Published in final edited form as:
J Sex Med. 2014 November ; 11(11): 2744–2755. doi:10.1111/jsm.12665.

The Impact of Multimorbidity on Sexual Function in Middle-Aged and Older Women: Beyond the Single Disease Perspective

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Abstract

Introduction—Little is known about sexual activity and function in women with multiple chronic health conditions.

Aim—To examine the impact of multimorbidity on sexual activity and function in middle-aged and older women.

Methods—Multiethnic cross-sectional cohort of 1,997 community-dwelling women (mean age of 60.2 [±9.5] years) in California. Structured questionnaires assessed prior diagnoses of common cardiometabolic, colorectal, neuropsychiatric, respiratory, musculoskeletal, and genitourinary conditions.

Outcome Measures—Sexual desire, frequency of sexual activity, overall sexual satisfaction, and specific sexual problems (i.e., difficulty with arousal, lubrication, orgasm, and pain) were assessed by structured questionnaires.

Results—Seventy-one percent of women had two or more diagnosed chronic conditions. Fifty-nine percent reported low sexual desire, 53% reported less than monthly sexual activity, and 47% reported low overall sexual satisfaction. Multimorbidity was associated with increased odds of reporting low sexual desire (OR=1.11, 95% CI=1.06-1.17, per each additional chronic condition), less than monthly sexual activity (OR=1.11, 95% CI=1.05-1.17 per each additional condition), and low sexual satisfaction (OR=1.10, 95% CI=1.04-1.16 per each additional condition), adjusting for age, race/ethnicity, and partner status. Depression and urinary incontinence were each independently associated with low desire (OR=1.53, 95% CI=1.19-1.97, and OR=1.23, 95% CI=1.00-1.52, respectively), less than monthly sexual activity (OR=1.39, 95% CI=1.06-1.83, and OR=1.29, 95% CI=1.02-1.62, respectively), and low sexual satisfaction (OR=1.49, 95% CI=1.14-1.93, and OR=1.38, 95% CI=1.11-1.73, respectively), adjusting for other types of conditions. After adjustment for total number of chronic conditions, age remained a significant predictor of low desire and less than monthly sexual activity, but not sexual satisfaction.

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Conclusions—Women with multiple chronic health conditions are at increased risk for decreased sexual function. Depression and incontinence may have particularly strong effects on sexual desire, frequency of activity, and satisfaction in women, independent of other comorbid conditions. Women's overall sexual satisfaction may be more strongly influenced by multimorbidity than age.

Keywords

female sexual dysfunction; multimorbidity; chronic disease; aging/geriatrics

INTRODUCTION

Over a quarter of middle-aged and older women report problems with some aspect of sexual activity,[1,2] with the prevalence of sexual dysfunction increasing with increasing age.[3,4] Although multiple factors may contribute to decline in sexual function with aging, preliminary studies suggest that changes in women's underlying physical and mental health may play an important role in determining whether women remain engaged in and satisfied with sexual activity as they age.[5,6,7] In particular, aging is associated with an increased risk of a wide variety of chronic health conditions that can interfere with women's interest in and ability to enjoy sexual activity.[8,9,10]

To date, a limited number of epidemiologic studies have examined the effects of chronic conditions such as diabetes mellitus, [11,12,13,14,15] end-stage renal disease, [16] Parkinson's disease, [17] depression, [18,19,20,21] inflammatory bowel disease, [22] and urinary incontinence[23,24,25] on sexual activity and function in women. These studies have tended to focus on the isolated effects of individual diseases, even though over half of women aged 50 years and older suffer two or more concurrent chronic conditions. With the aging of the population, there is a need for research that addresses the broader spectrum of multimorbidity that can influence sexual function in older women, while accounting for other contextual factors that can exacerbate decline in sexual function with age.

Among middle-aged and older women in the community, there is also a need for more data on the relative impact of different types of chronic health conditions on sexual activity and function. Among older men, diabetes mellitus and other cardiometabolic conditions that contribute to endothelial dysfunction and decreased genital vascular perfusion are well-established as risk factors for erectile dysfunction, the most common form of male sexual dysfunction.[10] Among older women, in whom changes in vascular perfusion may not translate as directly into changes in subjective arousal, the impact of cardiometabolic conditions on sexual function is not as well understood, [26] and it is possible that some of the reported effects of these conditions on sexual function may be attributable to other comorbid diseases that are also widely prevalent in older adults.

