MAKE A LITTLE LOVE? CHRONIC DISEASE AND SEXUALITY AMONG OLDER ADULTS

By

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ABSTRACT

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The extended life expectancy of adults in the United States has new implications for successful aging, particularly because the majority of older adults suffer from multiple chronic conditions which affect other aspects of their lives. One implicated aspect is their sexual activity. Thus, considering that chronic diseases can have harmful effects on sexual behavior and older adults today are more sexually active compared to earlier cohorts, my dissertation investigates how chronic disease burden is related to the sexual behavior and sexual satisfaction of older adults in intimate relationships. I use a three-essay approach to address this research question. The data come from Wave 1 and Wave 2 of the National Social Life, Health, and Aging Project (NSHAP), a nationally representative, community-based sample of older Americans. In the first paper, I use the lagged dependent variable approach to examine how chronic disease burden is related to sexual frequency and functioning, with a comparison by gender. Results from OLS regression models indicate that for older men, a higher chronic disease burden is negatively associated with sexual frequency. Results from binary logistic regression models demonstrate that for older women, a higher chronic disease burden is related to a greater risk of experiencing sexual dysfunction. In my second paper, I narrow my sample to adults who have one or more chronic diseases at Wave 1 to examine marital quality as a key factor that influences sexual behaviors at Wave 2. I run OLS regression models to find that for disease-afflicted older men, both baseline and change in positive marital quality is positively related to greater sexual frequency, while baseline and change in negative marital quality is negatively associated with

sexual frequency. For older women, only an increase in positive marital quality between waves and a decrease in negative marital quality between waves is associated with more frequent sex at Wave 2. In my final paper, I use dyad data from NSHAP Wave 2 and utilize actor-partner interdependence models to examine how chronic disease burden is associated with sexual frequency within older married couples, and, in turn, how it relates to husbands' and wives' sexual satisfaction. My analysis of couple-level NSHAP data reveals that a husband's lower chronic disease burden is related to his greater sexual frequency which is further related to his and his wife's increased sexual satisfaction. A husband's lower chronic disease burden is also linked to his wife's greater sexual frequency, and her greater sexual frequency is positively associated with her own sexual satisfaction. However, a wife's chronic disease burden is not significantly related to her own or her husband's sexual frequency, nor are her husband's feelings of sexual satisfaction affected by her sexual frequency. Taken together, these studies confirm that multimorbidity in later life plays a significant role in older adults' sexual lives. In addition to specifying how chronic disease burden can disrupt sexuality, my research demonstrates how marital quality may buffer the stress of illness to protect older adults' sexual frequency, while also highlighting how partner effects provide a more detailed understanding of how disease is intertwined with sexuality in older marriages. My research makes a significant contribution to the underexplored area of older adults' sexuality by identifying factors that can help maintain their sexual lives.

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CHAPTER ONE

INTRODUCTION

The sexual relationship is one of the most important social relationships (Liu, Waite, and Shen 2016). Cultural depictions of sexuality align it with youthful beauty and largely ignores adults in mid- to later-life. The lack of attention to older adults' sexual activity may promote the belief that sexuality is not healthy or natural for them, which precludes them from desiring sexual intimacy (DeLamater and Moorman 2007) and from having a clear understanding of what normalized sexual behaviors include in later life (Lodge and Umberson 2012). Additionally, it is important to research the sexuality of older adults because this population that is growing. The increase of the older adult population coincides with a rise in chronic disease incidence among Americans (Ward and Schiller 2013). Scientific and technological advancements have improved of medical care of people with chronic diseases, which means that older adults today tend to live longer with chronic diseases compared to previous cohorts (Crimmins, Hayward, and Saito 1994; Træen et al. 2017).

Age can enhance different aspects of sexuality (Levy 1994). Sexual activity in later life can be an enjoyable, leisure activity that increases happiness and quality of life (Berdychevsky & Nimrod, 2017). However, problems with sexual activity can yield stress, anxiety, and tension with one's sexual partner (Laumann et al., 2005; Merghati-Khoei, Pirak, Yazdkhasti, & Rezasoltani, 2016). Overall, there is a growing population of unhealthy older adults who still value sexuality as an important part of their lives but may experience complications to it (Træen et al. 2017). While there are theoretical motivations to predict that biological and psychosocial factors play an important role in the sexual lives of older adults, there has been little research

done which investigates a nationally representative sample of older Americans who have multiple chronic conditions.

In this dissertation, I present three papers that pose separate, but related, research questions to inform how the number and severity of chronic diseases among older adults may be related to their sexual frequency, sexual dysfunction, and sexual satisfaction. In the first paper, I ask how chronic disease burden is associated with sexual frequency and functioning among partnered, older men and women. To study chronic disease burden in the first and third paper, I utilize a chronic comorbidity index which scores chronic conditions based on their association with mortality and generates a sum for respondents given their total number of diseases (Vasilopoulos et al. 2014). In my second paper, I consider how, after the onset of one or more chronic diseases, marital quality affects the sexual frequency of partnered older adults. I draw upon the stress-buffering theoretical approach to consider how positive marital quality may help reduce disease-induced stressors and protect sexual frequency and how negative marital quality may harm it. In my third paper, I use dyad data to examine how a husband's and wife's chronic disease burden is linked to the couple's sexual satisfaction. In each of my papers, I separate my analyses by gender to examine how sexual experiences vary for men and women.

CHAPTER TWO

CHRONIC DISEASE BURDEN, SEXUAL FREQUENCY, AND SEXUAL DYSFUNCTION IN PARTNERED OLDER ADULTS

Introduction

The number of older Americans is growing as people are living longer, and in the next 25 years, this population is expected to double (Centers for Disease Control and Prevention 2013). Even though adults are extending their life expectancy, they are not doing so without health problems. 92% of adults age 65 and older have at least one chronic disease, and the risk of having a chronic disease increases with age (Akinyemiju et al. 2016; Vaupel 2010). These diseases can affect many areas of life, including sexual frequency and sexual functioning. Yet, there is little research on the sexuality of older adults, particularly as it is related to their total number of chronic diseases. Older adults' sexuality, understood as "the dynamic outcome of physical capacity, motivation, attitudes, opportunity for partnership, and sexual conduct" (Galinsky, McClintock, and Waite 2014, p. S83), is important to understand because sex in later life can bring many benefits, including increased happiness, well-being, and quality of life (Berdchevsky and Nimrod 2017). I focus on partnered sexuality, or the sexual relationship shared between intimate partners, because the majority of this cohort's sexual behaviors occur within a relationship with one partner (Galinsky et al. 2014; Liu, Waite, Shen, and Wang 2016). To examine the association between chronic disease status and sexuality among partnered older adults, I utilize the Interactive Biopsychosocial Model's framework for studying health and sexuality (Lindau, Laumann, Levinson, and Waite 2003).

Research shows that people stay sexually active into their eighties even if they do suffer from a chronic illness (DeLamater 2012; Lindau et al. 2007; Waite et al. 2009). Still, there are several links between health and sexuality to expect that chronic conditions would affect sexual frequency and functioning. For instance, problems with the cardiovascular, neurological, and endocrine systems limit sexual activity, and overall physical health is more predictive of experiencing a sexual dysfunction than age (DeLamater and Karraker 2009; Lindau et al. 2007; Schiavi 1994). Furthermore, complications from these conditions may present differently for older men and older women given the gender differences between sexual frequency and health (Liu and Waite 2014; Schiavi 1994) and sexual dysfunction and health (Laumann, Das, and Waite 2008; Waite et al. 2009).

The current study's research question asks how chronic disease burden is related to the sexual frequency and sexual dysfunction among partnered older adults. Using data from the nationally representative National Social Life, Health, and Aging Project (NSHAP), I apply a chronic comorbidity index that combines the total number of chronic diseases in order to measure chronic disease burden (Vasilopoulos et al. 2014). I present longitudinal results which are applicable to community-residing older adults in the United States. These findings are important for health practitioners and policy makers as they consider how the growing rates of multiple comorbidities will impact the aging population's sexual lives.

Background

Aging brings both benefits and challenges to sexual activity. Older adults have more leisure time to have sex and have learned their partner's sexual preferences over time (Lindau et al. 2003), but later life also includes biological changes and illnesses that can slow down or interrupt sexual activity (Carpenter and DeLamater 2012). Individuals who are in better health

and have fewer diseases may enjoy better sex lives. In addition to health, psychological well-being and social factors also play a role in older adults' sexuality. I utilize the Interactive Biopsychosocial Model (IBM) to explain the relationship between chronic disease and sexuality among older adults because it offers a multifaceted approach to studying health (Lindau et al. 2003). The IBM builds on the traditional biomedical approach to studying well-being and disease by incorporating psychological and social aspects to determine how health is produced by sociocultural contexts, among individuals, and across the life course (Lindau et al. 2003). Key aspects of the model contend that health outcomes can be studied analytically, and that researchers should equally consider biological, psychological, and social dimensions, and their positive and negative effects, when studying health (Lindau et al. 2003). Guided by this framework, I consider the biological and psychosocial dimensions of sexuality to direct my research.

Biological Dimensions of Older Adults' Sexuality

Biological dimensions refer to older adults' physical capacity for health, and, when extended to sexuality, to their ability to have sex. The human sexual response cycle identifies the sexual pattern that occurs in a sexual situation (Zeiss and Kasl-Godley 2001). Formulated by Masters and Johnson (1966), this cycle includes four phases that men and women each experience: the excitement, plateau, orgasmic, and resolution phases. Both men and women experience this same response cycle, although men have a refractory period in the resolution phase because they require time to recover after orgasm (Masters and Johnson 1966). The natural aging process includes declines in hormone levels that can impede these phases, for instance lowing an individual's desire to have sex (Camacho and Reyes-Ortiz 2005; Schick et al. 2010).

Also, chronic diseases that disrupt normal healthy functioning may lead to complications in the sexual response cycle (McClintock, Dale, Laumann, and Waite 2016).

Men and women have similar physical experiences during sex, including stretching of muscles, spasms, and increased breathing (Butt 1990). Yet, there are biological differences in how men and women achieve climax which leads to differences in how chronic diseases may cause problems with their sexuality. Men's sexual arousal is closely tied to their circulatory system, so diseases that compromise blood flow, such as heart or vascular diseases, may contribute to sexual functioning problems (Camacho and Reyes-Ortiz 2005). Physical health is also important for women's sexuality, as conditions which interrupt their vascular and neurologic systems can lead to sexual functioning problems (Ambler, Bieber, and Diamond 2015). However, Basson (2000) suggests that women's sexual response cycle is more tied to psychological factors rather than needing to fulfil a physical arousal. So, it may be that chronic disease burden plays a larger role in men's sexual behaviors than in women's.

Psychosocial Dimensions of Older Adults' Sexuality

In addition to physically being able to have sex, psychosocial aspects impact older adults' sexual attitudes and behaviors (Carpenter and DeLamater 2012). Psychologically, mental health affects one's desire for sex (Waite and Das 2010). Having a good self-image is important for having a healthy sex drive (Levy 1994), and this perception could be harmed when someone has one or more chronic diseases. Socially, having a partner to be sexually active with is an important influencer of sexual activity levels, especially for adults in later life who may have outlived their partner (DeLamater and Moorman 2007). Additionally, beliefs that older adults are asexual are prevalent in popular culture, and these stereotypes may limit older adults' sexuality

because they feel less desirable or attractive compared to when they were younger (Lodge and Umberson 2012).

Further, psychosocial aspects and their tie to health and sexuality can present differently for men and women. Depression is more greatly associated with sexual dysfunction among women than men (Ambler et al. 2015). Additionally, women's libido is closely tied to their mental appraisal of the sexual situation and excitement about it (Basson 2000), and social dimensions, such relationship quality and having a partner present are more closely related to women's sexual functioning than men's (Ambler et al. 2015). Still, men may be more worried about their sexual health and sexual satisfaction than women (Lee, Nazroo, O'Connor, Blake, and Pendleton 2016). Thus, there are gender variations in how psychosocial factors play a role in sexuality.

Empirical Evidence of Older Adults' Chronic Disease and Sexuality

Good health encourages better sexual activity and performance, but this relationship can change with age and the accumulation of disease. One study, which combined two nationally representative surveys of data to examine the sexuality of people ages 25 to 85, found that individuals in good health had higher sexual frequency, and their frequency of sexual activity allowed them to remain sexually active as they get older (Lindau and Gavrilova 2010). A review of studies showed that even in old age, men and women enjoyed sex and achieved orgasm, although this often required more time, new positions, or the use of stimulants or lubrication (Zeiss and Kasl-Godley 2001). However, being unhealthy may magnify the added sexual challenges that come with aging and curtail couples' attempts at sexual activity (Karraker and DeLamater 2013).

Chronic diseases can disrupt different stages of the sexual response cycle (Masters and Johson 1966), and there are several biologic pathways through which this occurs. Cardiovascular diseases, such as coronary artery disease or hypertension, can make sexual functioning more difficult because these conditions restrict the blood flow to body tissue (Schiavi 1994). Individuals who have a heart attack or a stroke often experience a decrease in sexual functioning afterward (Verschuren et al. 2010). Sexual dysfunctions can also be the result of diabetes because this condition causes nerve damage and diminishes vascular function (Zeiss and Kasl-Godley 2001). This makes it more difficult for men to control an erection, more difficult for women to lubricate, and harder for both men and women to achieve an orgasm (Schiavi 1994; Verschuren et al. 2010). Sexual problems are common among patients with arthritis as they can experience joint pain, stiffness, and inflammation which discourages sexual activity (Panush et al. 2000). Incontinence and urinary tract problems are also associated with sexual dysfunction for both men and women (Hansen 2004; Zeiss and Kasl-Godley 2001). Furthermore, diseases that interfere with breathing, such as chronic obstructive pulmonary disease (COPD), emphysema, and asthma, can limit oxygen flow during intercourse and restrict sexual functioning (Schiavi 1994).

Empirical studies of adults in late midlife and older demonstrate how chronic diseases may affect sexual frequency and sexual dysfunction for men and women. Evidence suggests that there is a negative relationship between different chronic disease statuses and sexual frequency. For instance, a study of men 75-95 years old in Australia revealed that osteoporosis, prostate cancer, and diabetes were each associated with lower odds of being sexually active over the 13-year study (Hyde et al. 2010). Additionally, a study of men and women aged 50-90 and older that used Wave 6 of the English Longitudinal Study of Aging (ELSA) found a negative association

between sexual activity and chronic diseases which varied by gender; for men, having arthritis, hypertension, cardiovascular disease, and diabetes were related to lower sexual frequency, and for women, hypertension and diabetes were related to lower sexual frequency (Lee et al. 2016). Further, for sexual dysfunction, the same ELSA data indicated that having arthritis, cardiovascular disease, diabetes, and asthma was associated with men experiencing erectile difficulties (Lee et al. 2016). Other empirical studies that have been done on how chronic conditions are associated with sexual dysfunction often examine all-male samples. For example, a cohort of men 50 and older drawn from the Health Professionals Follow-up Study (HPFS) data found that those who had chronic conditions, either diabetes, cancer, stroke, hypertension, or heart disease had a greater prevalence of erectile dysfunction compared to healthy men (Bacon et al. 2003). Also, a study of men 65 and older at a geriatric outpatient clinic found that having diabetes and being incontinent were both related to experiencing sexual dysfunction, defined in the study as summary measure of having no libido, erectile dysfunction, and low sexual activity (Mulligan, Retchin, Chinchilli, and Bettinger 1988).

These findings demonstrate that certain chronic diseases can limit sexual behaviors among the older adult population. Still, many older individuals do remain sexually active while having chronic diseases (DeLamater and Moorman 2007; Liu, Waite, Shen, and Wang 2016). However, there is a lack of research that utilizes a scale measure of chronic diseases to examine how the burden they collectively present impacts sexual frequency and functioning. It is important to examine multimorbidity, or having more than one chronic condition, because it is a growing problem in the U.S. population that can create complex conditions which must be examined as a whole rather than individually (Andersson and Monin 2017).

