 = Extremely difficult or impossible 2 = Very difficult 3 = Difficult 4 = Slightly difficult 5 = Not difficult
Q9: Over the past 4 weeks, how often did you **maintain** your lubrication ("wetness") until completion of sexual activity or intercourse?	0 = No sexual activity 5 = Almost always or always 4 = Most times (more than half the time) 3 = Sometimes (about half the time) 2 = A few times (less than half the time) 1 = Almost never or never
Q10: Over the past 4 weeks, how **difficult** was it to maintain your lubrication ("wetness") until completion of sexual activity or intercourse?	0 = No sexual activity 1 = Extremely difficult or impossible 2 = Very difficult 3 = Difficult 4 = Slightly difficult 5 = Not difficult
Q11. Over the past 4 weeks, when you had sexual stimulation or intercourse, how **often** did you reach orgasm (climax)?	0 = No sexual activity 5 = Almost always or always 4 = Most times (more than half the time) 3 = Sometimes (about half the time) 2 = A few times (less than half the time) 1 = Almost never or never
Q12: Over the past 4 weeks, when you had sexual stimulation or intercourse, how **difficult** was it for you to reach orgasm (climax)?	0 = No sexual activity 1 = Extremely difficult or impossible 2 = Very difficult 3 = Difficult 4 = Slightly difficult 5 = Not difficult
Q13: Over the past 4 weeks, how **satisfied** were you with your ability to reach orgasm (climax) during sexual activity or intercourse?	0 = No sexual activity 5 = Very satisfied 4 4 = Moderately satisfied 3 = About equally satisfied and dissatisfied 2 = Moderately dissatisfied 1 = Very dissatisfied
Q14: Over the past 4 weeks, how **satisfied** have you been with the amount of emotional closeness during sexual activity between you and your partner?	0 = No sexual activity 5 = Very satisfied 4 = Moderately satisfied 3 = About equally satisfied and dissatisfied 2 = Moderately dissatisfied 1 = Very dissatisfied

Question	Response Options
Q15: Over the past 4 weeks, how satisfied have you been with your sexual relationship with your partner?	5 = Very satisfied 4 = Moderately satisfied 3 = About equally satisfied and dissatisfied 2 = Moderately dissatisfied 1 = Very dissatisfied
Q16: Over the past 4 weeks, how **satisfied** have you been with your overall sexual life?	5 = Very satisfied 4 = Moderately satisfied 3 = About equally satisfied and dissatisfied 2 = Moderately dissatisfied 1 = Very dissatisfied
Q17: Over the past 4 weeks, how **often** did you experience discomfort or pain during vaginal penetration?	0 = Did not attempt intercourse I = Almost always or always 2 = Most times (more than half the time) 3 = Sometimes (about half the time) 4 = A few times (less than half the time) 5 = Almost never or never
Q18: Over the past 4 weeks, how **often** did you experience discomfort or pain following vaginal penetration?	0 = Did not attempt intercourse 1 = Almost always or always 2 = Most times (more than half the time) 3 = Sometimes (about half the time) 4 = A few times (less than half the time) 5 = Almost never or never
Q19. Over the past 4 weeks, how would you rate your **level** (degree) of discomfort or pain during or following vaginal penetration?	0 = Did not attempt intercourse 1 = Very high 2 = High 3 = Moderate 4 = Low 5 = Very low or none at all

The individual domain scores and full scale score of the FSFI are derived by the computational formula outlined in the table below. Individual domain scores are obtained by adding the scores of the individual items that comprise the domain and multiplying the sum by the domain factor (see below). The full scale score is obtained by adding the six domain scores. It should be noted that within the individual domains, a domain score of zero indicates that no sexual activity was reported during the past month.

Domain	Questions	Score Range	Factor	Minimum score	Maximum score
Desire	1, 2	1–5	0.6	1.2	6.0
Arousal	3, 4, 5, 6	0–5	0.3	0	6.0
Lubrication	7, 8, 9, 10	0–5	0.3	0	6.0
Orgasm	11, 12, 13	0–5	0.4	0	6.0
Satisfaction	14, 15, 16	0 (or 1)–5	0.4	0	6.0
Pain	17, 18, 19	0–5	0.4	0	6.0
		Full Scale Score Range		2.0	36.0

Addendum D: Ethical approval certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

R49 Professor C Brandt

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M240253

NAME:	Professor C Brandt **DEGREE:** MSc
DEPARTMENT:	School of Public Health Medical School University
PROJECT TITLE:	*Biopsychosocial factors associated with sexual dysfunction in self-identified females in Gauteng, South Africa, during 2013-2023*
DATE CONSIDERED:	1 March 2024
DECISION:	Approved unconditionally
CONDITIONS:	
NOTE:	If contact information regarding student study participants is required, please contact the Registrar's office <Nicoleen.Potgieter@wits.ac.za>
SUPERVISOR:	Professor S Mall
APPROVED BY:	Professor P Ruff, Chairperson, HREC (Medical)

DATE OF APPROVAL: 17 April 2024 **EXPIRY DATE:** 16 April 2029

This Clearance Certificate is valid for 5 years from the date of approval. An extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office secretariat on the 3rd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report** in the format available at https://wits.ac.za/research/researcher-support/research-ethics/ethics-committees/. This report is due annually, for the duration of the Clearance Certificate, beginning on the first anniversary of Date of Approval above. Unreported changes to the study may invalidate the clearance given by the HREC (Medical).

Signature of Principal Investigator Date

Addendum E: Turnitin report

Research report_Final.docx

ORIGINALITY REPORT

10%	7%	8%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Sandeep Grover, Anish Shouan. "Assessment Scales for Sexual Disorders—A Review", Journal of Psychosexual Health, 2020 Publication	<1%
2	www.mayoclinicproceedings.org Internet Source	<1%
3	www.researchgate.net Internet Source	<1%
4	jordanrullo.com Internet Source	<1%
5	jpma.org.pk Internet Source	<1%
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	pubmed.ncbi.nlm.nih.gov	