AIMS

We examined the impact of multimorbidity on self-reported sexual desire, activity, satisfaction, and sexual problems in a multiethnic, community-dwelling population of middle-aged and older women. Our goal was to provide new insight into the determinants of

sexual function in women with multiple chronic health conditions, to help guide development of future strategies for preserving female sexual function in the context of chronic disease.

METHODS

This research was conducted as an ancillary study to the Reproductive Risks of Incontinence Study at Kaiser (RRISK), a multiethnic cohort study of risk factors for urinary tract dysfunction in community-dwelling middle-aged and older women. Participants were female enrollees in Kaiser Permanente Northern California (KPNC), an integrated health care delivery system serving approximately 25% to 30% of the northern California population. To be eligible for the parent RRISK cohort, women had to have enrolled in KPNC by 21 years of age and to have had at least half of any childbirths at a KPNC facility. Additionally, women from racial/ethnic minorities were oversampled to achieve a target composition of 20% African-American, 20% Latina, 20% Asian, and 40% White. [27] Approximately 20% of all participants were recruited from the KPNC Diabetes Registry to ensure robust participation by women with diabetes, but no symptoms or complications of diabetes were required, nor were women required to have any symptoms of urinary tract dysfunction. For this ancillary study of sexual function, data were collected during the third wave of RRISK (RRISK3), involving home-based study visits with 2,016 women from November 2008 to April 2012. Informed consent was obtained from all participants prior to data collection, and all study procedures were approved the institutional review boards of both the University of California San Francisco and the Kaiser Foundation Research Institute.

Chronic health conditions were ascertained using structured-item questionnaires assessing prior physician diagnoses of selected health problems. These included pulmonary conditions such as asthma and chronic obstructive pulmonary disease; cardiometabolic conditions such as heart disease, hypertension, hyperlipidemia, and diabetes; neuropsychiatric conditions such as stroke, Parkinson’s Disease, and depression; colorectal conditions such as irritable bowel syndrome and inflammatory bowel disease; genitourinary conditions such as urinary incontinence, pelvic organ prolapse and endometriosis; musculoskeletal conditions such as arthritis; and cancer. For diabetes, questionnaire assessment was supplemented with review of abstracted clinical records indicating use of a diabetes glycemic control medication, or fasting blood glucose of 126 mg/dL or greater.

Structured-item questionnaires were also used to assess demographic history, surgical history, menopausal history, health-related behaviors, and overall functional status. The latter was assessed using the physical and mental health components of the validated Medical Outcomes Study SF-12 instrument, scaled from 0 to 50, in which higher scores indicate better physical and mental functioning.[28] Medications were assessed by abstraction and review of electronic KPNC pharmacy data for participants who reported filling at least 80% of their prescriptions through a KPNC pharmacy, or by questionnaires for participants reporting filling less than 80% of their prescriptions through a KPNC pharmacy. Medication names were reviewed and classified by two authors (AA, AH) who discussed and resolved

any discrepancies (see Appendix C). Participants also underwent brief physical examination including measurement of weight and height for calculation of body mass index (kg/m^2).

MAIN OUTCOME MEASURES

Sexual function was assessed using structured-item questionnaire measures adapted from previously validated instruments such as the Female Sexual Function Index (FSFI)[29] and administered in other large women's health studies (see Appendix A).[30,31] Participants completed these questionnaires in private and returned them in sealed envelopes to study personnel. Items were adapted to reflect the 3 months prior to women's study visits and to use to a more inclusive definition of sexual activity that included "any activity that is arousing to you, including masturbation," as being potentially more generalizable to older age groups. Structured items asked all participants to indicate their level of sexual desire/interest, frequency of sexual activity, and overall level of sexual satisfaction in the three months prior to their study visit (Appendix A). Additionally, women who reported some sexual activity in the past 3 months were asked to rate their degree of difficulty with arousal, lubrication, orgasm, and pain/discomfort during sexual activity. Participants were considered to have at least one sexual activity-specific problem if they reported difficulty with arousal, lubrication, orgasm, or pain/discomfort during sexual activity in the past 3 months.