The Present Study

I apply the IBM perspective to predict the relationship between chronic disease burden and sexual frequency and dysfunction among partnered older adults. The physical toll that chronic diseases take on the body can limit sexual frequency and functioning (Schiavi 1994), and the psychosocial changes in self-esteem and feelings of vitality that can come from disease diagnosis and management (Berdychevsky and Nimrod 2017; Levy 1994; Lodge and Umberson 2012). Although individuals can also learn to manage chronic diseases and incorporate their health and body changes into their sex lives (Kaplan 2003), this adaption may be more difficult for older adults because aging can slow the body's biological response to health conditions or because they are accustomed to established social routines (Schiavi 1994). Considering this information, I predict that:

Hypothesis 1: People who have a lower chronic disease burden will have a greater sexual frequency than people who have a higher chronic disease burden.

Hypothesis 2: People who have a lower chronic disease burden will have fewer sexual dysfunction problems than people who have a higher chronic disease burden.

Additionally, there are gender differences in health and sexual experiences. Older men's illnesses can extend the time it takes them to achieve an erection, while women's sexual performance is less affected by their physical health and more from the course of menopause (Levy 1994). Further, cultural ideas and masculine identity is more closely tied to men's ability to perform sexually than women's but trying to match these expectations is harder to do in old age (Lodge and Umberson 2012; Waite and Das 2010). These gender differences in biological and psychosocial dimensions suggest that in the face of multimorbidity, men's sexuality would be more vulnerable than women's. As such, I predict that:

Hypothesis 3: The associations between chronic disease burden and sexual frequency and sexual dysfunction will be stronger for men than women.

Data and Methods

I used data from two waves of the National Social Life, Health, and Aging Project (NSHAP). NSHAP is a population-based, community-resident sample that oversampled for African Americans, Latinos, men, and adults 75-84 years old. This dataset provided nationally representative longitudinal data on older Americans. A multi-mode collection of data occurred over a two-hour in-home interview, where a questionnaire was administered and biological marker data was collected. Interviewers also left behind a survey for a select sample to complete and return. The first wave of data collection occurred in 2005-2006 and sampled 3,005 respondents ages 57-85 (Waite, Laumann, et al. 2014). The second wave reinterviewed 2,261 of those respondents in 2010-2011 (Waite, Cagney, et al. 2014).

This study focused on the 1,607 respondents who were interviewed in both waves and who were married, cohabiting, or had an intimate partner at Wave 1 in order to assess the sexual frequency and functioning of partnered individuals. I excluded 73 participants who were missing data on one of the NCI scale measures, as this was a summary measure of all the dichotomously-measured chronic conditions. Thus, my final sample was 893 men and 641 women.

The sample size varied based on the outcome being tested, as respondents who were missing information on the outcome measure were dropped from that analysis. There were two respondents who were missing information on their drinking and exercise behavior, and because these variables were coded dichotomously, the missing cases were recoded into the mode category. The missing values for BMI and psychological distress were imputed at the mean. I ran robust tests for these missing values, such as excluding them and imputing them using single

imputation method, and the best results still occurred with the missing imputed at the mean, as reported in the result tables. All other control variables with missing cases were coded to have a missing category (see Tables 2-2 and 2-3).

Measures

Sexual Frequency. The first sexuality measure I examined was the sexual frequency of partnered individuals. In NSHAP, sex refers to "mutually voluntary activity with another person that involves sexual contact, whether or not intercourse or orgasm occurs" (Lindau et al. 2007:763). Frequency of having sex was determined by asking how often during the past year the respondent had sex with their partner. Options included never (reference category), once a month or less, 2-3 times a month, and once a week or more.

Sexual Dysfunctions. The second sexuality measure I examined was occurrence of sexual dysfunction, which was gender-specific. For men, I followed Cornwell and Laumann's (2011) measure of dysfunction, which was a composed of two functional problems: erectile dysfunction and anorgasmia. To measure erectile dysfunction, NSHAP asked men if, during the past year, there was a period of several months or more when they had trouble getting or maintaining an erection (0=no, 1=yes). To measure anorgasmia, NSHAP asked men if, during the past year, there was a period of several months or more when they were unable to climax (or unable to experience an orgasm) (0=no, 1=yes). I added if the respondent had trouble getting or maintaining an erection and if they had trouble achieving an orgasm, so that men's experience of sexual dysfunction was a summary measure, ranging from 0-2. Men either experienced neither dysfunction over the past year (score of 0), only experienced one of the dysfunctions (score of 1), or experienced both dysfunctions (score of 2).

To measure women's sexual dysfunction, I used an indicator for lubrication problems, one of the most common sexual problems older women experience (Lindau et al. 2007). NSHAP asked women if, during the past year, there was a period of several months or more when they had trouble lubricating, meaning the "vagina felt dry during sexual activity." Women who had experienced vaginal dryness during sex were coded dichotomously (0=no, 1=yes).

Chronic Disease Burden. I utilized a comorbidity index as a measure of multiple disease statuses to examine how chronic disease burden was related to sexual frequency and sexual functioning. I followed the NSHAP comorbidity index (NCI) that Vasilopoulous and colleagues (2014) created, which provided a framework for combining chronic conditions using NSHAP data. Their measure followed the widely used Charlson Comorbidity Index (CCI) (Charlson et al. 1987), but they expanded it to add conditions measured in NSHAP, including hypertension, skin cancer, bone diseases, and incontinence. Vasilopoulous and colleagues (2014) argued that the new NCI scale is better to use because it incorporates a broader range of diseases.

I created an NCI scale at Wave 1 following the measures Vasilopoulos and colleagues (2014) used. As seen in Table 2-1, it is a summary of 12 conditions, and each condition is assigned a higher or lower value based on its association with mortality risk (Vasilopoulos et al. 2014). The NCI scale ranges from 0-18. The higher score a person had on the index, the greater the burden of chronic disease in their life. All the variables used in the NCI scale construction were coded dichotomously, and respondents missing data on one or more conditions were not included in the index.

Other Covariates. I add sociodemographic and health behavior covariates that are all measured at Wave 1 and are related to the presence of chronic disease and sexuality.

Sociodemographic covariates. All the analyses are stratified by *gender*. *Race-ethnicity* is coded as non-Hispanic White (reference), non-Hispanic Black, Hispanic, and other. *Education* is broken into whether the respondent had a high school degree or below (reference), completed some college, or graduated from college. *Income* is measured as relative family income that asked respondents how their household income related to other American families, with response options of below average (reference), average, or above average family income. *Age* is a continuous measure, ranging from 57-85. *Marital status* is a dichotomous measure of whether the respondent was not married or cohabiting (reference) or if they were married or cohabiting.

Health related covariates. I include five health behavior measures to control for the effect that these measures may have on a person's chronic disease status (Fine et al. 2004) as well as their sexual frequency (Brody 2010; Butt 1990) and dysfunction (Camacho and Reyes-Ortiz 2005; Laumann et al. 2008). *Body mass index* (BMI) is a ratio of height to weight, and it was coded according to the Centers for Disease Control and Prevention's weight status categories: normal weight or underweight (BMI less than 25) (reference), overweight (BMI of 25—29.9), and obese (BMI of 30 and greater) (CDC 2015). *Smoking* measured if the respondent currently smokes cigarettes (0=no, 1 =yes). *Drinking* measured if the respondent ever drank any alcoholic beverages (0=no, 1=yes). *Physical activity* measured how frequently the respondent was physically active, including activities such as walking, playing sports, or gardening, with responses being less than 3 times per week (reference) and 3 or more times per week. Finally, I control for *psychological distress* to account for a respondent's mental well-being. Mental health can have consequences on men's and women's sexuality, with depression in older adults being tied to sexual activity (Bancroft 2007) and sexual dysfunction (Camacho and Reyes-Ortiz 2005). I followed the Center for Epidemiological Studies Depression Scale (CES-D) (Radloff 1977). In

this scale, respondents answered a series of 11 questions where they indicated how often in the previous week they felt: depressed, sad, lonely, happy, that everything they did was an effort, they had restless sleep, they did not feel like eating, that people were unfriendly, that they enjoyed life, that people disliked them, and that they could not get going. The responses were added together, with options ranging from rarely or none of the time (0) up to most of the time (3). The higher sum of all 11 items indicate a greater level of depression that the respondent had.

Analytic Approach

I tested the models in Stata 11 (StataCorp 2009), and all the analyses are weighted. I used lagged dependent variables approach to analyze sexual frequency and sexual dysfunction in relation to chronic disease burden between the two waves of data. Specifically, I used Wave 1 NCI to predict Wave 2 sexual frequency, while controlling for Wave 1 sexual frequency and all other covariates. I repeated this for the outcome of sexual dysfunction, again while controlling for Wave 1 sexual dysfunction and all other covariates. To test men's and women's sexual frequency, I estimated ordinary least squares (OLS) regression models. For men's sexual dysfunction, I estimated ordinal logistic regression models. For women's sexual dysfunction, I estimated binary logistic regression models. Finally, to account for sample attrition lost to mortality, I follow previous NSHAP studies (Liu and Waite 2014, Liu, Waite, and Shen 2016; Liu et al. 2016) and include a measure of the probability of death. This measure was developed by Heckman (1979), and it helps to correct for selection bias by estimating the probability that respondents would die between Waves 1 and 2.

Results

Descriptive Results

Table 2-2 shows the weighted descriptive statistics of all the analyzed variables for partnered men (N=893), and Table 2-3 shows these results for partnered women (N=641). The t-test results for gender comparison are also included in each table, with an indicator for when the test was significant at $p<0.05$ level. The NCI scale measuring chronic disease burden allows for a maximum score of 18, but for men, the range was 0-12 points and for women it was 0-10 points. Women have a significantly higher chronic disease index score at Wave 1 compared to men (2.53 vs. 2.34), but men have a significantly higher probability of death at Wave 2 (0.11 vs. 0.07). This is in line with previous research that finds women have higher morbidity rates while men have higher mortality rates (Rieker and Bird 2005; Vaupel 2010). For sexual frequency at Wave 1, only men and women who are having sex either once a week or more or not at all are significantly different from one another, while sexual frequency at Wave 2 shows that men and women are statistically different in all categories except having sex 2-3 times a month. At both Wave 1 and Wave 2, a greater percentage of men than women report having had sex at all frequency levels, once a month, 2-3 times a month, and once a week or more. About half of men experienced no sexual dysfunction at Wave 1 (47.30%); this number was similar in Wave 2 (49.47%). The percentage of men who experienced either trouble with getting/maintaining an erection or trouble achieving orgasm increased from Wave 1 to Wave 2 (18.96% to 29.48%), as did the percentage of men who experienced both dysfunctions (10.76% to 21.05%). For women, there was an increase in the percent who experienced lubrication troubles between Wave 1 to Wave 2 (25.46% to 30.88%).

Men are significantly more likely than women to be a college graduate. Women are significantly more likely to report having an average family income and to be Non-Hispanic White than men. There is no significant difference in age across gender, nor are men more likely than women to be married/cohabiting. The lack of any statistical differences in these measures is likely due to the fact that my sample selection focused on partnered individuals, thus eliminating women who are widowed or who have outlived their husbands in Wave 1.

In terms of health-related covariates, men are significantly more likely to be obese, while women are more likely to have a normal or underweight BMI. There are no significant differences between men and women in smoking status. However, husbands are significantly more likely than wives to drink alcohol (69.40% vs. 58.21%) and to exercise three or more times a week (71.27% vs. 62.90%). Finally, women have significantly higher scores on the psychological distress scale than men (4.99 vs. 4.23). This follows previous research which finds that women often report more depression and depressive symptoms compared to men (Kessler 2003; World Health Organization 2002).

Sexual Frequency

I first estimate the link between chronic disease burden at Wave 1 and sexual frequency at Wave 2. Table 2-4 shows the estimated regression coefficients for sexual frequency by chronic disease burden for men and women after controlling for all sociodemographic and health-related covariates. For men, the results in Table 2-4 suggest that chronic disease burden, measured using NCI, is significantly and negatively related to sexual frequency. Specifically, men who have a higher burden of chronic disease tend to have sex less frequently than men who have a lower burden of chronic disease ($\beta = -0.06$, $p<0.05$).

For women, the sexual frequency results in Table 2-4 suggest that there is no significant relationship between chronic disease burden and later sexual frequency. I ran t-tests to compare men's and women's outcomes, and the results (shown in Appendix A1) indicate that the differences for men's and women's results in Table 2-4 are statistically significant at the level of $p<0.05$. I also ran tests on a sample that combined men and women and included an interaction term of NCI by male. The results (shown in Appendix A2) indicated that there was a significant, negative interaction term meaning that the relationship of chronic disease burden on sexual frequency does depend on gender, specifically for men. The main effect of NCI was not significant, meaning that the relationship was not significant for women. These findings support the results presented here.

Sexual Dysfunction

Table 2-5 shows results for chronic disease burden predicting sexual dysfunction (i.e., experience of trouble getting/maintaining an erection and trouble achieving an orgasm) for men. These results in Table 2-5 suggest that for men, chronic disease burden is not significantly related to sexual dysfunction. There is no significant association between an older man's total number of chronic diseases and his likelihood of experiencing anorgasmia and/or erectile dysfunction. However, for women, the results tell a different story. Table 2-6 shows results for chronic disease burden predicting sexual dysfunction (i.e., experience of lubrication problems) for women. Results in Table 2-6 suggest that there is a significant and positive relationship between chronic disease burden and having lubrication problems. Specifically, after Wave 1 sexual dysfunction, sociodemographic, and health behavior covariates are controlled, an increase in chronic disease status is significantly associated with a 12% greater odds of experiencing trouble lubricating at Wave 2 for women (i.e. e^0.11).

Discussion

The increase in the older adult population combined with more people living with chronic diseases is a growing area of concern for different aspects, including well-being, medical expenses, caregiving, and even sexuality. Sexuality of older adults is understudied, and there is a gap in the literature on how increasing disease in later life may impact sexual behaviors. This is a salient topic because sexual frequency continues into later life, especially for people who were sexually active earlier in life (Lindau and Gavrilova 2010). Sexuality in later life can be an enjoyable, leisure activity that brings different benefits (Berdychevsky and Nimrod 2017). Positive sexual activity can increase happiness, quality of life, and relationship quality with one's partner, while interruptions or problems with sexual activity can contribute to anxiety, stress, and relationship problems (Laumann et al. 2005; Merghati-Khoei, Pirak, Yazdkhasti, and Rezasoltani 2016). I applied a biopsychosocial approach to the analysis of partnered older men and women to examine how chronic disease burden shaped their sexual behaviors and sexual dysfunctions. My use of two waves of nationally representative data allows me to comment on how chronic disease burden from five years prior is related to one's sexual frequency and dysfunction. These findings are especially important, as there is still a need for social researchers to understand what the sexual experiences of disease-burdened older adults may include as they age (Burgess 2004; Kornrich, Brines, and Leupp 2013). Overall, the results reveal that chronic disease burden is related to sexuality for partnered older adults, but that there are important gender differences in how it manifests to be associated with sexual frequency and sexual dysfunctions.

Chronic Disease Burden and Sexual Frequency

Unhealthy individuals may be less inclined to have sex with their partner because chronic diseases interrupt normal biological functions that can contribute to difficulties with intercourse

and a lower sexual frequency (Schiavi 1994). Additionally, having one or more chronic diseases may harm a person's self-confidence and self-esteem which could also limit their sexual frequency (Merghati-Khoei et al. 2016). These biological and psychosocial factors may grow more prominent in old age and can present differently in men and women. Considering this, I predicted that individuals with a lower chronic disease burden would have a greater sexual frequency than people with a higher chronic disease burden (Hypothesis 1), and further that the association between chronic disease burden and sexual frequency would be stronger for men than women (Hypothesis 3). The results partially support this hypothesis, as chronic disease burden is inversely associated with sexual frequency, but this relationship is only significant for men. These gendered findings are related to my final hypothesis, but rather than one association being stronger, I find that only men's chronic disease burden is tied to their sexual frequency.

These results were somewhat expected, and there are several reasons that a larger chronic disease burden would be particularly harmful for men's sexual frequency. First, men's physical health is more closely tied to their sexual response cycle than women's because proper erectile functioning is intertwined to good blood flow, such that conditions like coronary artery disease or diabetes can inflict vascular problems and result in erectile failure (Meston 1997; Schiavi 1994). For older men, this inability to engage in sex as easily as they did when they were younger may lead to a lower sex frequency (Meston 1997). Second, cultural definitions that tie masculinity to sexuality may leave unhealthy, older men preoccupied and anxious as they try to meet cultural expectations and hinder their sexual activity (Merghati-Khoei et al. 2016). My results echo these findings even after adding a number of sociodemographic and health-related controls. In addition to these biopsychosocial pressures, there are other factors that come with having one or more chronic diseases which hinder the sexual frequency of diseased men. It could

be that the medications they are prescribed for their disease lowers their sex drive (Camacho and Reyes-Ortiz 2005). Or, the different diseases that they are managing may leave them too disabled to attempt to have sex or wear them out so much that they do not feel up to it (Merghati-Khoei et al. 2016). Further, a man may be busy as a caregiver for their partner's own illnesses, and they lose sexual interest (Hayes, Boylstein, and Zimmerman 2009).

