ORIGINAL PAPER

Lifetime Abstention of Sexual Intercourse and Health in Middle-aged and Older Adults: Results from Wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions

Kee-Lee Chou · Isabella S. F. Ng · Kar-Ming Yu

Abstract This study aimed to examine the association of lifetime abstention of sexual intercourse with lifetime Axis I and II psychiatric disorders, attempted suicide, past-year Axis I psychiatric disorder, past-year medical condition, past-year obesity, health-related quality of life, and health service use in middle-aged and older adults in the United States. Face-to-face interviews were conducted in the 2004–2005 Wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions. Analyses were performed for the subsample aged 40 years and older (males = 14,427; female = 19,860). Lifetime abstinence from sexual intercourse, sociodemographic variables, prevalence of lifetime Axis I and II DSM-IV psychiatric disorders, schizophrenia, and attempted suicide, past-year Axis I psychiatric disorders, 14 medical conditions, obesity, health-related quality of life, and health service use were obtained. The prevalence of lifetime abstinence from sexual intercourse was 0.90 % (0.88 % for males; 1.00 % for females). The adjusted risks of any lifetime and past-year Axis I disorder, any lifetime and past-year substance-use disorders, lifetime alcohol-use disorder, lifetime and past-year alcohol-abuse disorder, lifetime nicotine dependence, lifetime drug-use disorder, and lifetime drug-abuse disorder were significantly lower for who abstained from sexual intercourse than for those who did not. However, those who abstained from sexual intercourse were more likely to have a diagnosis of obesity and lifetime avoidant and dependent personality disorders. The unadjusted risk of dysthymic disorder was also significantly greater for those who abstained from sexual intercourse. Results indicate that the effect of lifetime absence of sexual intercourse on psychiatric disorders is mixed.

K.-L. Chou (✉) · I. S. F. Ng · K.-M. Yu
Department of Asian and Policy Studies, The Hong Kong Institute of Education, 10 Lo Ping Road, Hong Kong, China
e-mail: klchou@ied.edu.hk

Introduction

In modern society, sexual behavior is so important that it is difficult to imagine life without sex, even though the clergy of the Catholic Church is known to practice a celibate lifestyle. Perhaps because lifetime abstinence from sexual intercourse is so rare, its prevalence in the general population is largely unknown. One exception is a recent study of a nationally representative sample of Americans aged between 15 and 44 years in which the prevalence rate of abstention from vaginal, oral, and anal sex in females and males was found to be 5 and 6 %, respectively (Poston & Baumle, 2010). Most of what is known about psychiatric problems among individuals who abstain from sexual intercourse comes from studies of priests, often without proper control groups (Rausch, 1992; Virginia, 1998). Previous studies have found that Catholic priests are more vulnerable to depressive and anxiety symptoms (Knox, Virginia, & Lombardo, 2002; Raj & Dean, 2005; Rausch, 1992; Virginia, 1998), and it is argued that the abstention of sexual intercourse is one of the underlying causes (Knox et al., 2002; Raj & Dean, 2005; Rausch, 1992; Virginia, 1998). However, it is not clear to what extent abstinence from sexual intercourse contributes to psychopathology and whether the results extend to the general population. Furthermore, most research in this area has focused on depressive and anxiety symptoms, rather than a broader range of psychiatric disorders and other indicators of physical health.

Besides religious reasons, asexuality is another plausible reason for leading a life without sexual intercourse. "Asexuality" refers to the absence of sexual attraction or desire (Brotto, Knudson, Inskip, Rhodes, & Erskine, 2010; Prause & Graham, 2007) and about 1 % of the general population in the United