Statistical Analyses

Descriptive statistics were first used to examine the total number and distribution of chronic health conditions in the study population. For each chronic condition with at least 5% prevalence in the cohort, we examined the proportion of participants with 0, 1, 2, 3, 4, and 5 or more chronic conditions who reported 1) low or very low sexual desire, 2) less than monthly sexual activity, or 3) low or very low overall sexual satisfaction, as outcomes that have previously been reported to be associated with advancing age in women's health research.[5] Among women reporting some sexual activity in the past 3 months, we also examined the proportion who reported at least one sexual activity-specific problem, again with stratification by total number of chronic health conditions. Tests of linear trend were used to examine differences in the unadjusted prevalence of these outcomes by total number of chronic conditions.

Multivariable logistic regression models were then developed to examine the strength of associations between the total number of chronic conditions and each of the above sexual function outcomes, adjusting for age, race/ethnicity, and relationship status. In subsequent models, additional covariates such as menopausal status, history of pelvic surgery, body mass index, tobacco and alcohol use, medication utilization, and self-reported physical and mental functioning (assessed by SF-12 scores) were added to the model in a step-wise fashion to evaluate their potential role as mediators of the relationship between the total number of chronic conditions and sexual function outcomes. Additional models were developed to evaluate independent relationships between individual types of chronic conditions and sexual function outcomes, focusing once again on those conditions with at least 5% prevalence in the overall cohort. These models examined the independent relationship of each type of chronic condition to self-reported sexual desire, frequency of

activity, sexual satisfaction, and sexual problems, adjusting for all other types of chronic conditions in the model, as well as for age, race/ethnicity, and relationship status. All analyses were performed using SAS statistical software Version 9.2 (SAS Institute, NC).

RESULTS

Of the 2,016 RRISK3 participants, 1,997 (99.1%) provided data on at least one sexual function outcome. Demographic and clinical characteristics of the 1,997 participants are summarized in Table 1. Mean (SD) age was 60.2 (9.5) years, and 64% of participants were racial/ethnic minorities. Over two thirds (69%) had a spouse or sexual partner. Nearly 90% of women had at least one chronic condition, and 19% had five or more chronic conditions, with the most common reported conditions being hypertension (53%), hyperlipidemia (44%), and arthritis (38%).

Overall, 59% (N=1,174) of women reported low to no sexual desire, 53% (N=1,056) reported less than monthly sexual activity, and 47% (N=771) reported low overall sexual satisfaction. Of the 1,193 women who described some sexual activity during the past three months, 19% (N=225) reported difficulty with arousal, 24% (N=282) reported difficulty with lubrication, 22% (N=261) reported difficulty with orgasm, and 18% (N=179) reported pain or discomfort with vaginal intercourse in the past 3 months. As shown in Table 2, the unadjusted prevalence of low sexual desire, less than monthly sexual activity, low overall sexual satisfaction, difficulty with arousal, difficulty with lubrication, and difficulty with orgasm increased with increasing number of chronic conditions ($P < 0.05$ for tests of linear trend with increasing number of chronic conditions).

In models adjusting for age, race/ethnicity, and partner status, multimorbidity was a significant predictor of low sexual desire, less than monthly sexual activity, and low overall sexual satisfaction [Table 3]. Specifically, the odds of reporting low desire, less than monthly activity, and low satisfaction increased by an estimated 10% to 11% with each additional chronic condition reported by participants. Among sexually active women, those with multiple chronic conditions were also more likely to report difficulty with arousal, lubrication, orgasm, and pain/discomfort during intercourse. The adjusted odds of reporting each of these sexual problems increased by an estimated 10% to 16% with each additional chronic condition reported by participants.

After adjustment for multiple additional health-related factors with the potential to mediate relationships between chronic conditions and sexual function (menopausal status, body mass index, pelvic surgery, number of types of medications, and smoking or alcohol use), the observed relationships between multimorbidity and sexual function remained strongly significant for all outcomes except for frequency of sexual activity (Table 3). Further adjustment for participants' SF-12 physical and mental functioning scores resulted in only modest decrease in the magnitude of associations between total number of chronic conditions and sexual function outcomes, which continued to be statistically significant (Table 3).