For partnered, older women, the null findings were surprising. I find no evidence that older women's chronic disease burden is related to how frequently they have sex. The lack of evidence suggests that other factors may be more important in determining how often women have sex. One major change unique to women is menopause, and women in or post-menopause incur biological changes which may influence their sexual frequency in a more significant way than their chronic disease burden. This is because menopause brings a depletion of estrogen and testosterone which lead to a host of changes to women's sexual experiences, from vaginal dryness to discomfort during intercourse to decreased sexual desire (Ambler et al. 2015). In addition to menopause's complications, the sexual frequency of older women with multiple chronic diseases may be more linked to their relationship with their intimate partner and their satisfaction with their sexual relationship (Liu et al. 2016). Further research is needed to examine this topic.

The different results demonstrate a gender difference in chronic disease burden and sexual frequency, with the suggestion that among partnered older adults who are concerned about how frequently they have sex, it is the presence of chronic diseases in men which is associated with this aspect of sex. This may be because in late life, men who are healthier (i.e. have fewer chronic diseases) may find they can better uphold their masculine identity in part because they can still have intercourse (Lodge and Umberson 2012). Men are often the initiators

of sex, so being in good enough health to be able to do so may contribute to maintaining sexual frequency in older age (DeLamater and Hyde 2008). Of course, given the natural changes of age combined with any physical limitations incurred from chronic diseases, older adults may also need to incorporate different behaviors that emphasize quality over quantity to enjoy their sex lives (Levy 1994). A decrease in intercourse can be supplemented by engaging in different pleasurable activities, such as caressing or massaging, especially for caregiving spouses (Burgess 2004).

Chronic Disease Burden and Sexual Dysfunction

My second hypothesis predicted that people with a lower chronic disease burden would experience less sexual dysfunction than people who have a higher chronic disease burden. Given the gender differences in the sexual response cycle, cultural pressures for men's sexual performance, and the physical effects of aging, I further predicted that the link between chronic disease burden and sexual dysfunction would be stronger for men than women (Hypothesis 3). Again, I found partial support for my hypotheses. For older men, I find that an increasing number of chronic diseases is not related to their experiencing more sexual dysfunctions in terms of erectile dysfunction and anorgasmia. On the other hand, older women's NCI is significantly related to their experience of sexual dysfunction. As women's chronic disease burden increases, so does their odds of experiencing trouble lubricating.

Post-menopausal older women experience lubrication trouble due to a decrease in estrogen that makes lubrication more difficult (Kingsberg 2002). However, both the present results and previous research indicate that chronic diseases can also contribute to women's sexual dysfunction. Physiologically, women with diabetes have decreased vaginal engorgement during sex (Ambler et al. 2015) while suffering from chronic urinary problems and incontinence

is associated with a decrease in women's lubrication (Salonia et al. 2004). Like men, women also need a healthy cardiovascular system to be normally aroused, but there is a lack of research on the pathways by which chronic cardiovascular problems interrupt women's sexual functioning (Ambler et al. 2015). Psychosocially, the stress of being diseased and managing an illness could interrupt normal sexual functioning, and different studies have found that psychological distress has a larger impact on women's sexual experiences (Ambler et al. 2015; Laumann et al. 1999). Still, there may be other factors, such as medications being used or a woman's relationship quality with her intimate partner, which link women's chronic disease burden and sexual dysfunction (Ambler et al. 2015; Meston 1997).

Overall, my findings indicate that a greater chronic disease burden is related to the sexual experiences of older adults. First, having a lower burden of chronic disease is important for a man to continue having sex as he gets older. Regardless of his sociodemographic or health related covariates, an older man's total chronic disease burden is negatively related to how frequently he has sex in the future, so it is in the interest of partnered older men who wish to remain sexually active that they lead a lifestyle that keeps chronic diseases at bay. Second, for older women, their main complication from chronic disease burden is their greater odds of experiencing sexual dysfunction. Lubrication troubles more readily occur in older age, but the addition of one or more chronic diseases contribute to this problem (Ambler et al. 2015). Considering the relationship that an increased chronic disease burden has with sexuality, In order to incorporate the changes and consequences that chronic diseases have on their sex lives, partnered older adults may need to include different sexual expressions, adjust to less frequent sex, or better manage their sexual dysfunctions (Call, Sprecher, and Schwartz 1995).

Limitations

There are different limitations to this analysis, the first being that the outcomes include sexual activity measures, which can be a sensitive data collection topic that may include response bias and overreporting (Hyde et al. 2010). Also, this study does not control for any medications respondents may be taking. Considering the multiple chronic diseases that are included in the index and the amount of medications which could be prescribed for each of them, there were far too many medications to account for. Previous research indicates that certain drugs, such as blood pressure medications or selective serotonin reuptake inhibitors prescribed for depression and anxiety, have a negative effect on sexual performance (Camacho and Reyes-Ortiz 2005). Future studies can examine how certain drugs may interact to play a role in the sex lives of older adults with multiple chronic diseases. Along the same lines, I did not control for the use of pills to combat erectile dysfunction. The dataset includes a variable which asks respondents about taking impotence agents, but fewer than 30 respondents indicated that they use such drugs. Because of the small cell size, this variable is not very useful. Furthermore, only the perspective of one member of the sexual relationship is included. Certainly, a sexual partnership includes two people, and by only examining the respondent's chronic disease burden, I am precluded from analyzing how one's partner's disease status also impacts their relationship. I plan on exploring this topic in future analyses. Finally, dataset limitations further restrict the analysis to heterosexual couples. In general, there is limited representative data on the sexual lives of older LGBT adults (DeLamater and Hyde 2004). More data collection is needed to better study this population and to make comparisons across straight and gay/lesbian partnerships.

Conclusion

This study is the first to consider how chronic disease burden among partnered older adults is related to their sexual frequency and sexual dysfunctions using a nationally representative dataset. It demonstrates that older adults' chronic disease burden, a summary measure of their chronic conditions as they are related to mortality, are related to men's sexual frequency and women's sexual dysfunction. The number of adults living with more than one chronic diseases is increasing (Ward and Schiller 2013), and this study provides some insight on how this can have an impact on the often-understudied sexual lives of older adults. Although they are getting older, adults are not losing their desire to have sex (DeLamater and Sill 2005). These findings help paint a picture of what sexuality looks like for older adults, particularly when they are trying to be sexually active while managing chronic diseases. There is still more work to be done in this area, but the current results can offer some guidance for older adults as they approach changes to their health and sexuality in later life, as well as health practitioners and policy makers who are considering how the growing levels of disease in the United States may influence other areas of life, including sexuality.

CHAPTER THREE

MARITAL QUALITY AND SEXUAL FREQUENCY AMONG DISEASE-AFFLICTED OLDER ADULTS

Introduction

The population of older adults in the United States is projected to continue growing in future decades (Centers for Disease Control and Prevention, 2013). This burgeoning age group has attracted much research focus as scholars consider the implications of increased longevity on multiple domains of life. One historically understudied dimension of older adults' lives which is garnering more attention is sexuality. Part of the research on older adults' sexuality concentrates on how the increased incidence of chronic disease in this population coincides with sexual dysfunctions and cessation (Verschuren, Enzlin, Dijkstra, Geertzen, and Dekker 2010). However, less research explores how psychosocial factors such as marital quality may help or hinder disease-afflicted older adults' sexual experiences.

This study examines how positive and negative dimensions of the marital relationship are related to the sexual frequency of older adults in heterosexual relationships who have been diagnosed with one or more chronic diseases. Over 90% of adults age 65 and older have at least one chronic condition (Akinyemiju, Jha, Moore, & Pisu, 2016). The presence of one or more chronic diseases in later life can disrupt sexual activity (Schover and Jensen 1988). Chronic diseases can also result in increased dependency on others for help and management (Berg and Upchurch 2007) and be a source of stress (Maes, Leventhal, and DeRidder 1996). Marital quality is a route by which disease-burdened individuals can buffer the stressor of disease and avoid a decline in their sexual activity (Schnarch 1991). Drawing upon the stress-buffering theory, this

paper investigates the following research questions: 1) how does marital quality affect the sexual frequency of older adults after the onset of chronic disease, and 2) is there a gender difference in this relationship?

The importance of this study is highlighted by the multiple benefits that sex in later life brings. Sex is an integral aspect of a relationship, and culturally, sex is seen to foster happiness and longevity (Fisher 2010; Lodge and Umberson 2012). Older adults identify sex to be tied to well-being and quality of life (Berdychevsky and Nimrod 2017; Syme 2014). Sexual activities can increase mood and decrease stress (Brody 2010). Although chronic diseases can disrupt sexuality in older adults, good marital quality has the potential to play a role in protecting sexuality among unhealthy individuals in later life.

Health and Older Adults' Sexuality

Being in good health is important for older adults' continued sexual behavior while being unhealthy can be detrimental to sexuality. Individuals who are in poor health have a greater likelihood of experiencing a sexual problem or lower sex frequency, and poor health is a contributing factor to marriages void of sexual activity (Call, Sprecher, and Schwartz 1995; Donnelly 1993; Laumann, Gagnon, Michael, and Michaels 1994). Chronic conditions, such as cardiovascular disease, diabetes, obesity, and hypertension, are linked to older adults' sexual problems and lower sexual activity (Camacho and Reyes-Ortiz 2005; DeLamater 2012; DeLamater and Karraker 2009). Additionally, patients with irregular thyroid activity, incontinence, asthma, or chronic obstructive pulmonary disease can also experience sexual dysfunctions from these conditions (Zeiss and Kasl-Godley 2001). Health problems, especially if they are chronic, affect both men and women as they try to engage in sexual activities (Call et al. 1995, Syme 2014). Older men and women still have the capacity for intercourse and orgasm, and

many still desire it. The limiting factor for sex among this population is most often their physical health rather than their age (Waite et al. 2009).

Physical changes that naturally occur over the life course can impact sexuality (Levy 1994). For instance, when women experience menopause, estrogen declines and intercourse becomes uncomfortable because the vagina shrinks and makes penile insertion difficult (DeLamater and Friedrich 2002). However, this problem is not inevitable, as vaginal atrophy can be counteracted with regular coital activity (Levin 2007). As men age, their testosterone decreases which makes getting an erection more difficult (DeLamater and Karraker 2009). However, they can communicate this problem to their partner and try new methods or spend more time having sex to still maintain their sex lives (Zeiss & Kasl-Godley 2001). Thus, it is important to consider how other factors, such as relationship factors, play a role in the association between health and sexuality. This is because sexuality is determined not only by biological factors, but also by psychological and social factors (Lindau, Laumann, Levinson, and Waite 2003). For instance, after an individual has been diagnosed with a chronic disease, having a more positive marital relationship may help assuage health concerns and incorporate physical limitations so that there is not a decrease in sexual activity or functioning. In contrast, negative marital interactions may encourage a decrease in sexual activity and functioning after chronic disease onset. To explain the relationship between marital quality and sexuality, I work from a stress-buffering perspective.

Theoretical Approach: The Stress-Buffering Model

Chronic diseases progress slowly, require constant attention, and can rarely be cured (U.S. Department of Health and Human Services 2010). Having a chronic disease can be stressful in a variety of ways (Bisschop, Kriegsman, Beekman, and Deeg 2004) and having one

or more chronic diseases is a source of stress (Jackson, Knight, and Rafferty 2010). When multiple events cause stress or if multiple stressful problems accumulate, serious complications can occur (Cohen and Willis 1985). However, social relationships may play a role in managing—or enhancing—that stress. The stress-buffering model suggests that social support is protective for well-being when a person is stressed (Cohen and Willis 1985; Robles, Slatcher, Trombello, and McGinn 2014). This model incorporates an individual's perception of their stress and their support to influence their health (Cohen, Gottlieb, and Underwood 2000). The marital relationship is one of the most important social relationships which can provide either stress or support (Robles and Kiecolt-Glaser 2003; Umberson, Williams, Powers, Liu, and Needham 2006). As Galinsky and Waite (2013) suggest in their model, poor health can lead to stress which can lead to worse marital quality. However, positive marital quality, such as social support from a spouse, can help mediate the stress and buffer negative outcomes (Cohen and Willis 1985) while negative marital quality can be an additional stressor, compound the stress, and enhance problems (Robles and Kiecolt-Glaser 2003).

I extend this stress-buffering approach to sexuality, as stress often corresponds with sexual problems (Schnarch 1991). Both physical health conditions and relationship well-being can contribute to problems with sexual functioning (Laumann, Das, and Waite 2008). Negative marital quality is a source of strain and being stressed can have a negative impact on maintaining sexual activity (Laumann, Paik, and Rosen 1999; Laumann et al. 2008). However, couples who are more supportive of one another may be able to adapt to their stressors and avoid a decline in their marital sexuality and intimacy (Schnarch 1991). Thus, the stress-buffering model would suggest that among individuals who are afflicted with chronic disease, positive marital quality

would help buffer the stress from being unhealthy so that sexual frequency continues, while negative marital quality would enhance that stress and lead to decreased sexual activity.

Marital Quality and Sexuality: Positive and Negative Dimensions

Marital quality can bring benefits for older adults, such as increased quality of life, life satisfaction, and happiness (Carr, Freedman, Cornman, and Schwarz 2014; Hinchliff, Tetley, Lee, and Nazroo 2018). Marital quality also affects sexual experiences (Verschuren et al. 2010), however there is little understanding of how marital quality is related to sexual activity. While it may be a logical assumption that good marital quality would be associated with a better sex life (Brubaker 1990), there is limited evidence on this topic. Research using a representative sample of older adults shows that their marital quality can be protected through sexual activity even when they or their partner are in declining health (Galinsky and Waite 2014), but there are no studies that examine how marital quality may protect sexual activity in unhealthy older populations. Instead, there has been some research done in more general populations to examine how positive and negative marital quality are related to sexual frequency.

Positive Marital Quality. Positive martial quality, which refers to "positive experiences such as feeling loved, cared for, and satisfied in the relationship" (Umberson and Williams 2005, p. S109), can help older adults to continue sexual activity (DeLamater 2012). Empirical evidence on how positive marital quality is related to sexual frequency is limited and largely comes from convenience samples. An analysis of a convenience sample of older couples found that better marital quality was correlated with greater sexual frequency and more interest in sex (Brubaker 1990). Another community sample of partnered, middle-aged women found an association between sex frequency and positive marital quality (Hawton, Gath, and Day 1994). In a convenience sample of married couples ages 56-92, better marital quality was correlated with

more sexual interest, while worse marital quality was linked to lower sexual interest of older adults (Ade-Ridder 1990). Marital happiness has also been associated with sexuality. A cross-sectional sample of adults 19 and older found that people in marriages that were happier and more satisfying had higher sexual frequency (Donnelly 1993). A representative study of older adults found that higher levels of marital happiness was associated with continued sexual activity (Karraker and DeLamater 2013). Further, a nationally representative survey of married adults 18 and older found that being satisfied in one's marriage was positively associated with frequency of marital sex (Call et al. 1995). These studies, while not focusing on unhealthy adults and how marital quality can buffer health stressors, demonstrate a positive pattern between marital quality and sexuality.

Although it is currently unclear how positive marital quality is related to sexuality for older individuals with a chronic disease, it is likely that the support from better marital quality would have a protective effect on sexuality. Research indicates that individuals have better marital adjustment when they feel that their spouse is supportive rather than controlling (Berg and Upchurch 2007). For instance, individuals who experience positive marital quality may receive more support from their spouse which can protect against other stressors, such as chronic diseases, and not harm their sex life (Donoho et al. 2013). As these studies demonstrate, positive feelings and emotions toward a spouse are beneficial for sex (DeLamater and Hyde 2004). Given this information, I predict that:

> *Hypothesis 1:* After chronic disease burden onset, people who have higher levels of positive marital quality will have higher sexual frequency than people who have lower levels of positive marital quality.