In analyses comparing the independent effects of different types of chronic conditions, depression was found to be independently associated with low sexual desire (OR 1.53; 95% CI 1.19-1.97), less than monthly sexual activity (OR 1.39; 95% CI 1.06-1.83), and low overall sexual satisfaction (OR 1.49; 95% CI 1.14-1.93), after adjustment for age, race/ethnicity, partner status, and all other chronic conditions with at least 5% prevalence in the cohort. Among sexually active women, women with depression were also more likely to report difficulty with arousal, lubrication, orgasm, and pain with intercourse (Table 4). Urinary incontinence was also independently associated with increased odds of reporting low sexual desire (OR 1.23; 95% CI 1.00-1.52), less than monthly sexual activity (OR 1.29; 95% CI 1.02-1.62), and low sexual satisfaction (OR 1.38; 95% CI 1.11-1.73), as well as difficulty with arousal (OR 1.43; 95% CI 1.04-1.98) and lubrication (OR 1.44; 95% CI 1.06-1.95) in sexually active women, after adjustment for other types of chronic conditions. Additional adjustment for any use of selective serotonin reuptake (SSRI) or anticholinergic bladder medications during the two years preceding participants' study visits did not significantly change these associations (see Appendix B).

No specific independent associations between cancer, diabetes, heart disease, hypertension, hyperlipidemia, irritable bowel syndrome, asthma, or endometriosis with adverse sexual function outcomes were detected in these models that adjusted for all types of chronic conditions simultaneously. In a sensitivity analysis in which women reporting all four types of cardiometabolic conditions—diabetes, heart disease, hypertension, and hyperlipidemia—were compared to women with only one, some, or none of these conditions, we found that women with all four cardiometabolic conditions in combination were more likely to report difficulty with orgasm (OR 3.22; 95%CI 1.55-3.11), after adjustment for age, race, partner status, and all other types of chronic conditions with at least 5% prevalence in the cohort. No significant effects on other sexual function domains were detected, however.

In multivariable models, age remained a significant independent predictor of low sexual desire (OR 1.21, 95% CI 1.14-1.28 per each 5-year increase) and less than monthly sexual activity (OR 1.49, 95% CI 1.39-1.59 per each 5-year increase) after adjustment for total number of chronic health conditions as well as race/ethnicity and partner status, but not low overall satisfaction (OR 1.05, 95% CI 0.98-1.11 per each 5-year increase). Among sexually active women, age also remained an independent predictor of reporting difficulty with arousal (OR 1.15; 95% CI 1.05-1.26) per each 5-year increase), lubrication (OR 1.16; 95% CI 1.06-1.27), and orgasm (OR 1.16, 95% CI 1.06-1.27), but not pain with vaginal intercourse (OR 0.98, 95% CI 0.88 – 1.09), independent of total number of chronic conditions, race/ethnicity, and partner status.

DISCUSSION

This study provides new insight into the impact of multimorbidity on sexual activity and function in middle-aged and older women. In this cohort of ethnically diverse, community-dwelling women aged 40 years and older, there was a strong linear relationship between the total number of chronic conditions reported by women and the likelihood of reporting low interest in or satisfaction with sexual activity. Furthermore, the more chronic health conditions women reported, the more likely they were to report specific types of sexual

problems such as difficulty with arousal, lubrication, and orgasm. These findings suggest that clinicians and researchers need to take into account the cumulative effects of chronic conditions on women's sexual quality of life in middle and older age, rather than simply considering individual conditions in isolation.

Our research also suggests that there may be relative differences in the impact of different types of chronic conditions on sexual function among middle-aged and older women in the general population. Of the conditions we studied, only depression and urinary incontinence emerged as consistent independent predictors of worse sexual function, after controlling for other types of chronic conditions as well as age, race/ethnicity, and partner status.

Several previous studies have also linked depression and urinary incontinence with sexual dysfunction in women. Depression in particular has been linked to low sexual desire, problems with sexual arousal, and difficulty with organism in both men and women using a variety of different instruments.[18,19,20,21, 32,33] Similarly, urinary incontinence has been shown to contribute to decreased interest in and satisfaction with sexual activity when women experience urine leakage during sexual activity. [23,24,25,34,35,36] Nevertheless, most studies of the impact of depression or incontinence on female sexual function have relied upon a single-disease perspective, with limited adjustment for other co-morbid conditions, even though both depression and incontinence are known to be associated with a wide array of other health problems. Our findings provide strong evidence that depression and urinary incontinence are associated with worse sexual function in women independent of other common chronic conditions, and irrespective of use of SSRI or anti-cholinergic medications.