Negative Marital Quality. Similar to studies of positive marital quality, there is little research about how negative marital quality, defined as "negative experiences such as demands from one's spouse and marital conflict" (Umberson and Williams 2005, p. S109), is related to sexuality. Several studies using data from community and clinical samples find a link between poor marital quality and sexual activity. A cross sectional study of adults who were 45 years old on average found that negative marital quality was associated with a decrease in sexual activity (Call et al. 1995). A longitudinal survey of partnered, middle aged women found that less spousal support was predictive of a later decline in desire to have sex (Hällström and Samuelsson 1990). A community sample of women saw a significant relationship between sexual dysfunction and negative marital quality (Osborn, Hawton, and Gath 1988), while another convenience sample found that, among middle-aged couples, those who struggled with low sexual desire had worse marital quality compared to those couples who did not have this problem (Trudel, Landry, and Larose 1997). One representative study of older adults found that being dissatisfied with their relationship with their partner was tied to older women's difficulty achieving orgasm and old men's greater disinterest in sex (Laumann et al. 2008). Finally, a clinical sample comparing diabetic and nondiabetic women found that problems with sexual functioning were related to poor marital quality regardless of diabetes status (Enzlin et al. 2002). These studies demonstrate that there is a relationship between marital quality and sexuality, and that this is even true among individuals with a chronic disease.

Worse marital quality in older adults' relationships is associated with the cessation of sexual behaviors (Karraker and DeLamater 2013). One characteristic of sexually inactive marriages is that spouses are unhappy with their marital relationships (Donnelly 1993). Still,

there is no data on how this relationship occurs for a nationally representative sample of unhealthy, older adults. Drawing upon this information, I anticipate that:

Hypothesis 2: After chronic disease burden onset, people who have higher levels of negative marital quality will have lower sexual frequency than people who have lower levels of negative marital quality.

Gender Differences. The limited empirical evidence on this topic does not leave much room for comparing men's and women's experiences with sexuality. However, previous research does show that experiences of marital quality vary by gender. First, women experience more distress from their marital relationship than men, as women are more aware of and sensitive to their marital quality and their spouse's experiences in the relationship (Berg and Upchurch 2007; Kiecolt-Glaser and Newton 2001; Liu and Waite 2014). Women can also spend more time reminiscing about marital disagreements which can arouse stress or leave them feeling depressed (Kiecolt-Glaser, Glaser, Cacioppo, and Malarkey 1998). Further, women's sexual desire is more sensitive to their relationship context, while men's desire is not as heavily linked to their relationship or even having a partner (DeLamater and Sill 2005). Still, men may report greater relationship satisfaction than women (Smith et al. 2011). So, women may be more reactive to their marital quality than men while men will report higher levels of marital quality than women.

As for sex, some women think that problems with engaging in and enjoying sex come from problems within their marriage (Hawton et al. 1994; Osborn 1988). One study of 45 couples, who on average were married for almost four decades, found that men's marital quality is correlated to their own sexual desire, while their wives' sexual desire does not affect their marital quality; however, women in this study were more attuned to their partner, as their husband's sexual desires were related to their marital quality even though their own desires were

not (Brubaker 1990). Overall, marital quality is a stronger predictor of older women's sexual activity while physical health is more predictive of men's sexual activity (Dominguez and Barbagallo 2016). This evidence shows that while there is a link between marital quality and sexuality for both men and women, women's sexual lives may be more strongly linked to marital quality than men. Therefore, I form my final hypothesis:

Hypothesis 3: After chronic disease onset, the effect of marital quality on sexual frequency will be stronger for women than men.

Data

I use data from Waves 1 and 2 of the National Social Life, Health, and Aging Project (NSHAP) to test my hypotheses. NSHAP data is nationally representative of U.S. community-residing adults who were 57-85 years at Wave 1. Respondent information was collected by the National Opinion Research Center (NORC) at the University of Chicago. Data collection included over sampling of men, African Americans and Latinos, and adults 75-84 years old (Waite, Laumann, Levinson, Lindau, & O'Muircheartaigh 2014). From 2005-2006, the first wave of NSHAP data was collected from a sample of 3,005 adults. The interviews took place in respondents' homes and included biomarker data collection and a leave behind questionnaire that respondents returned via mail (Waite, Laumann, et al. 2014). For the second wave of data, collected from 2010-2011, NSHAP re-interviewed 2,261 of the Wave 1 respondents and collected similar data using interviews, biomarker collections, and leave behind questionnaries (Waite, Cagney, et al. 2014).

Sample Selection. I restricted my analysis to the 1,250 respondents who were interviewed and who remained married or cohabiting in both waves. Married and cohabiting couples in later life are more similar compared to their younger cohorts and they are relatively similar in terms

their appraisals of marital quality (Brown and Kawamura 2010; Lindau et al. 2010). For the sake of brevity, however, I refer to "husbands," "wives," and "marital quality" throughout the paper. Additionally, I focused on individuals who, at baseline, had at least one chronic disease. To identify which disease diagnoses qualified respondents to be in my analytic sample, I followed Vasilopoulos and colleagues' (2014) classification of chronic diseases in Wave 1 of NSHAP which are most prevalent among older adults, which are associated with mortality and disability, and which have an impact on their overall health and aging. This included seven categories of conditions: cardiovascular, endocrine and metabolic, cancer, lung, inflammatory and bone, neurological, and sensorimotor conditions (Vasilopoulos et al. 2014). Diseases in each of these categories have been linked to poor sexual outcomes (Schover and Jensen 1988). Specifically, I included individuals who were diagnosed by a doctor (yes/no) with hypertension, heart attack, congestive heart failure, stroke, diabetes, skin cancer, non-skin cancer, metastatic cancer, chronic obstructive pulmonary disease, emphysema, asthma, arthritis, Alzheimer's disease, dementia, urinary incontinence, stool incontinence, or other urinary problems. If a respondent had one or more of these diseases at Wave 1, they were included in my sample. There were 146 men and women who reported never being diagnosed with any of these conditions by a doctor, and there were 8 respondents who were missing on all measures; these 154 respondents were excluded from the analysis sample. Further, I excluded cases with missing values on key measures including Wave 2 sexual frequency (N=27) and marital quality (N=57). The final analytic sample include 608 men and 404 women.

Measures

Sexual Frequency. Sexual frequency at Wave 2 was the key outcome measure. NSHAP gave the following definition of sex to respondents when asking sexuality-related questions: sex

refers to "mutually voluntary activity with another person that involves sexual contact, whether or not intercourse or orgasm occurs" (Lindau et al., 2007, p. 763). Sexual frequency was the combination of two variables. First, NSHAP asked respondents whether they had sex in past three months (yes/no). NSHAP also asked respondents how frequently during the past twelve months respondents had sex with their partner (none, once a month, two to three times a month, once a week or more). I combined these variables so that sexual frequency was a continuous measure reflecting frequency of sexual activity in the past year, ranging from none (0) to once a week or more (3).

Marital Quality. Marital quality was the key predictor variable, and it consisted of positive and negative aspects. Marriages can include high or low positive and negative aspects at the same time, so each of these aspects of marital quality should be examined separately (Kiecolt-Glaser and Newton 2001; Umberson et al. 2006). I followed previous research that used NSHAP data to create marital quality measures (Galinsky and Waite 2014; Liu and Waite 2014; Liu, Waite and Shen 2016; Warner and Kelley-Moore 2012; Waite, Iveniuk, Laumann, and McClintock 2017). There were eight measures used to form the two dimensions of marital quality, and they were recoded so that the response categories were consistent and in the same direction.

For item one, respondents were asked how close they felt their relationship was with their spouse, with response categories including not very or somewhat close (1), very close (2), and extremely close (3). For item two, respondents were asked how they would describe their marriage in terms of happiness, with categories collapsed to include unhappy (1), happy (2), and very happy (3). For item three, respondents were asked how emotionally satisfying they find their relationship with their spouse, with response categories collapsed to include not satisfied

(1), satisfied (2), and very satisfied (3). For item four, respondents were asked if they spend their free time together or apart from their spouse, with responses reversed coded to be mostly apart (1), some together and some apart (2), and mostly together (3). For item five, respondents were asked how often they can open up to their spouse, with responses including never, hardy ever, or rarely (1), some of the time (2), and often (3). For item six, respondents were asked how often they can rely on their spouse, with responses including never, hardy ever, or rarely (1), some of the time (2), and often (3). For item seven, respondents rated how often their spouse makes too many demands on them, with responses including never, hardy ever, or rarely (1), some of the time (2), and often (3). Finally, for item eight, respondents rated how often their spouse criticized them, with responses including never, hardy ever, or rarely (1), some of the time (2), and often (3).

I ran exploratory factor analysis using these eight measures which yielded two dimensions, positive and negative marital quality. Table 3-1 includes the factor loadings of each measure that are used to create factor scores for each of the continuous positive and negative marital quality variables.

Additional Covariates. I controlled for a respondent's sexual frequency at Wave 1. This variable was coded using the same two variables as the Wave 2 measure, except that it included a missing category and was treated as a categorical variable to account for the missing group. The response categories for sexual frequency a Wave 1 were never (reference), once a month, two to three times a month, once a week or more, and missing.

I included several sociodemographic covariates in my analyses, all measured at Wave 1, which relate to marital quality and sexuality. *Age* was a continuous measure which ranges from 57-85. I coded *race/ethnicity* into four categories: non-Hispanic white (reference), non-Hispanic

black, Hispanic, and all others. The measure for *income* asked respondents to compare their income to other Americans. Response categories were coded into below average (reference), average, above average, and missing. Finally, *education* was a continuous measure ranging from having no high school degree (1) to having a college degree or higher (4). These covariates and my analyses are stratified by *gender*.

Analytic Approach

I used lagged dependent variables to analyze how, among individuals who have been diagnosed with at least one chronic disease, marital quality is related to sexual frequency. Specifically, I used Wave 1 marital quality, as well as the change in marital quality from Wave 1 to Wave 2 to predict Wave 2 sexual frequency, while controlling for Wave 1 sexual frequency and all other covariates. I ran separate analyses for men and women, with two models for each. In Model 1, I tested measures of positive marital quality. In Model 2, I tested measures of negative marital quality. All models are estimated using ordinary least squares (OLS) regression. I ran the models in Stata 11 (StataCorp, 2009), and all the analyses were weighted. I ran *t* tests to determine if there were statistically significant differences between men's and women's outcomes. Results for the *t* tests (shown in Appendix A3) indicated that gender differences in all findings were statistically significant.

Correction for Sample Selection

I restricted my sample to people who provided data in both waves, and I made some corrections to account for changes that would occur in the sample over the five-year period between data collections. I accounted for sample attrition that occurred from mortality by including a measure of the probability of dying between waves. I also included a measure that accounted for the probability that respondents would remain married or partnered across waves.

These probability measures were developed by Heckman (1979); to help correct for selection bias, the measures estimated the probability that respondents would die or experience marital dissolution between Waves 1 and 2. These corrections have been calculated in previous studies using the first two waves of NSHAP data and included in their data analysis (Liu and Waite, 2014; Liu et al. 2016).

Results

Descriptive Results

Table 3-2 depicts the weighted descriptive statistics for partnered men (N=642) and women (N=427). The *t* test results to determine if gender differences were statistically significant at or below the $p<0.05$ level are included with an indicator. From Table 3-2, it is evident that on average, men reported a significantly higher frequency of sex than women in Wave 2. Considering men's and women's sexual frequency at Wave 1, a significantly greater percent of women reported having no sex in the past year (33.56%) compared to men (22.89%), while a significantly greater percent of men reported having sex once a month in the past year (25.78%) compared to women (19.86%). There were no significant differences in the percentage of men and women reporting having sex 2-3 times a month or once a week or more in the past year.

In terms of marital quality, men report significantly higher scores of positive and negative marital quality at both Wave 1 and Wave 2 compared to women. There are only modest changes in positive and negative marital quality between waves for men and women. For sociodemographic covariates, the average age of the sample is about 66 years old, with no significant difference between men and women. Men and women have similar education levels, with an average for both being between having a high school degree and having experienced some college education. A large majority of the sample are non-Hispanic white. A significantly

greater percentage of women than men report having an average family income compared to other American families.

Sexual Frequency

Table 3-3 shows the regression coefficients from ordinary least squares (OLS) regression models for sexual frequency at Wave 2 predicted by marital quality at Wave 1 and the change in marital quality from Wave 1 to Wave 2, separated by men and women. Model 1 includes both positive marital quality predictors and Model 2 includes both negative marital quality predictors. For men, results in Model 1 of Table 3-3 suggest that higher positive marital quality at baseline and an increase in positive marital quality between waves is significantly associated with a higher sexual frequency at Wave 2 (W1 PMQ β=0.20, $p<0.01$; PMQ W1-W2 β=0.17, $p<0.01$), when holding Wave 1 sexual frequency and all other covariates constant. The effect size of these two positive marital quality measures are similar to one another. Men's negative marital quality is also related to their sexual frequency. Model 2 of Table 3-3 indicates that higher negative marital quality at baseline and an increase in negative marital quality between waves is significantly associated with a lower sexual frequency at Wave 2 (W1 NMQ β=-0.17, $p<0.01$; NMQ W1-W2 β=-0.15, $p<0.05$), when controlling for Wave 1 sexual frequency and all other covariates. Again, these negative marital quality measures have similar effect sizes.

The results for women tell a slightly different story. For both positive and negative marital quality, only a change in marital quality between waves significantly predicts sexual frequency at Wave 2. Specifically, in Model 1 of Table 3-3, women who experience an increase in positive marital quality between waves have a significantly higher sexual frequency at Wave 2 (β=0.15, $p<0.01$), when holding Wave 1 sexual frequency and all other covariates constant. In Model 2 of Table 3-3, women who experience an increase in negative marital quality between

waves have significantly lower sexual frequency at Wave 2 (β=-0.18, $p<0.01$), when controlling for Wave 1 sexual frequency and all other covariates.

Discussion

Chronic diseases can add complications, challenges, and stressors to a marriage; these diseases may limit sexual activity in older age (Call et al. 1995; Donnelly 1993; Laumann et al. 1994). Marital quality may be one way to protect sexual activity, as it plays a role in both the health (Liu et al. 2016) and sexuality (Galinsky and Waite 2013) of partnered older adults. Positive marital quality may allow older adults with chronic conditions to buffer the stress that comes from being unhealthy and continue having sex (Cohen and Willis 1985; Donoho et al. 2013). This is because a more supportive partner, or positive interactions with one's partner, may help diseased individuals incorporate health and behavioral changes into their lives (Schnarch 1991). Thus, I predicted that among older adults diagnosed with chronic diseases, people who have higher levels of positive marital quality will have higher sexual frequency than people who have lower levels of positive marital quality (Hypothesis 1). At the same time, experiencing negative marital quality may exacerbate the stressors that accompany chronic diseases (Robles and Kiecolt-Glaser 2003). This could have a negative spillover into older adults' sex lives and result in a lower sexual frequency. So, I also predicted that among older adults diagnosed with chronic diseases, people who have higher levels of negative marital quality will have lower sexual frequency than people who have lower levels of negative marital quality (Hypothesis 2). The results supported both of these hypotheses, as positive marital quality was associated with an increase in sexual frequency and negative marital quality was associated with a decrease in sexual frequency for older men and women.

More research focuses on marital quality as an outcome and how varying amounts of sexual activity are associated with it (Galinsky and Waite 2013; Syme 2014; Waite et al. 2017). There is less research on the opposite direction, and none that focuses on a population of older adults afflicted with a variety of chronic disease. The limited information on the link between marital quality and sexuality in more general populations supports the relationships I find using an afflicted older sample, namely that an increase in older adults' positive marital quality over time, as well as higher positive marital quality at baseline for men, are related to higher sexual frequency five years later and that an increase in older adults' negative marital quality, as well as a higher baseline level of negative marital quality for men, is related to lower sexual frequency five years later.

These results may be somewhat explained by additional sexual relationship factors which demonstrate how marital quality is important for sexuality in other ways. Good relationships with one's spouse can encourage feelings that indirectly benefit sexual activity. For older women especially, feeling sexually attractive and having a positive body image play an important role in fostering sexuality (Lodge and Umberson 2012; Syme 2014). Additionally, being interested in and desiring sex is an important factor in facilitating sexual activity, particularly for older women (DeLamater and Sill 2005, Kingsberg 2002). Moreover, being open with one's sexual partner about health problems and being able to incorporate changes to the sexual relationship that come from these illnesses can lessen sexual activity interruptions (Lodge and Umberson 2012; Zeiss and Kasl-Godley 2001). Further, valuing sex as important is positively related to both older men's and women's sexual desire (DeLamater and Sill 2005), while being satisfied with one's relationship is associated with higher sexual frequency (DeLamater and Moorman

2007). It is possible that these various positive appraisals of one's relationship may be fostered by positive marital quality and facilitate more frequent sex in later life.

Although previous research has found that women are more attuned to their marital relationship, and it may have a stronger relationship to their health and well-being outcomes (Kiecolt-Glaser et al. 1997; Kiecolt-Glaser et al. 1998; Kiecolt-Glaser et al. 2005), I do not find that the relationship between marital quality and sexuality is stronger for unhealthy older women compared to unhealthy older men (Hypothesis 3). In fact, positive and negative marital quality are each tied to men's and women's sexual frequency with similar effect sizes across gender. The one gender difference in the results is that is it only a change in positive and negative marital quality that is important for influencing unhealthy older women's later sexual frequency; baseline measures of positive and negative marital quality were not significantly associated with women's later sexual frequency. This result is somewhat explained by literature that finds women are more in tune with their marital relationship and that it has a larger impact on them than men (Kiecolt-Glaser and Newton 2001). The finding that both baseline and change in marital quality are significant for predicting men's sexual frequency follows research that indicates more generally how better marital quality can encourage positive outcomes while worse martial quality can discourage them.

Moreover, the finding that women's marital quality at Wave 1 was not associated with their later sexual frequency is interesting because qualification for sample selection was that women were diagnosed with one or more chronic diseases at Wave 1. The results indicate that over the five years, which is a significant amount of time for disease progression but also for patients to learn how to properly manage their diseases, a rise in positive marital quality and a fall in negative marital quality was related to an increase in sexual frequency. In line with the

stress-buffering perspective, my results suggest that it is how sick women perceive their interactions with their spouse over time which is important in their later sexual frequency. Specifically, experiencing more positive marital quality where they feel close to their spouse and their spouse can be relied on that may strengthen their relationship with their partner and in turn have a significantly positive effect on their sexual frequency. The opposite is also true for negative marital quality, as it is women who are afflicted with chronic disease in old age and who perceive that their spouse becomes more critical or less reliable over time who experience a decrease in their sexual frequency. Donoho and colleagues' (2013) examination of inflammation markers for adults at midlife found that simply being married was beneficial for men's health, while women needed support and compassion from their partner to have marriage benefit their health. My results support a related pattern for sexual outcomes. Both measures of positive and negative marital quality are important for men's sexual activity, while for women, it is only experiencing an increase in positive marital quality and a decrease in negative marital quality over time that is related to an increase in their sexual frequency.

Contrary to cultural depictions of older adults, they are still having sex and continue to do so despite have chronic diseases. With increased longevity, the quality of life of older adults is a growing area of concern for researchers, policy makers, and health practitioners. Sexuality is one aspect of quality of life (Berdchevsky and Nimrod 2017; Fisher 2010), and older adults are curious about how these diseases and the medications prescribed for them will affect their sexual lives (Steinke 1994). Much of the research on marital quality among older adults focuses on how it is linked to their physical and emotional health, finding that higher levels of marital quality are associated with better physical health outcome (Robles et al. 2014) and that worse negative marital quality is related to greater emotional distress (Carr, Cornman, and Freedman 2016).

However, the current findings indicate that these associations can also be extended for older adults' sexual frequency and suggest that even in the face of disease, marital quality plays a significant role in their sexuality.

Limitations

My analysis of two waves of longitudinal data collected five years apart allow me to comment on how baseline as well as changes in positive and negative marital quality are associated with later sexual frequency. Still, there are some limitations to this study. First, while I test two waves of data, I cannot conclusively predict directionality. It is possible that there are bidirectional relationships among the key measures, as regular sexual activity is associated with healthy physical and mental outcomes (DeLamater 2012) and better marital quality (Galinsky and Waite 2014). A third wave of NSHAP data will soon be publicly available and allow me to better determine causal relationships. Second, as I control for the probability of dying between and remaining married between waves, the results apply to a select population and should be interpreted with caution. Third, it is possible that there is reporting error in the outcome measure because sexuality measures can be sensitive data to collect and research indicates that men tend to overreport their sexual activity and women tend to underreport it (Hyde et al. 2010). Fourth, I do not control for any medications respondents may be taking although with the sample selection, it is highly likely that all respondents are using prescription drugs. However, given the wide range of chronic diseases used to classify my analytic sample, there are too many medication controls to include. In future studies, I intend to examine specific chronic conditions more closely, and when I focus on diseases that include drugs in their management plan which can have negative side effects on sexual functioning, such as cardiovascular diseases, I will control for medications. Finally, this study does not test specific strategies respondents use to

manage their disease nor does it distinguish between sources of stress in older adults' lives. Still, the stress-buffering perspective would suggest that social relationships play a role and that more social support, i.e. from more positive marital quality, would help moderate the stressors that arise from disease (Cohen and Willis 1985). There is room for future studies to examine how the growing population of aging, disease-afflicted adults' sexuality is linked to their marital quality and other social relationships. This study begins the conversation by establishing the significant association between them.

Conclusion

This is the first nationally representative study that examines how experiences of positive and negative marital quality can help or hinder sexual frequency among older adults who have one or more chronic conditions. Marital support is an important resource for helping older adults adhere to complex health care routines (Berg and Upchurch 2007), but as my results show, it is also related to sexual frequency. The results are important because they suggest how social relationships can help older adults continue their sexual lives even while they face chronic health problems. This is a salient topic in developed countries, considering that the concurrent increase of chronic disease incidence in older adults and the advancement of medical treatment for chronic diseases results in an older adult population who still value sexuality but may experience more complications to it (Træen et al. 2017). Older adults who have one or more chronic diseases but still want to continue having sex may focus on their relationship with their spouse as being either a resource that can help foster their sexuality or an added stressor which precludes it.

CHAPTER FOUR

I CAN'T GET NO SATISFACTION: CHRONIC DISEASE AND SEXUAL SATISFACTION AMONG OLDER COUPLES

Introduction

Sexual frequency declines with aging, but it does not stop altogether (Christopher and Sprecher 2000; Herbenick et al. 2010). In fact, older couples who are sexually active report that the sex they have is more emotionally and physically satisfying compared to earlier years because they are more familiar with their partner's sexual preferences, they are removed from the stressors of raising children, and they have developed intimacy with their spouse over time (Lodge and Umberson 2012). Although sexual relationships involve two people, there is limited evidence that examines marital dyads to see how a husband's and wife's sexual activity has an impact on their own and each other's sexual satisfaction, and there are no studies that consider how this occurs in the more unhealthy, later stages of life.

This study will use couple-level data to examine how a husband's and wife's burden of chronic disease are associated with their own and each other's sexual frequency and, in turn, their sexual satisfaction. While adults may experience better sexual satisfaction in later life, those who are ill may face a decrease in sexual satisfaction, as chronic diseases have been linked to worse levels of sexual frequency and satisfaction among older adults (DeLamater, Hyde, and Fong 2008; DeLamater and Sill 2005). Considering this information, I apply a partner learning perspective on sexuality in dyadic relationships to explore the following research questions: 1) what impact do a husband's and wife's chronic conditions have on the couple's sexual satisfaction, and 2) is there a gender difference in these relationships?

This is the first study to use nationally representative data to examine the sexual satisfaction of older dyadic couples in the U.S. The importance of this topic is emphasized by the fact that older adults are more sexually active today compared to earlier cohorts (Zeiss and Kasl-Godley 2001). Many older adults feel that sex is an important aspect of their lives (Lindau et al. 2007). It is important for couples to maintain a good sexual relationship because it is linked to deeper intimacy which can enhance the overall sexual experience (Schnarch 1991). While chronic conditions can have a negative effect on sexuality, exploring the interdependence of health on sexual satisfaction within sexual partnerships will highlight the gendered pathways by which this relationship occurs among older couples.

Background

Theoretical Background: A Partner Learning Perspective on Sexuality in Dyadic Relationships

Sexuality refers to "the dynamic outcome of physical capacity, motivation, attitudes, opportunity for partnership, and sexual conduct" (Galinsky, McClintock, and Waite 2014:S83). This means that for older adults, being physically healthy and able to have sex is one necessary aspect to maintaining one's sexual activity. Physical health is not only important for successfully having sex, but also for how enjoyable the sex can be (Laumann et al. 2006). To examine the relationship between chronic disease and sexual satisfaction I apply the partner-specific learning theory and the sexual dyad model. The partner-specific perspective addresses how sexual satisfaction will occur in a relationship where each partner knows the other's sexual preferences (Waite and Joyner 2001). To compliment this theory, I apply the dyad approach which proposes that sexuality is influenced by both partners and allows for the simultaneous study of each partner in a sexual relationship (Waite et al. 2015).

The partner-specific learning perspective proposes that individuals gain skills over the course of their relationship which are specific to their significant other (Laumann et al. 1994). When applied to sex, it argues that individuals in an exclusive, long-term relationship learn how to pleasure one another, so it is likely that know what their partner enjoys and how to provide sexual satisfaction (Armstrong et al. 2012; Laumann et al. 1994). Growing old in a relationship with a partner can improve the couple's sexual behaviors because it takes time to learn the skills specific to please a sexual partner (Levy 1994). It is likely that married individuals, because of their greater commitment to their relationship compared to single individuals, have invested in their partnership and learned how to provide sexual satisfaction (Laumann et al. 1994; Waite and Joyner 2001).

This partner-learned sexuality approach explains how people in a marital relationship would be invested in the sexuality of their partner, but the dyad approach is also important to thoroughly study sexual relationships (Laumann and Gagnon 1995). Marital partners are confidants and provide companionship in addition to sexual intimacy, so they can have large effects on the sexuality of one another (Hirayama and Walker 2011). Individuals in a marital dyad have learned what their partner's sexual desires are. The marriage commitment implies that both individuals are physically and emotionally involved in their partnership which means that sexual activity and sexual satisfaction are important parts of this relationship (Waite 1995). An actor who is committed to their marital partner in this way would derive pleasure from seeing their partner satisfied, so that sexually pleasing their partner would be enjoyable for both partners in the relationship (Waite 1995).

Partnered individuals have knowledge of their own and their partner's chronic disease burden and the physical toll it has taken on the body. For those older adults who are sexually

active, they may have learned how to properly adjust their sexual behaviors to incorporate any disease burden limitations so that they can still achieve sexual satisfaction (Hawton 1984). This is a partner-learned experience, and actors who invest in their long-term relationship will gain an understanding over time that is specific to the health and sexuality of their partner (Waite and Joyner 2001). Therefore, the partner learning perspective on sexuality in dyadic relationships predicts that if one or both partners in a marital dyad suffers from a chronic disease, this can have an impact on the sexual activity and sexual satisfaction of each partner in the relationship, but that partners are able to learn new behaviors which will enable them to continue having sex and achieve sexual satisfaction.

The Impact of Chronic Disease on Partnered Sexuality

The dyadic relationship and the partner-learned skills that are acquired within it are also closely tied to the health and chronic conditions of both partners. This is because the dyad encompasses emotional processes and health behaviors as well as biological pathways that are associated with well-being (Robles et al. 2014). The health of one person is linked to others who contribute to the resources needed to maintain and manage health, so that within a relationship, the poor health of one partner can have harmful effects on the health of the other (Lindau, Laumann, Levinson, and Waite 2003). The health of partners is not only interconnected in this way, but sexuality is also the result of both partners (Das, Waite, and Laumann 2012).

92% of adults age 65 and older have at least one chronic disease, and the risk of having a chronic disease increases with age (Akinyemiju et al. 2016; Vaupel 2010). Chronic diseases can disrupt the stages of the sexual response cycle (Masters and Johnson 1966). Still, adults can stay sexually active into their eighties even if they do suffer from a chronic illness (DeLamater 2012;

Lindau et al. 2007; Waite et al. 2009). However, there are several biological pathways through which those diseases make sexual activity more difficult.

Cardiovascular health is closely tied to sexual activity. A person who is in better cardiovascular health is more able to actively and successfully behave sexually (Brody 2010; Levin 2007). Chronic cardiovascular diseases, such as coronary artery disease or hypertension, can make sexual functioning more difficult because these conditions restrict the blood flow to body tissue (Schiavi 1994). Individuals who have a heart attack or a stroke often experience a decrease in sexual functioning afterward (Verschuren et al. 2010). Similarly, diabetes can also diminish vascular function and cause nerve damage, both of which contribute to problems with proper sexual functioning (Zeiss and Kasl-Godley 2001). This makes it more difficult for men to control an erection, more difficult for women to lubricate, and harder for both men and women to achieve an orgasm (Schiavi 1994; Verschuren et al. 2010). Furthermore, chronic conditions that interfere with breathing, such as chronic obstructive pulmonary disease (COPD), emphysema, and asthma, can limit oxygen flow during intercourse and restrict sexual functioning (Schiavi 1994). Individuals with arthritis can experience joint pain, stiffness, and inflammation which discourages sexual activity (Panush et al. 2000). Incontinence and urinary tract problems are also related to sexual dysfunction, and these conditions are risk factors for both men and women (Hansen 2004; Zeiss and Kasl-Godley 2001). Clearly, chronic diseases can limit sexual activity in older adults through a variety of different biological pathways (DeLamater and Karraker 2009).

Although the physical toll that chronic diseases have on the body can limit sexual activity and functioning (Schiavi 1994), individuals can also learn to manage chronic diseases and incorporate their health changes into their sex life (Kaplan 2003). Still, this adaption may be

more difficult for older adults because aging can slow the body's biological response to health conditions (Schiavi 1994). The odds of being sexually inactive are greater when either or both partners are in poor physical health (Karraker and DeLamater 2013). Thus, the greater number of chronic diseases an older adult has and the overall burden of those illnesses may be more influential on the sex they are having with their partner. Considering this information, I predict that:

Hypothesis 1: A higher chronic disease burden of either partner will be related to a lower sexual frequency.

Chronic Disease, Sexual Frequency, and Sexual Satisfaction

The effect that chronic disease has on sexual frequency can in turn affect sexual satisfaction. Sexual satisfaction refers to a person's "subjective evaluation of the positive and negative dimensions associated with one's sexual relationship" (Lawrance and Byers 1995:268), and their emotional response to this assessment (Dogan, Tugut, and Golbasi 2013; Stephenson et al. 2010). Sexual satisfaction is a subjective measure, so the burden that a person feels from their chronic diseases may influence how frequently they have sex and how satisfied they are with their sex life. In studying sexual satisfaction among dyads, it refers to the way that married people evaluate the quality of their sexual relationship (DeLamater, Hyde, and Fong 2008; Christopher and Sprecher 2000).

There are several studies which demonstrate that sexual frequency is correlated with sexual satisfaction (DeLamater et al. 2008; Haavio-Mannila and Osmo 1997; Smith et al. 2011; Waite and Joyner 2001). Looking at couples at the beginning of their marriage, one study that followed newlyweds over the first five years of marriage found a positive relationship between sexual frequency and satisfaction (McNulty, Wenner, and Fisher 2016). A dyadic study of

international couples at midlife found that more frequent sexual activity of each partner in the couple was predictive of sexual satisfaction (Fisher et al. 2015). Among studies of individuals, one global analysis of adults ages 40-80 found that sexual frequency was a strong correlate of sexual well-being for both men and women (Laumann et al. 2006). Another investigation used nonrepresentative data of adults 70 and older and found that being sexually active predicted being satisfied sexually (Matthias et al. 1997). These empirical results demonstrate that among studies of both individuals and couples, sexual satisfaction of both partners is related to their sexual frequency. However, it is unclear how this occurs among older, married couples.