In contrast to our research, several previous studies have reported associations between specific cardiometabolic conditions such as diabetes, [12,13-15] heart disease, [37,38] hypertension, [38,39,40,41] and/or hypercholesterolemia[37,38] and sexual dysfunction in middle-aged or older women. A few of these studies have focused on specialty clinic or referral populations in which the spectrum of disease was more severe than in our population-based RRISK cohort. Given that most participants in the RRISK cohort were well-functioning, community-dwelling women, our study may not have captured the effects of severe cardiometabolic disease on sexual function in women. Of note, we did find that women with a combination of diabetes, heart disease, hypertension, and hyperlipidemia were more likely to report difficulty with orgasm than women with only one, some, or none of these conditions. This may point to a synergistic effect of multiple types of cardiometabolic conditions on orgasm function in women. Also, our findings also suggest that more research may be necessary to determine whether the effects of common cardiometabolic conditions on female sexual function may be partly mediated by unmeasured co-morbid conditions such as depression.[42]

Interestingly, our findings do not suggest that the impact of multimorbidity on women's sexual function is mediated primarily by menopausal status, history of pelvic surgery, medication side effects, or health habits such as smoking or alcohol use. Further, the relationship of multimorbidity to sexual function was only partly mediated by differences in self-reported physical and mental functional status as measured by SF-12 questionnaire scores. Future research should assess for other factors that may explain why women with

multiple chronic conditions are more likely to experience decreased interest in or enjoyment of sexual activity, such as changes in self-image and body concept, the quality of women's relationships with sexual partners, or opportunities for sexual activity.

Finally, we found that age remained a significant predictor of lower sexual desire and frequency of sexual activity, as well as several types of sexual activity-specific problems, despite adjustment for the number and type of chronic conditions. This suggests that the development of chronic illness alone is not responsible for decline in women's sexual desire and activity with aging.[4,5] Nevertheless, we also found that age was no longer a predictor of overall sexual satisfaction in women after controlling for total number of chronic conditions in addition to partner status. This suggests that women's overall ability to enjoy sexual activity may be more strongly influenced by their health status than age. [6,8]

This study benefits from a large, multiethnic cohort of middle-aged and older women, assessment of multiple dimensions of sexual function, and evaluation of both the cumulative burden and the independent effects of individual chronic conditions. However, this investigation is limited by certain features. First, assessment of chronic conditions was based on participant report of prior clinician diagnoses, and did not take into account the clinical severity of women's chronic disease. Second, the cross-sectional design of this study prevented us from assessing changes in the relationship of chronic conditions to sexual function over time or determining directionality in these relationships. Additionally, our study measures did not include assessment of the health or sexual function of women's partners or the strength of the participant-partner relationship. Finally, this study was conducted within a cohort of community-dwelling middle-aged and older women who were long-term enrollees in a group health plan, and results may not be generalizable to other populations, including institutionalized older women or those with major functional disabilities.

CONCLUSIONS

In summary, this study suggests that among middle-aged and older women, chronic health conditions can exert a cumulative impact on interest in and ability to have and enjoy sexual activity, as well as specific problems with lubrication, arousal, orgasm, and pain during sex. Of the many chronic conditions that affect this population, depression and urinary incontinence may be especially likely to contribute to worse sexual function in women, independent of co-morbidities. While older age remains a significant predictor of sexual function in middle-aged and older women, women's overall sexual satisfaction may be influenced more by multimorbidity than by age.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Funding Sources: Funding for this research was provided by the Office of Research on Women's Health Specialized Center of Research Grant # P50 DK064538 and the National Institutes Diabetes, Digestive and Kidney Diseases (NIDDK) Grant # DK53335. Dr. Huang is additionally supported by a Paul B. Beeson Career

Development Award in Aging Research from the National Institute on Aging (1K23AG038335) and the American Federation for Aging Research.

Presentations: This work was presented at the Society of General Internal Medicine's Annual Meeting on April 26th, 2013 in Denver, Colorado, as well as at the American Geriatric Society's Annual Meeting on May 3rd, 2013 in Grapevine, Texas.

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Table 1
Demographic & Clinical Characteristics of RRISK3 Participants

Characteristic	Participants N=1997
Demographics	
Age	
<55 years	643 (32%)
55-64 years	661 (33%)
≥65 years	693 (35%)
Race/ethnicity	
White/Caucasian	709 (36%)
African-American	425 (21%)
Asian-American	394 (20%)
Latina/Hispanic	455 (23%)
Native American or other	14 (1%)
Relationship history	
Current spouse or sexual partner	1,367 (69%)
Clinical characteristics	
Body mass index, kg/m^2	30.1 (±7.4)
SF-12 Mental Health Score	44.8 (±5.9)
SF-12 Physical Health Score	45.5 (±6.6)
Postmenopausal*	1,636 (82%)
History of pelvic surgery**	571 (29%)
Chronic Conditions	
Cancer	280 (14%)
Diabetes	534 (27%)
Heart disease (including myocardial infarction, angina, coronary artery disease)	139 (7%)
Hypertension	1,049 (53%)
Hyperlipidemia	878 (44%)
Irritable bowel syndrome	185 (9%)
Inflammatory bowel disease	23 (1%)
Depression	403 (20%)
Stroke	82 (4%)
Parkinson's disease	8 (<1%)
Asthma	428 (21%)
Chronic obstructive pulmonary disease	75 (4%)
Urinary incontinence (weekly)	633 (32%)
Symptomatic pelvic organ prolapse	74 (4%)
Endometriosis	116 (6%)

Characteristic	Participants N=1997
Arthritis	758 (38%)
Total number of chronic conditions:	
0 conditions	228 (11%)
1 condition	348 (17%)
2 conditions	378 (19%)
3 conditions	362 (18%)
4 conditions	301 (15%)
5+ conditions	380 (19%)
Medications	
Number of types of medications***	
0	153 (8%)
1	161 (8%)
2	194 (10%)
3	208 (11%)
4	215 (11%)
5+	1013 (52%)
Health-related behaviors	
Currently smoker	109 (5%)
5 or more alcoholic drinks per week	499 (25%)

Data are presented as number (%) or mean (SD)

* Defined as without menses for at least 12 months prior.

** Includes women with a history of unilateral or bilateral oophorectomy, hysterectomy, or surgery to address pelvic organ prolapse and/or urinary incontinence.

*** Based on abstraction of pharmacy records for the past 2 years for women reporting filling ≥80% of prescriptions at a KPNC pharmacy, or self-report for women reporting filling <80% of prescriptions at a KPNC pharmacy

Table 2

Proportion of Women Reporting Each Sexual Function Outcome, by Total Number of Chronic Conditions

Sexual Function Outcomes Assessment Among All Participants (N=1997)							
	Total Number of Conditions						
	None n=228	*1 n=348*	*2 n=378*	*3 n=362*	*4 n=301*	*5+ n=380*	*P value*
Low Sexual Desire[α]	93 (49%)	152 (54%)	190 (56%)	192 (60%)	184 (59%)	363 (67%)	<0.001
<Monthly Sexual Activity[β]	71 (38%)	129 (45%)	167 (49%)	164 (51%)	167 (54%)	358 (67%)	<0.001
Low Sexual Satisfaction[γ]	61 (37%)	96 (40%)	126 (45%)	122 (45%)	147 (54%)	219 (55%)	<0.001
Sexual Problems Assessed in Sexually Active Participants Only (N=1193)							
	Total Number of Conditions						
	None n=160	*1 n=236*	*2 n=238*	*3 n=215*	*4 n=174*	*5+ n=170*	*P value*
Arousal Difficulty[δ]	21 (13%)	34 (15%)	46 (19%)	39 (18%)	39 (23%)	46 (27%)	0.002
Lubrication Difficulty[ε]	28 (18%)	45 (19%)	63 (27%)	51 (24%)	38 (22%)	57 (34%)	0.005
Orgasm Difficulty[ζ]	24 (15%)	43 (19%)	51 (21%)	50 (23%)	41 (25%)	52 (30%)	0.02
Pain with Intercourse[η]	24 (17%)	34 (17%)	34 (17%)	37 (20%)	18 (14%)	32 (25%)	0.24

[α]Participants were considered to have low to no sexual desire if they described their “sexual desire or interest” as low, very low, or none.

[β]Participants were considered to have less than monthly sexual activity if they reported no sexual activity or less than monthly sexual activity in the past three months.

[γ]Participants were considered to have low overall sexual satisfaction if they indicated that they were less than “moderately” satisfied.

[δ]Participants were considered to difficulty with arousal if they reported their level of sexual arousal during sexual activity was low, very low, or none.