Previous studies have also found that in addition to sexual activity, having better self-rated physical health (Fisher et al. 2015; Laumann et al. 2006), having good functional mobility (Matthias et al. 1997), and having good sexual functioning (Carpenter, Nathanson, and Kim 2009; Fisher et al. 2015) were all correlates of sexual satisfaction. Furthermore, the process of certain chronic diseases, such as diabetes or cardiovascular disease, impedes the normal sexual response which interferes with sexual activity and consequently sexual satisfaction (Carpenter et al. 2009). However, there is limited empirical evidence about how specific chronic diseases may impact sexual frequency and thus sexual satisfaction for older adults (Schiavi 1994). A study of fifty men who on average were 49 years old and who suffered a stroke found that most had physical problems with positioning during sexual activity, while fewer reported that they experienced reduced sexual interest in the months after their stroke (Hawton 1984). For diabetic men, there is some clinical evidence that the disease can contribute to decreased sexual satisfaction (Schiavi et al. 1993). A community sample of women with Parkinson's disease found that they were more likely to be dissatisfied with their sexual experiences than women without the disease (Welsh, Hung, and Waters 1997). Therefore, while it is likely that healthier

partners who engage in sex more frequently will report better sexual satisfaction compared to partners who are unhealthy and who have sex less frequently (Carpenter et al. 2009), the results largely come from convenience, community, or clinical samples, and they do not comment on how overall burden of chronic disease is linked to sexual frequency and in turn to sexual satisfaction among older adults. Taken together, I predict that:

Hypothesis 2: Higher sexual frequency will be related to greater sexual satisfaction.

Gender Variations in Sexuality

Gender plays a key role in my approach. First, because men and women reach climax in biologically different ways (Masters and Johnson 1966), poor health has different results on men's and women's sexual behaviors (Schiavi 1994). Second, sexual experiences vary by gender because men and women acquire different social, psychological, and physiological experiences across their lifetime which influence their sexual attitudes and behaviors (Carpenter and DeLamater 2012). Traditionally, men are taught to be the instigators of sexual activities, while women are the passive receivers, and these roles can make men feel that their masculinity is tied to their ability to successfully have sex with and pleasure their partner (Armstrong et al. 2012; DeLamater and Hyde 2008). Culturally, the ability to perform sexually is more greatly tied to men's masculinity than to women's femininity (Lodge and Umberson 2012), such that men with greater health problems that complicate sex may feel their masculinity threatened and engage in sex less frequently. On the other hand, women may be more concerned with emotional aspects of their sexual relationship (Das et al. 2012). The interruptions to normal sexual function, which can be brought on by aging or poor health, may cause sexual tension for the man or his female partner, who might feel that she is sexually inadequate (Lodge and Umberson 2012). Overall,

men and women differ in both their physiological paths for sexual functioning as well as in the cultural expectations for their sexual behaviors.

Men's sexual functioning is more closely tied to their physical health. The presence of hypertension, unhealthy cholesterol levels, or diabetes pose a greater risk for men developing impotence (Schwartz and Rodriguez 2005). Cardiovascular disease is particularly harmful to men's sexual behavior because it limits blood flow to the penis which results in erectile dysfunction (Schiavi 1994). Erectile dysfunction is the most common dysfunction for men (Bacon et al. 2003; Laumann et al. 2008). Since this dysfunction is a disorder of the blood vessels, it is important that men have good cardiovascular health to curtail it (Schwartz and Rodriguez 2005). Additionally, men who are unhealthy may not want to engage in sexual activities as frequently because their poor health may harm their ability to perform and thus threaten their masculinity (Lodge and Umberson 2012). These physiological effects and cultural pressures indicate that men's sexuality may be more effected by poor health than women's (Carpenter and DeLamater 2012). As such, I predict that:

Hypothesis 3: Husbands' chronic disease burden will be more important than wives' chronic disease burden in affecting their sexual frequency.

Both men and women with chronic diseases report a decline in their desire to have sex (Brody 2010; Levy 1994). Their feelings about sexual satisfaction, however, varies with men's sexual satisfaction being more strongly tied to their physical health and women's satisfaction more closely tied to their psychological well-being and relationship quality (Bancroft 2007; Carpenter et al. 2009; McNulty and Fisher 2008). Men generally report better sexual satisfaction compared to women (Haavio-Mannila and Osmo 1997; Laumann et al. 1994; Lindau and Gavrilova 2010; Waite and Joyner 2001). This gender difference is true even as people get older.

A study of Australians ages 16-64 found that men were more satisfied with their sexual relationship, and as women got older, their sexual satisfaction declined (Smith et al. 2011). There is evidence that once they reach the end of midlife, women's sexual satisfaction begins to decrease (Laumann, Gagnon, Michael, and Michaels 1994), while men's sexual satisfaction does not vary much by their age (Schiavi 1996). However, the decline in women reporting sexual satisfaction as they get older may be attributed in part to their partner's poor health (Smith et al. 2011). Still, the sexual satisfaction of both members of a couple are connected, with data from recently-married couples showing that men's sexual satisfaction was positively predicted by their partner's sexual satisfaction (McNulty et al. 2016).

It is evident that sexual frequency influences sexual satisfaction, and that in old age, husbands may be more sexually satisfied than their wives. Because men's sexual satisfaction is more closely tied to physical aspects, such as the frequency of having sex, while women's may be more affected by her feelings toward her partner (Basson 2000; Carpenter et al. 2009), I hypothesize that:

Hypothesis 4: Sexual frequency will be more strongly related to husbands' sexual satisfaction than wives' sexual satisfaction.

Data

I use the National Social Life, Health and Aging Project (NSHAP) to test my hypotheses. NSHAP data collection is conducted by NORC at the University of Chicago. It is a population-based, community-resident sample that oversamples for men, adults 75-84 years old, and African Americans and Latinos. It is a unique dataset that provides nationally representative longitudinal data on older Americans. A multi-mode collection of data occurred over a two-hour in-home interview, where a questionnaire was administered and biological marker data was collected.

Interviewers also left behind a survey for a select sample to complete and return. Currently, there are two waves of data publicly available. The first wave collected data from 3,005 respondents ages 57-85 between 2005-06. The second wave reinterviewed 2,261 respondents from 2010-11 (NORC 2014).

I am specifically interested in couple-level data which was only collected during the second wave. Wave 2 contains information on 955 dyads; however, two are gay/lesbian couples that I drop them from the sample because I am focusing on heterosexual sexuality, and the gay/lesbian sample is too small to be compared to heterosexual couples. Additionally, my focus is on partnered sexual relationships, including couples who are either married or cohabiting or whose sexual partner lives in the same household, so I drop five couples where the partners reported different marital statuses, did not live in the same household, and had no sexual or intimate partner (see Kim and Waite 2014). I further restrict my sample to the couples who responded to at least one of the measures used to construct the sexual satisfaction scale. The final sample consists of 929 couples (1,858 respondents). To note, I refer to "marital dyads" and "husbands and wives" throughout the paper, but 4% of the sample is composed of cohabiting couples. These couples are living together and are sexually intimate with one another. I choose to keep them in my sample to retain sample size but also because, for this cohort, the majority of sexual activities occurs with the current marital or cohabiting partner (Galinsky, McClintock and Waite 2014). Finally, all analyses are weighted, and I adjust for clustering using the complex analysis in MPLUS (Muthén and Muthén 2007).

Measures

Sexual Satisfaction. I used three variables to construct the sexual satisfaction measure. Two of these variables have been used by Laumann and colleagues (1994). The first refers to a

respondent's physical pleasure, asking "how physically pleasurable did/do you find your relationship with your current or recent partner to be?" and the second refers to emotional satisfaction, asking "how emotionally satisfying did/do you find your relationship with your current or recent partner to be?" These two variable response options were extremely, very, moderately, slightly, or not at all pleasurable or satisfying. The third measure to construct sexual satisfaction was asked in the leave behind questionnaire. It asks about the quality of a respondent's sex life. The question read "to what extent do you feel your sex life is lacking in quality?" with response options including not at all lacking in quality to extremely lacking. I include this third variable because sexual satisfaction is defined as a subjective feeling of positive and negative aspects of a person's sexual relationship (Lawrance and Byers 1995). This variable asks directly if there are any negative aspects to the quality of a respondent's sex life. Each of these variables refer specifically to the respondent's sexual experiences, and they are used to make a scale for sexual satisfaction.

To construct the sexual satisfaction scale, I reverse-coded the quality of sex life variable so that higher values indicated that a respondent's sex life was not lacking in quality. Then, because of the different response categories, I standardized the values of each measure and added them together to create a summary index for sexual satisfaction. This scale ranged from -7.31 to 3.11, with higher values indicating more sexual satisfaction. Cronbach's alpha for the scale is 0.70, with a value of 0.65 for men and 0.75 for women. The overall scale value and the value for women suggests high scale reliability, however men's alpha is lower than what is commonly used in social science research. Still, because I have a small number of items on this scale, and because the measures each reflect a person's subjective measure of their sex life (Loewenthal

2004), I use a slightly lower criterion and keep the value for men[1]. Further, the index itself showed significant associations with chronic disease burden (p=0.015) when I ran a simple regression of chronic disease burden on sexual satisfaction.

Sexual Frequency. To examine the frequency that couples are having sex, I use two sexual activity variables, including if the respondent has had sex in the past 3 months and their sexual frequency in the past 12 months. The first category is people who either reported having no sex in the last 3 months or who reported "never" having sex in the past 12 months. The next category are people who report having sex once a month, followed by people who have sex 2-3 times a month, once or twice a week, 3-6 times a week, and once a day or more. There is also a category for respondents missing on both sexual frequency variables.

I retain respondents who had reported no sex in the past 12 months because previous research shows that, especially for older adults, some may find abstinence or very infrequent intercourse to be sexually satisfying (Marsiglio and Donnelly 1991). Matthias and colleagues (1997) find that, among a population of adults 70 and older, more people report that they are sexually satisfied than people who report that they are sexually active. This may be especially true for women, who may have found sex to be a procreative necessity rather than a purely enjoyable activity.

Chronic Disease Burden. I use the NSHAP Comorbidity Index (NCI) to measure chronic disease burden. Vasilopoulous and colleagues (2014) provide an index for combining chronic conditions using NSHAP data which improves on the Charlson Comorbidity Index (Charlson et al. 1987). NCI is a continuous measure that is a summary of 15 conditions. Respondents earn a

[1] I tried factor analysis with the 3 sexual satisfaction measures. It produced one factor, so these variables are measuring one dimension. However, the factor loading of sex quality was low, so I kept using the described satisfaction scale.

score from 0-21. The higher score a person has on the index, the greater the burden of chronic disease in their life. For the majority of the chronic disease diagnoses, each condition counts for 1 point on the NCI scale. However, being diagnosed with cancer (other than skin cancer) is worth 2 points on the scale, while being diagnosed with metastatic cancer is worth 6 points on the scale. These diseases are assigned a higher score because they are associated with a greater mortality risk (Vasilopoulos et al. 2014). Each of the variables used in the index are dichotomous, self-reports of having ever been diagnosed with the condition by a doctor. Table 4-1 describes the breakdown of how the variables used in the scale construction are combined into the index and how many points each are worth.

Covariates. I control for sexual dysfunctions by creating a summary measure of several sexual problems. These include a "yes" or "no" response to whether the respondent either climaxed too quickly, was unable to climax, experienced pain during sex, or either had trouble getting/maintaining an erection (for men) or had trouble lubricating (for women). Two gender-specific sexual dysfunction variables were created so that if a respondent answered positively to any of these problems they were marked as experiencing one or more sexual dysfunctions, experiencing no sexual dysfunctions, or missing.

Antihypertension medications are often prescribed to people with cardiovascular disease, and they can have negative effects on sexual functioning (DeLamater et al. 2008), so I control for whether a respondent takes any antihypertensive medications (1=yes; 0=no). I also control for whether a respondent takes any sex hormones, such as estrogen, progestin, or testosterone (1=yes; 0=no).

Finally, I include sociodemographic covariates. Age and education are continuous variables, with age measured in years and education ranging from less than a high school degree

to a college degree or beyond. Race is added as a categorical measure, with options of non-Hispanic White, non-Hispanic Black, Hispanic, and other. Income is a measured of relative family income with respondents indicating if they are below average, average, or above the average compared to other families. Finally, because partner learning theory proposes that learning to sexually satisfy a partner occurs over time (Laumann et al. 1994; Waite and Joyner 2001), I control for relationship duration in number of years a couple has been together, and I control for the order of unions (0=first marriage/cohabitation, 1=second or higher marriage/cohabitation).

Analytic Approach

To test how chronic disease burden impacts sexual frequency and sexual quality among older couples, I use the Actor-Partner Interdependence Model (APIM) (Cook and Kenny 2005). I utilize the APIM because it allows me to analyze the marital dyad rather than just the individuals in the marriage. This model assumes that within a relationship, such as a married couple, the experiences of the two people involved are correlated (Cook and Kenny 2005). Using the APIM model, I examine how a husband's and a wife's chronic disease burden are related to their own and their spouse's sexual frequency and how the sexual frequency of a husband and wife are related to their own and their spouse's sexual satisfaction, all within the same model.

I run the analysis in MPLUS (Muthén and Muthén 2007). I utilize the Full Information Maximum Likelihood (FIML) method to handle missing values. With this approach, missing cases are assumed to be missing at random, and they are estimated as a function of the observed variables (Muthén and Muthén 2007). I assess my models using two goodness-of-fit indices: the Comparative Fit Index (CFI), where a good fit is at or above 0.90, and Root Mean Square Error of Approximation (RMSEA), where a good fit is at or below 0.05 (Ullman and Bentler 2003). I

ran t-tests on the path coefficients to compare husbands' and wives' results within the APIM model. Results (not shown; available upon request) show that all differences between husbands and wives are statistically significant at or below $p < 0.05$.

Results

Descriptive Results

The descriptive results are shown in Table 4-2, with results separated by husbands and wives. Husbands have a significantly higher chronic disease index compared to wives (2.99 vs. 2.69). Husbands and wives are not significantly different from one another in their frequency of sex. There is a statistically significant difference for sexual satisfaction, with wives reporting a notably lower score on the sexual satisfaction scale (-0.12) compared to men (0.47). This is in line with previous literature that finds that women report less sexual satisfaction compared to men (Haavio-Mannila and Osmo 1997; Laumann et al. 1994; Lindau and Gavrilova 2010; Waite and Joyner 2001).

Husbands are significantly more educated than wives, while wives are significantly more likely than husbands to report average family income. Husbands are significantly older than wives, on average (71.03 years old vs. 67.54 years old, $p<0.05$). The age of the sample includes some people who were younger than original study sample range because the dyad sample did not exclude data from partners who were outside the age range[2]. While there are some couples in which one partner may not be considered an "older adult," my results are true of couples where at least one person is age 62 or older. More women are outside the age range than men, which is likely due to culture expectations of this cohort of men marrying younger women (Neugarten,

[2] A small number of men and women are younger than 65. There is one man who is 38 years old, eight men in their 50s, and the rest are 60 or older. There are two women younger than 40, 11 in their 40s, and 72 in their 50s, with the rest being 60 years old or older.

Moore, and Lowe 1965). On average, couples have been together for 37 years, and a significantly greater percentage of men are in their first marriage or cohabiting relationship, while a significantly greater percentage of women in their second or higher marriage or cohabiting relationship. There are no significant differences between husbands and wives in race or the experience of sexual dysfunction. However, wives are significantly more likely than husbands to report using sexual hormones, whereas husbands are more likely than wives to be taking antihypertensive medications.

APIM Results

Figure 4-1 shows the results of the APIM analysis, which assesses how husband and wife chronic disease burden are related to their own and each other's sexual frequency, and how their sexual frequency is in turn related to their own and each other's sexual satisfaction. It is evident that each of the corresponding husband and wife variables are significantly correlated with one another. This is one assumption of the APIM, and it demonstrates that there is a positive relationship between a couple's chronic disease burden, such that as husband's chronic disease burden increases, his wife's own chronic disease burden also increases. Correlations are also present in both sexuality measures. First, husbands report more frequent sex also have wives who report more frequent sex. Second, if a husband rates his sexual satisfaction higher than other men, his wife also rates her sexual satisfaction higher than other women. The correlations for the sexuality variables have a stronger magnitude compared to that of chronic disease burden, but they all still demonstrate that husbands and wives are correlated with each other with regard to these measures.

The model further shows that husband's chronic disease burden is significantly associated with his own and his wife's sexual frequency. Specifically, husbands who have a

higher burden of chronic disease tend to have sex less frequently than other husbands who have a lower burden of chronic disease ($\beta = -0.063$, $p<0.01$). Also, wives whose husbands have a higher burden of chronic disease tend to have a lower sex frequency than wives whose husbands have a lower chronic disease burden ($\beta = -0.081$, $p< 0.001$). There is no significant relationship between a wife's chronic disease burden and her own or her husband's sexual frequency.