[ε]Participants were considered to have difficulty with lubrication if they reported it was difficult, very difficult, extremely difficult, or impossible to become lubricated during sexual activity.

[ζ]Participants were considered to have difficulty with orgasm if they reported it was difficult, very difficult, extremely difficult, or impossible to reach orgasm during sexual stimulation or intercourse

[η]Participants were considered to have pain or discomfort with intercourse if they reported their level of discomfort or pain during or after vaginal penetration was moderate, high, or very high.

Table 3

Adjusted Associations Between Total Number of Chronic Conditions & Sexual Function Outcomes

	Sexual Function Outcomes Assessed in All Participants (N=1997)		
	Low Sexual Desire[α] OR (CI)	<Monthly Sexual Activity[β] OR (CI)	Low Sexual Satisfaction[γ] OR (CI)
Adjusted for age, race/ethnicity, and partner status only	**1.11 (1.05 - 1.17)***	**1.11 (1.05 - 1.17)***	**1.10 (1.04 - 1.16)***
Additionally adjusted for medication use**, body mass index, menopausal status, pelvic surgery, and smoking/alcohol use***	**1.13 (1.06 – 1.21)***	1.05 (0.98 – 1.13)*	**1.13 (1.05 – 1.22)***
Additionally adjusted for SF-12 physical 8and mental function scores	**1.10 (1.03 – 1.18)***	1.04 (0.96 – 1.12)*	**1.10 (1.03 – 1.19)***

	Sexual Problems Assessed in Sexually Active Participants Only (N=1193)			
	Arousal Difficulty[δ] OR (CI)	Lubrication Difficulty[ε] OR (CI)	Orgasm Difficulty[ζ] OR (CI)	Pain with Intercourse[η] OR (CI)
Adjusted for age, race/ethnicity, and partner status only	**1.13 (1.05–1.23)***	**1.14 (1.06–1.22)***	**1.16 (1.07–1.25)***	**1.10 (1.01 –1.20)***
Additionally adjusted for medication use**, body mass index, menopausal status, pelvic surgery, and smoking/alcohol use***	**1.21 (1.09–1.35)***	**1.26 (1.14–1.39)***	**1.28 (1.15–1.42)***	**1.31 (1.16–1.49)***
Additionally adjusted for SF-12 physical 8and mental function scores	**1.19 (1.07–1.33)***	**1.22 (1.10–1.35)***	**1.24 (1.12–1.38)***	**1.28 (1.13–1.45)***

*Odds ratio reflects change in odds per *each* additional chronic condition.

[α]Participants were considered to have low to no sexual desire if they described their “sexual desire or interest” as low, very low, or none.

[β]Participants were considered to have less than monthly sexual activity if they reported no sexual activity or less than monthly sexual activity in the past three months.

[γ]Participants were considered to have low overall sexual satisfaction if they indicated that they were less than “moderately” satisfied.

[δ]Participants were considered to difficulty with arousal if they reported their level of sexual arousal during sexual activity was low, very low, or none.

[ε]Participants were considered to have difficulty with lubrication if they reported it was difficult, very difficult, extremely difficult, or impossible to become lubricated during sexual activity.

[ζ]Participants were considered to have difficulty with orgasm if they reported it was difficult, very difficult, extremely difficult, or impossible to reach orgasm during sexual stimulation or intercourse

[η]Participants were considered to have pain or discomfort with intercourse if they reported their level of discomfort or pain during or after vaginal penetration was moderate, high, or very high.

** Medication use covariate consists of medication types utilized in the past two years. See Appendix C for details.

*** Additional covariates included BMI, menopausal status, any pelvic surgery, current smoking, and >5 alcoholic drinks/week.

Table 4

Adjusted Associations* Between Specific Types of Chronic Conditions & Sexual Function Outcomes

	Sexual Function Outcomes Assessed in All Participants (N=1997)			Sexual Problems Assessed in Sexually Active Participants Only (N=1193)			
	Low Sexual Desire[α] OR (CI)	**<Monthly Sexual Activity[β] OR (CI)**	**Low Sexual Satisfaction[γ] OR (CI)**	**Arousal Difficulty[δ] OR (CI)**	**Lubrication Difficulty[ε] OR (CI)**	**Orgasm Difficulty[ζ] OR (CI)**	**Pain with Intercourse[η] OR (CI)**
Cancer	1.00 (0.76 - 1.33)	0.83 (0.61 - 1.13)	0.87 (0.65 - 1.18)	1.02 (0.66 – 1.57)	0.89 (0.58 – 1.35)	0.94 (0.62 – 1.44)	1.30 (0.80 – 2.11)
Diabetes	0.88 (0.69 - 1.12)	1.18 (0.90 – 1.53)	1.05 (0.82 – 1.36)	0.99 (0.68 – 1.44)	0.84 (0.59 – 1.21)	0.98 (0.69 – 1.41)	0.72 (0.46 – 1.14)
Heart Disease	1.01 (0.67 – 1.51)	1.16 (0.75 – 1.79)	0.87 (0.56 – 1.33)	0.92 (0.48 – 1.78)	1.49 (0.83 – 2.68)	1.69 (0.95 – 2.99)	1.18 (0.56 – 2.50)
Hypertension	1.18 (0.95 – 1.47)	0.94 (0.74 – 1.19)	0.91 (0.73 – 1.15)	1.02 (0.73 – 1.43)	0.78 (0.57 – 1.07)	0.88 (0.63 – 1.21)	0.70 (0.48 – 1.02)
Hyperlipidemia	1.07 (0.86 - 1.33)	1.10 (0.87 – 1.39)	1.14 (0.91 - 1.44)	1.19 (0.85 – 1.66)	1.16 (0.85 – 1.66)	1.29 (0.94 – 1.78)	1.08 (0.73 – 1.59)
Irritable Bowel Syndrome	1.30 (0.92 - 1.83)	1.20 (0.83 - 1.73)	1.13 (0.79 - 1.61)	1.05 (0.62 – 1.75)	1.46 (0.92 – 2.32)	0.99 (0.61 – 1.63)	1.36 (0.79 – 2.35)
Depression	**1.53 (1.19 - 1.97)**	**1.39 (1.06 – 1.83)**	**1.48 (1.14 – 1.93)**	**1.74 (1.20 – 2.51)**	**1.47 (1.03 – 2.09)**	**2.17 (1.53 – 3.08)**	**1.54 (1.02 – 2.34)**
Asthma	0.89 (0.70 - 1.13)	1.15 (0.88 - 1.50)	1.08 (0.84 - 1.39)	1.15 (0.80 – 1.64)	1.39 (1.00 – 1.93)	1.22 (0.86 – 1.71)	1.79 (1.21 – 2.65)
Urinary incontinence	**1.23 (1.00 – 1.52)**	**1.29 (1.03 – 1.62)**	**1.38 (1.11 – 1.73)**	**1.43 (1.04 – 1.98)**	**1.44 (1.06 – 1.95)**	1.28 (0.94 – 1.74)	1.30 (0.90 – 1.88)
Endometriosis	1.24 (0.81 – 1.89)	0.91 (0.58 – 1.41)	1.01 (0.66 – 1.54)	0.92 (0.48 – 1.74)	1.70 (0.98 – 2.94)	0.81 (0.42 – 1.54)	1.75 (0.91 – 3.36)
Arthritis	**1.24** (1.00 – 1.53)	1.03 (0.82 – 1.30)	1.22 (0.97 – 1.53)	1.06 (0.76 – 1.48)	1.23 (0.90 – 1.68)	1.01 (0.73 – 1.39)	1.09 (0.74 – 1.60)

*Adjusted for: age, race/ethnicity, partner status, and all other conditions in the model.

[α]Participants were considered to have low to no sexual desire if they described their "sexual desire or interest" as low, very low, or none.

[β]Participants were considered to have less than monthly sexual activity if they reported no sexual activity or less than monthly sexual activity in the past three months.

[γ]Participants were considered to have low overall sexual satisfaction if they indicated that they were less than "moderately" satisfied.

[δ]Participants were considered to difficulty with arousal if they reported their level of sexual arousal during sexual activity was low, very low, or none.

[ε] Participants were considered to have difficulty with lubrication if they reported it was difficult, very difficult, extremely difficult, or impossible to become lubricated during sexual activity.

[ζ] Participants were considered to have difficulty with orgasm if they reported it was difficult, very difficult, extremely difficult, or impossible to reach orgasm during sexual stimulation or intercourse

[η] Participants were considered to have pain or discomfort with intercourse if they reported their level of discomfort or pain during or after vaginal penetration was moderate, high, or very high