Sexual frequency and sexual satisfaction of husbands and wives are more closely associated. First, husband's sexual frequency is significantly related to both his and his wife's sexual satisfaction. If the husband reports greater sexual frequency, both his and his wife's sexual satisfaction is greater, with the actor effect on husband's sexual satisfaction of $\beta = 0.618$ ($p<0.001$) and the partner effect on wife's sexual satisfaction of $\beta = 0.189$ ($p<0.01$). There is a similar partner effect present in wife's sexual frequency on her sexual satisfaction. That is, if a wife reports greater sexual frequency, she tends to report better sexual satisfaction ($\beta = 0.482$, $p<0.001$), compared to wives who report lower sexual frequency. However, the partner effect for a wife's sexual frequency in relation to her husband's sexual satisfaction was not significant.

Discussion

The population of older adults is growing in the United States, with many of these adults living with one or more chronic diseases, and they continue to be sexually active. Still, sexuality of older adults is understudied, and older couples' sexual life is overlooked. It is increasingly important to understand how sexual behavior and sexual satisfaction operate within an older couple who is also combating the process of disease onset as they age. I apply a partner-learned sexuality approach to the analysis of sexual dyads to examine how chronic disease burden shapes the sexual activity of an individual and their spouse and how this in turn is related to the sexual satisfaction of both partners. My use of dyadic data to examine older adults' sexuality

contributes to the lack of research that examines both partners of a couple, particularly for this age group. The study of intimate dyads to examine sexual satisfaction is especially important to the topic of sexuality, which most often necessitates a partner and is tied to one's sexual experiences with that partner (Burgess 2004; DeLamater and Hyde 2004; Waite et al. 2015). Overall, the results reveal significant gender differences in older adults' experience of chronic disease and sexuality within their partnership.

Sexual Frequency in Older Couples: Whose Health Matters?

Individuals who are in better health may enjoy better sex lives. This is because chronic diseases interfere with normal physiological functioning which can lead to problems with successfully having sex, enjoying sex, and desiring sex (Brody 2010; Schiavi 1994; Verschuren et al. 2010). I predicted that a higher chronic disease burden of either partner will be related to a lower sexual frequency (Hypothesis 1). The results only partially support this hypothesis, as a husband's chronic disease burden is negatively associated with his own and his wife's frequency of sex, but a wife's chronic disease burden is not related to how often she or her husband have sex. The gender difference in these findings are related to Hypothesis 3, which predicted that a husbands' chronic disease burden will be more important than wives' chronic disease burden in affecting their sexual frequency. Rather than one association being stronger, I find that only husband's chronic disease burden is related to sexual frequency, and that it is important to both members of the couple. In the relationship between disease burden and sexual frequency, the results indicate that husbands who have a higher chronic disease burden are more likely to have less sex with their partner than husbands who have a lower chronic disease burden, and wives whose husbands have a greater chronic disease burden are also more likely to have sex less frequently with their partner compared to wives with husbands who have a lower chronic disease

burden. These results hold even when controlling for one's own sexual dysfunction, medication use, and socio-demographic factors.

These results were mostly expected, as men's sexuality is more closely tied to their physical health than women's. This is because the biological differences in men's and women's normal sexual functioning means that men's sexual functioning may be more effected by poor health than women's (Carpenter and DeLamater 2012; Dunn, Croft, and Hackett 1999). To get and maintain an erection, proper blood flow is necessary, and this is inhibited in men who have a condition which limits their vascular function, such as cardiovascular problems or diabetes (Schiavi 1994). My results support this relationship, showing that husband's chronic disease burden plays a more significant role in how frequently the couple has sex. Even if couples try partner-specific methods to successfully have sex, it still appears men's health matters for their sexuality.

Husbands who are healthier (i.e. have fewer chronic diseases) tend to report more frequent sex, as do their wives. It is likely that a husband with fewer chronic diseases has better sexual functioning and is able to have more frequent sex (Schiavi 1994). Additionally, healthier men may find it easier to maintain their masculine identity in old age, as it is likely tied to their sexual performance ability (Lodge and Umberson 2012). According to the gendered sexuality approach, man is scripted to be the sexual instigator in heterosexual relationships, and woman is the receiver (DeLamater and Hyde 2008). Because of these roles, men feel that their ability to sexually pleasure a woman is a positive reflection of their masculinity (Armstrong et al. 2012). This also means that men have more cultural pressures to perform well sexually and having health conditions that result in sexual dysfunction can harm men's feeling of masculinity so that they are unable to engage in their gendered sexuality (Lodge and Umberson 2012).

The null finding for the effect of women is further interesting, as there is no evidence that wife's chronic disease burden is related to how frequently she or her husband have sex. This result speaks to how important a husband's physical health is for the sexual frequency of the couple, but it also suggests that other factors may be more important in determining a wife's (and her husband's) sexual frequency, such as relationship factors (Liu et al. 2016), rather than her chronic disease burden.

Additionally, there is evidence that wives whose husbands have a lower chronic disease burden have more frequent sex compared to wives whose husbands have a higher chronic disease burden. While the present study does not examine the motivations for having sex (for example, if a healthier husband instigates sex more often or if a wife of a healthier husband instigates more sex because she knows he is able to successfully function sexually), it is evident that having a healthy husband is important for the wife's sexual activity. These results support the sexual dyad approach because the results indicate how one partner in the dyad is reliant on the other for their own sexual activity.

Sexual Satisfaction in Older Couples with Chronic Disease: A Gendered Experience

How is the relationship that chronic disease burden has on sexual frequency associated with sexual satisfaction in older couples? I posited that higher sexual frequency will be related to greater sexual satisfaction (Hypothesis 2), and that the relationship will be stronger for husbands' than wives' sexual satisfaction (Hypotheses 4). I find partial support for this hypothesis. A husband's sexual frequency is related to both his and his wife's sexual satisfaction, but a wife's sexual frequency is only related to her own sexual satisfaction. This means that among older couples, there is a positive relationship for individuals who have more frequent sexual activity to report more sexual satisfaction and for wives whose husbands' report more frequency sexual

activity to also have greater sexual satisfaction. Notably, the magnitudes of the partner effects are smaller compared to the actor effects, indicating that one's own sexual frequency is more strongly linked to their own sexual satisfaction than their partner's sexual frequency. However, both sexuality measures are highly correlated with one another and it is likely that within this sample of older adults, sexual frequency is engaged in and shared by husbands and wives.

The significant effects of sexual frequency on sexual satisfaction for wives adds new information to the literature, suggesting that that within older couples, husband's sexual satisfaction is independent of his wife's sexual frequency and is instead tied to his own sexual frequency. However, the significant actor and partner effects on wife's sexual satisfaction demonstrate an interdependence of the partners' sexual frequency in a relationship and a wife being satisfied with her sex life.

There are previous studies which help explain these results. It is suggested that entering the later life stages may allow men to remove the pressures of masculinity (Cornwell and Laumann 2011), so perhaps within the sex that older couples are having, husbands are more open to learning more about what will satisfy their partner rather than focusing more on themselves. Additionally, both older men and women who are having sex are doing so for enjoyment as these older female partners are free from procreation ages. The stages of menopause may reinvigorate some women (Dillaway 2012). This is one aspect of older women's gendered sexuality, and post-menopausal women may want to have more frequent sex with their partner as they enter this new stage, which may be related to their greater sexual satisfaction.

Overall, my findings demonstrate that sexual frequency is important in the relationship between chronic disease burden and sexual satisfaction. The results indicate that a husband's higher burden of chronic disease decreases his own sexual frequency which, in turn, is related to

his own and his partner's sexual satisfaction, such that having sex more frequently is linked to higher sexual satisfaction for both the husband and his partner. Further, a husband's higher burden of chronic disease also decreases his wife's sexual frequency, which is positively related to her own sexual satisfaction but is not linked to her husband's sexual satisfaction. Notably, a wife's chronic disease burden has no significant effect on her own or her spouse's sexual frequency. These results suggest that a husband's lower chronic disease burden may promote sexual satisfaction of both partners through an increase in the couple's sexual frequency, and that a husband's sexual frequency may be especially important to a couple because it is significantly related to both partners' sexual satisfaction.

Limitations

This study is limited in several ways. First, due to data collection limitations, there is only dyad data for one wave of the NSHAP. These results reflect cross-sectional data, and so I am unable to make any causal claims in the relationship between older couples' chronic disease burden and their sexual satisfaction. Second, this analysis does not examine which specific chronic diseases are related to sexual functioning and satisfaction, so I do not identify if there is one condition that is more important to address when older couples are dealing with sexual problems. Furthermore, the study sample came from a second wave of data, and individuals who may have been very sick or who died between waves were unable to be included. It is likely those with more extreme health conditions would have some influence in the analysis, so the results should be interpreted with this precaution. Finally, this study only includes certain covariates, but there is literature which would support the incorporation of other variables related to health and sexuality of older adults. For example, future work can examine how feelings of

love, relationship quality, or sexual motives (Stephenson et al. 2011), are related to sexual satisfaction.

Conclusions and Implications

Many studies that examine the sexuality of older adults focus on the presence and effects of sexual dysfunctions (Laumann et al. 1999; Laumann et al. 2008; Waite et al. 2009). While health as it relates to sexual dysfunctions is certainly important in being able to successfully have sex, I take a different approach to studying the health and sexuality of older adults. This study provides evidence for how chronic disease burden is tied to the sexual frequency and sexual satisfaction of older dyads. I find gendered results, such that a husband with a higher chronic disease burden has a lower sexual frequency which, in turn, is positively related to his and his partner's sexual satisfaction. I find no evidence that a wife's chronic disease burden is related to her own or her husband's sexual frequency, and a wife's sexual frequency is only related to her own sexual satisfaction, not her husband's. These results have several implications for older couples. First, it is important for a couple's sexual life that the husband has a lower chronic disease burden. Through increased sexual frequency, there may be increased sexual incentives for husbands and wives when the husband is living with fewer chronic conditions. It is in the interest of both partners' sexual satisfaction to encourage husbands to have a lower chronic disease burden, perhaps through a healthy lifestyle, doctor's visits, and regular physical activity. Second, a husband's greater disease burden puts more limitations on his and his wife's sex life, and this is bothersome for husbands' and wives' sexual satisfaction. Compared to previous cohorts, older adults today may feel more pressure to have sex partially because of the wide availability of men's performance enhancers (Lodge and Umberson 2012). The successful sexual effects of these enhancers can make older women feel attractive but relying on such enhancers

may strain the couple's relationship and leave the husband feeling incompetent or the wife feeling undesirable (Lodge and Umberson 2012). Finally, as the partner-specific learning perspective would suggest, it may be that couples adapt more to women's sexual problems that arise from disease burden in part because women are traditionally making accommodations in their sexual relationship with their partner (Lodge and Umberson 2012) but also because women expect to encounter physical changes with menopause and can adjust accordingly (using lubricant, for example) to keep having sex (Dillaway 2005). Future studies should continue to examine this understudied area and consider additional interdependent factors, such as mental health, relationship satisfaction, and quality of life, in order to further understand gendered sexual experiences within older couples.

CHAPTER FIVE

CONCLUSION

Older adults today are more sexually active compared to earlier cohorts, but there is limited understanding of the ways in which they are having sex and their satisfaction with their sex lives. My research makes a significant contribution to this underexplored area by identifying factors that help maintain older adults' sexuality. This dissertation is situated in current population demographics which includes the simultaneous growth of older adults and the increase of multimorbidity. This project is a nationally representative investigation of how chronic diseases are associated with the sexual lives of the Baby Boomer population, how marital quality can help or hinder sexuality, and how this occurs at both the individual and the partner level. My results support the theoretical predictions that poor health is linked to sexual problems, but it also adds a deeper understanding of how social relationships contribute to different outcomes for men and women. First, my project highlights the importance of considering multiple chronic conditions for this older population, specifically that men's sexual frequency and women's sexual functioning are at greater risk when older adults have a higher burden of disease. Second, this research adds another dimension to the benefits of positive marital quality, suggesting that even in the face of chronic disease, more positive marital quality and less negative marital quality are beneficial for greater sexual frequency. This result signifies that future work be done on the unhealthy, older population to investigate additional social ties which may affect sexuality. Third, my findings recognize dyadic pathways by which sexual satisfaction is achieved for older couples. Overall, this project provides strong evidence for keeping older men healthy if they want to continue their own and their partner's sexual frequency, while also identifying marital quality as an important predictor of women's sexual

frequency in the unhealthy, later stages of life. Recently, there has been a call for a more detailed understanding of older adults' sexuality which is sensitive to their health changes (Burgess 2004; Kornrich, Brines, and Leupp 2013). The findings from this dissertation project inform researchers, policy workers, and health practitioners of the ways in which health and relationship dynamics may inhibit or encourage sexuality among older adults.

APPENDICES

APPENDIX A: Chapter 2 Tables

Table 2-1. Wave 1 NSHAP Comorbidity Index (NCI) Construction, Variables and Points	
Chronic Disease Measure	Points
Hypertension	1
Heart Attack	1
Congestive Heart Failure	1
Stroke	1
Diabetes	1
Skin Cancer	1
Other Cancer	2
Metastatic Cancer	6
Lung Disease (emphysema, COPD, or asthma)	1
Arthritis	1
Dementia	1
Sensorimotor Condition (urinary incontinence, stool incontinence, urinary problems)	1
Total Score:	18

Table 2-2. Weighted Descriptive Statistics for Men (N=893)			
	Mean(SD)/ %		Mean(SD)/ %
Sexuality Variables (Wave 2)		*Sexuality Variables (Wave 1)*	
Sexual Frequency[1]		Sexual Frequency	
None†	31.00	None (*ref*) †	21.16
Once a month†	23.21	Once a month	24.73
2-3 times a month	22.36	2-3 times a month	22.76
Once a week or more†	23.42	Once a week or more†	28.57
		Missing	2.78
Sexual Dysfunction[2]		Sexual Dysfunction	
None	49.47	None (*ref*)	47.30
One dysfunction	29.48	One dysfunction	18.96
Both dysfunctions	21.05	Both dysfunctions	10.76
		Missing	22.99
Chronic Disease Index			
Wave 1 NCI†	2.34(1.85)		
Covariates (all at Wave 1)			
Education		Marital Status	
High school or less (*ref*)	35.21	Unmarried/not cohab (*ref*)	7.32
Some college†	28.31	Married/cohabiting	92.68
College graduate†	36.47	BMI	
Race-Ethnicity		Normal/underweight (*ref*)†	19.15
Non-Hispanic White (*ref*)†	80.77	Overweight	41.73
Non-Hispanic Black	8.69	Obese†	39.12
Hispanic	7.48	Smoke	
Other	3.06	No (*ref*)	85.61
Income		Yes	14.39
Below Average (*ref*)	18.69	Drink	
Average†	32.51	No (*ref*)†	30.60
Above Average†	32.96	Yes†	69.40
Missing	15.84	Exercise	
Age	66.12(7.21)	< 3 times a week (*ref*)†	28.73
Death probability at Wave 2†	0.11(0.09)	> = 3 times a week†	71.27
		Psychological distress†	4.23(4.26)

Note: *ref* specifies the reference category. 1: N=822; 2: N=805.
†t-test was significant at the $p<0.05$ level when comparing men and women samples (Tables 2-2 and 2-3).

Table 2-3. Weighted Descriptive Statistics for Women (N=641)			
	Mean(SD)/ %		Mean(SD)/ %
Sexuality Variables (Wave 2)		*Sexuality Variables (Wave 1)*	
Sexual Frequency[1]		Sexual Frequency	
None†	45.88	None (*ref*) †	33.71
Once a month†	16.63	Once a month	23.12
2-3 times a month	18.97	2-3 times a month	19.56
Once a week or more†	18.52	Once a week or more†	19.60
		Missing	4.01
Lubrication Problem[2]		Lubrication Problem	
No (*ref*)	69.12	No (*ref*)	38.43
Yes	30.88	Yes	25.46
		Missing	36.11
Chronic Disease Index			
Wave 1 NCI†	2.53(1.60)		
Covariates (all at Wave 1)			
Education		Marital Status	
High school or less (*ref*)	38.54	Unmarried/not cohab (*ref*)	6.81
Some college†	38.05	Married/cohabiting	93.19
College graduate†	23.41	BMI	
Race-Ethnicity		Normal/underweight (*ref*)†	27.50
Non-Hispanic White (*ref*)†	85.84	Overweight	39.40
Non-Hispanic Black	7.14	Obese†	33.09
Hispanic	5.42	Smoke	
Other	1.60	No (*ref*)	86.96
Income		Yes	13.04
Below Average (*ref*)	19.45	Drink	
Average†	40.10	No (*ref*)†	41.79
Above Average†	26.26	Yes†	58.21
Missing	14.19	Exercise	
Age	66.27(6.80)	< 3 times a week (*ref*)†	37.10
Death probability at Wave 2†	0.07(0.06)	> = 3 times a week†	62.90
		Psychological distress†	4.99(4.86)

Note: *ref* specifies the reference category. 1: N=590; 2: N=485
†t-test was significant at the $p<0.05$ level when comparing men and women samples (Tables 2-2 and 2-3).

Table 2-4. Estimated Regression Coefficients from OLS Regression Models of Chronic Disease Burden to Predict Sexual Frequency				
	Men		Women	
NCI	-0.06*	(0.03)	0.02	(0.03)
W1 Sex Frequency (*ref:* none)				
Once a month	0.63***	(0.14)	0.45**	(0.14)
2-3 times month	0.84***	(0.11)	1.13***	(0.16)
Once a week or more	1.47***	(0.11)	1.93***	(0.13)
Missing	0.54+	(0.28)	1.10**	(0.35)
Age	-0.01	(0.01)	0.01	(0.01)
Race (*ref:* non-Hispanic white)				
Non-Hispanic Black	0.52**	(0.18)	-0.03	(0.14)
Hispanic	0.19	(0.13)	-0.02	(0.15)
Other	-0.18	(0.21)	-0.12	(0.35)
Education (*ref:* high school or less)				
Some college	-0.01	(0.09)	0.07	(0.13)
College graduate	0.21+	(0.12)	-0.12	(0.15)
Income (*ref:* below average)				
Average	-0.12	(0.18)	0.18	(0.11)
Above average	0.07	(0.18)	0.15	(0.12)
Missing	-0.02	(0.18)	0.44*	(0.17)
Married/cohabiting	-0.37*	(0.14)	0.02	(0.17)
Probability of death	0.06	(0.97)	-2.50*	(1.21)
Smoke	0.31	(0.20)	-0.20	(0.17)
Drink	0.06	(0.07)	-0.17	(0.11)
Exercise 3+ times a week	0.15	(0.11)	-0.30*	(0.12)
BMI (*ref:* normal/underweight)				
Overweight	0.25*	(0.11)	-0.11	(0.11)
Obese	0.29*	(0.14)	-0.05	(0.15)
Psychological distress	0.00	(0.01)	-0.01	(0.01)
Constant	1.15*	(0.53)	-0.25	(0.70)
R-squared	0.335		0.402	
	N=822		N=590	
*** p<0.001, ** p<0.01, * p<0.05, + p<0.1				
Note: Standard errors in parentheses; W1 = Wave 1				

Table 2-5. Coefficients for Chronic Disease Burden to Predict Men's Sexual Dysfunction from Ordinal Logistic Regression Models (N=805)		
NCI	0.08	(0.05)
W1 Sexual Dysfunction (*ref:* none)		
One dysfunction	0.77***	(0.17)
Both dysfunctions	1.32***	(0.28)
Missing	0.43	(0.29)
Age	0.03	(0.02)
Race (*ref:* non-Hispanic white)		
Non-Hispanic Black	0.06	(0.30)
Hispanic	-0.29	(0.29)
Other	0.05	(0.33)
Education (*ref:* high school or less)		
Some college	0.17	(0.24)
College graduate	0.20	(0.17)
Income (*ref:* below average)		
Average	0.13	(0.30)
Above average	-0.09	(0.32)
Missing	-0.13	(0.20)
Married/cohabiting	0.07	(0.32)
Probability of death	-0.63	(1.86)
Smoke	-0.24	(0.34)
Drink	0.14	(0.22)
Exercise 3+ times a week	-0.20	(0.29)
BMI (*ref:* normal/underweight)		
Overweight	0.08	(0.19)
Obese	0.22	(0.27)
Psychological distress	0.04	(0.03)
Cut 1	2.63*	(1.12)
Cut 2	4.10***	(1.13)
*** p<0.001, ** p<0.01, * p<0.05, + p<0.1		
Note: Standard errors in parentheses; W1 = Wave 1		

Table 2-6. Coefficients for Chronic Disease Burden to Predict Women's Sexual Dysfunction from Binomial Logistic Regression Models (N=485)		
NCI	0.11*	(0.05)
W1 Lubrication Problem (*ref:* no)		
Yes	1.07***	(0.25)
Missing	-1.23***	(0.33)
Age	-0.02	(0.03)
Race (*ref:* non-Hispanic white)		
Non-Hispanic Black	0.37	(0.61)
Hispanic	-0.35	(0.55)
Other	-0.31	(0.54)
Education (*ref:* high school or less)		
Some college	0.13	(0.35)
College graduate	-0.04	(0.40)
Income (*ref:* below average)		
Average	0.53	(0.44)
Above average	0.78+	(0.43)
Missing	0.12	(0.51)
Married/cohabiting	0.21	(0.52)
Probability of death	-0.80	(3.73)
Smoke	-0.59	(0.45)
Drink	0.40	(0.30)
Exercise 3+ times a week	0.14	(0.31)
BMI (*ref:* normal/underweight)		
Overweight	-0.68*	(0.32)
Obese	-0.48	(0.42)
Psychological distress	0.02	(0.02)
Constant	-0.62	(1.78)
*** p<0.001, ** p<0.01, * p<0.05, + p<0.1		
Note: Standard errors in parentheses; W1 = Wave 1		

APPENDIX B: Chapter 3 Tables

Table 3-1. Factor Loadings for Positive and Negative Marital Quality				
	Wave 1		Wave 2	
	Positive	Negative	Positive	Negative
How close do you feel is your relationship with spouse?	**0.58**	-0.10	**0.62**	-0.08
How would you describe your marriage in terms of happiness?	**0.58**	-0.14	**0.62**	-0.08
How emotionally satisfying do you find your relationship with spouse?	**0.63**	-0.07	**0.56**	-0.07
Do you and spouse spend free time together or apart?	**0.37**	-0.02	**0.45**	0.06
How often can you open up to spouse?	**0.60**	0.08	**0.62**	-0.02
How often can you rely on spouse?	**0.61**	0.09	**0.52**	0.00
How often does spouse make too many demands on you?	-0.01	**0.64**	0.08	**0.77**
How often does spouse criticize you?	0.03	**0.71**	-0.13	**0.51**

Table 3-2. Weighted Descriptive Statistics

	Men (N=642)			Women (N=427)		
	Mean(SD)/%	Min	Max	Mean(SD)/%	Min	Max
Sexuality						
W2 Sexual Frequency	1.10(1.11)†	0	3	0.94(1.11)†	0	3
W1 Sexual Frequency						
None (ref)	22.89†			33.56†		
Once a month	25.96			23.09		
2-3 times a month	22.47			20.02		
Once a week or more	25.78†			19.86†		
Missing	2.89			3.48		
Marital Quality						
W1 Positive MQ[1,2]	0.13 (0.80)†	-3.53	0.95	-0.09 (0.94)†	-3.75	0.95
W1 Negative MQ[1,2]	0.01 (0.80)†	-0.96	2.55	-0.13 (0.77)†	-0.92	2.52
W2 Positive MQ[3,4]	0.14 (0.79)†	-3.56	0.95	-0.09 (0.95)†	-3.56	0.95
W2 Negative MQ[3,4]	-0.01 (0.80)†	-0.81	2.59	-0.11 (0.76)†	-0.81	2.59
Covariates (all W1)						
Age	66.13 (7.20)	57	85	65.75 (6.47)	57	84
Education	2.86 (1.05)	1	4	2.77 (0.94)	1	4
Probability of Death	0.11 (0.08)†			0.06 (0.06)†		
Probability of Remaining Married	0.62 (0.19)†			0.43 (0.18)†		
Race						
Non-Hispanic White (ref)	83.68			86.79		
Non-Hispanic Black	6.69			6.73		
Hispanic	7.06			4.36		
Other	2.57			2.13		
Income						
Below Average (ref)	19.79			16.16		
Average	33.84†			40.90†		
Above Average	32.74			31.37		
Missing	13.62			11.57		

W1=Wave 1; W2=Wave 2. PMQ=Positive martial quality; NMQ=Negative marital quality. [1]N=633 (men); [2]N=422 (women); [3]N=616 (men); [4]N=408 (women). †: t-tests significant at or below p=0.05.

Table 3-3. Regression Coefficients from OLS Regression Models of Marital Quality to Predict Sexual Frequency

	Men (N=608)				Women (N=404)			
	Model 1		Model 2		Model 1		Model 2	
W1 PMQ	0.20**	(0.07)			0.08	(0.04)		
PMQ W2-W1	0.17**	(0.06)			0.15**	(0.05)		
W1 NMQ			-0.17**	(0.06)			-0.11	(0.06)
NMQ W2-W1			-0.15*	(0.07)			-0.18**	(0.06)
Constant	1.44	(1.10)	1.33	(1.09)	0.30	(0.83)	0.06	(0.83)
R-squared	0.334		0.330		0.516		0.517	

*** p<0.001, ** p<0.01, * p<0.05. Standard errors in parentheses. W1=Wave 1; W2=Wave 2. PMQ=Positive marital quality; NMQ=Negative marital quality. Models control for Wave 1 sex frequency, age, race, education, relative family income, probability of remaining married, and probability of death.

APPENDIX C: Chapter 4 Tables

Table 4-1. Wave 2 NSHAP Comorbidity Index (NCI) Construction	
Chronic Disease Measure	Points
Hypertension	1
Heart Attack	1
Congestive Heart Failure	1
Coronary Artery Disease procedure	1
Stroke	1
Diabetes	1
Skin Cancer	1
Other Cancer	2
Metastatic Cancer	6
Lung Disease (emphysema, asthma, COPD, or chronic bronchitis)	1
Bone Condition (arthritis, osteoporosis, or hip fracture)	1
Rheumatoid Arthritis	1
Neurological Condition (dementia, Alzheimer's)	1
Parkinson's Disease	1
Sensorimotor Condition (urinary incontinence, stool incontinence, urinary problems)	1
Total Score:	21

Table 4-2. Weighted Descriptive Statistics for Men (N=929) and Women (N=929)						
	Men			Women		
	Mean(SD)/%	Min	Max	Mean(SD)/%	Min	Max
NCI[1, 2]	2.99(2.32)†	0	15	2.68(1.88)†	0	13
Sexual Frequency[3, 4]	1.29(1.23)	0	5	1.22(1.28)	0	5
Sexual Satisfaction Scale	0.47(1.98)†	-7.31	3.11	-0.12(2.23)†	-7.31	3.11
Age	71.03(7.46†	38	99	67.54(8.16)†	36	89
Education	2.83(1.07)†	1	4	2.78(0.94)†	1	4
Relationship duration[5]	37.0(17.04)	0.13	82.08	37.0(17.04)	0.13	82.02
Race-ethnicity						
Non-Hispanic White (ref)	83.90			83.69		
Non-Hispanic Black	6.27			6.32		
Hispanic	7.29			7.29		
Others	2.54			2.70		
Relative family income						
Below average (ref)	25.75†			20.62†		
Average	35.82†			44.50†		
Above average	26.84†			21.89†		
Missing	11.59			12.99		
Order of unions						
First union (ref)	84.66†			73.47†		
Higher order unions	15.34†			26.53†		
Sexual dysfunction						
None (ref)	32.59			32.36		
One or more	50.49			48.34		
Missing	16.92			19.29		
Sexual hormones use						
No (ref)	92.10†			86.96†		
Yes	7.90†			13.04†		
Antihypertensive medication use						
No (ref)	31.82†			43.30†		
Yes	68.18†			56.70†		

[1]N=869 (men); [2]N=888 (women); [3]N=840 (men); [4]N=864 (women); [5]N=908 (men and women). Ref=reference category; NCI=NSHAP Comorbidity Index. †t-test was significant at the 0.05 level

APPENDIX D: Supplemental Tables

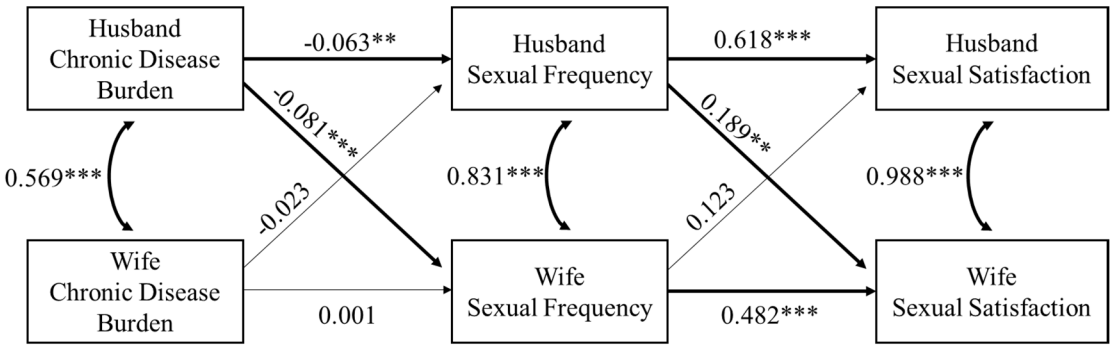
Table A1: *t* test Comparing Results for Men and Women					
	Coefficient (SD)		Sample Size		
	Men	Women	Men	Women	p-value
NCI	-0.06(0.03)	0.02(0.03)	822	590	p<0.05
Note: NCI=NSHAP Comorbidity Index; SD=standard deviation					

Table A2: Estimated Regression Coefficients of Chronic Disease Burden to Predict Sexual Frequency Regression (N=1412)		
NCI x Male	-0.07*	(0.03)
NCI	0.02	(0.03)
Male	0.25*	(0.10)
W1 Sex Frequency (*ref:* none)		
Once a month	0.62***	(0.12)
2-3 times month	1.00***	(0.10)
Once a week or more	1.66***	(0.10)
Missing	0.81***	(0.23)
Age	0.00	(0.01)
Race (*ref:* non-Hispanic white)		
Non-Hispanic Black	0.31+	(0.17)
Hispanic	0.12	(0.08)
Other	-0.13	(0.20)
Education (*ref:* high school or less)		
Some college	0.06	(0.07)
College graduate	0.11	(0.10)
Income (*ref:* below average)		
Average	0.00	(0.14)
Above average	0.09	(0.15)
Missing	0.13	(0.16)
Married/cohabiting	-0.17	(0.13)
Probability of death	-0.71	(0.67)
Smoke	0.15	(0.15)
Drink	-0.01	(0.08)
Exercise 3+ times a week	-0.02	(0.09)
BMI (*ref:* normal/underweight)		
Overweight	0.05	(0.09)
Obese	0.14	(0.12)
Psychological distress	-0.00	(0.01)
Constant	0.34	(0.50)
R-squared	0.331	
*** p<0.001, ** p<0.01, * p<0.05, + p<0.1 Note: Standard errors in parentheses; W1 = Wave 1; NCI=NSHAP Comorbidity Index		

Table A3: *t* tests Comparing Results for Men and Women					
	Coefficient (SD)		Sample Size		
	Men	Women	Men	Women	p-value
W1 PMQ	0.20(0.07)	0.08(0.04)	608	404	p<0.001
PMQ W1-W2	0.17(0.06)	0.15(0.05)	608	404	p<0.001
W1 NMQ	-0.17(0.06)	-0.11(0.06)	608	404	p<0.001
NMQ W1-W2	-0.15(0.07)	-0.18(0.06)	608	404	p<0.001
PMQ=positive marital quality; NMQ=negative marital quality; W1=Wave 1; W2=Wave 2; SD=standard deviation					

APPENDIX E: Chapter 4 Figure

Figure 4-1. Chronic Disease Burden, Sexual Frequency, and Sexual Satisfaction among Couples (N=929)



Model fit indices: CFI=0.918, RMSEA=0.037.

Model controls for actor's age, race-ethnicity, education, family income, order of unions, relationship duration, sexual dysfunction, taking sexual hormones, and taking cardiovascular disease medications.

*p < .05, **p < .01, ***p < .001

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