Kingdom report being asexual (Bogaert, 2004). Asexuality is also associated with social withdrawal and personality disorder (Brotto et al., 2010). On the other hand, lifetime abstention of sexual intercourse may also be involuntary, caused by psychopathology, such as social anxiety disorders or avoidant personality disorder. These disorders are associated with poor sexual performance and marked avoidant of sexual behavior (Bodinger et al., 2002; Cox, Turnbull, Robinson, Grant, & Stein, 2011; Ernst, Foldenyi, & Angst, 1993; Figueira, Possidente, Marques, & Hayes, 2001; Leary & Dobbins, 1983). To our knowledge, there has been no population-based study that has examined the association of lifetime abstinence from sexual intercourse with psychiatric disorders, medical conditions, health-related quality of life and health service utilization among middle-aged and older adults. To fill in this gap, this study assessed the relationship between abstaining from sexual intercourse and Axis I and II psychiatric disorders, medical conditions, health-related quality of lives and healthcare use in a random sample of middle-aged and older Americans aged 40 years and older.
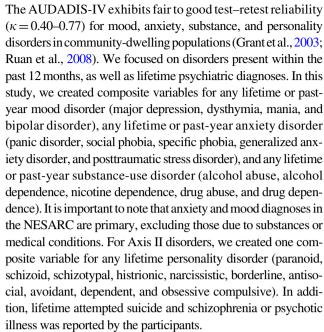
Method

Participants

The data came from Wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), conducted by the U.S. National Institute on Alcohol Abuse and Alcoholism (Grant et al., 2004). The second wave of data, collected in 2004–2005, was from a representative sample of community-dwelling civilians aged 20 years and older residing in the United States. The NESARC oversampled young Black and Hispanic adults. The data were weighted to account for this oversampling, to reflect the survey's complex sampling design, and to accurately reflect the U.S. population in terms of age, gender, ethnicity, and region of the country. A total of 34,653 individuals completed NESARC Wave 2 interviews, with an impressive response rate of 86.7 %. The current study included participants aged 40 years and older, yielding a sample size of 23,119. Due to missing values related to sexual behavior, we focused on 22,829 participants in this analysis.

Measures

Lifetime abstention of sexual intercourse was measured with an item that asked "In your lifetime, have you had sex with only males, only females, both males and females or have you never had sex?" Those who chose the last option were classified as having the status of lifetime abstention of sexual intercourse.

Trained lay interviewers conducted face-to-face computerized personal interviews in participants' homes, using the Alcohol Use Disorder and Associated Disabilities Interview Schedule-(AUDADIS-IV) to assess DSM-IV psychiatric disorders.

The AUDADIS-IV exhibits fair to good test–retest reliability ($\kappa = 0.40$–0.77) for mood, anxiety, substance, and personality disorders in community-dwelling populations (Grant et al., 2003; Ruan et al., 2008). We focused on disorders present within the past 12 months, as well as lifetime psychiatric diagnoses. In this study, we created composite variables for any lifetime or past-year mood disorder (major depression, dysthymia, mania, and bipolar disorder), any lifetime or past-year anxiety disorder (panic disorder, social phobia, specific phobia, generalized anxiety disorder, and posttraumatic stress disorder), and any lifetime or past-year substance-use disorder (alcohol abuse, alcohol dependence, nicotine dependence, drug abuse, and drug dependence). It is important to note that anxiety and mood diagnoses in the NESARC are primary, excluding those due to substances or medical conditions. For Axis II disorders, we created one composite variable for any lifetime personality disorder (paranoid, schizoid, schizotypal, histrionic, narcissistic, borderline, antisocial, avoidant, dependent, and obsessive compulsive). In addition, lifetime attempted suicide and schizophrenia or psychotic illness was reported by the participants.

To measure medical conditions, participants indicated if they experienced any of the following 14 medical conditions in the past year: arteriosclerosis, hypertension, diabetes mellitus, cirrhosis, non-cirrhotic liver disease, angina pectoris, tachycardia, myocardial infarction, high cholesterol, any other form of heart disease, stomach ulcer, gastritis, arthritis, or stroke. Participants answering yes to any of these conditions indicated if they had been diagnosed by a physician or other health professional. In this study, we used self-reported medical conditions only if they were diagnosed by a physician. We also created an obesity variable with self-reported weight and height ($\geq 30\,\mathrm{kg/m}^2$), as in another recent study (Simon et al., 2006).

Participants completed the 12-item Medical Outcomes Study Short Form (SF-12) as a measure of their past-month health-related quality of life (HRQOL). The SF-12 demonstrates good reliability and validity (Ware, Kosinski, & Keller, 1996) and is widely used in large population studies (Chou, 2009). The SF-12 is divided into two component scores (physical HRQOL and mental HRQOL), as well as eight index scores (physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional, and mental health). All scores were continuous measures with a mean of 50 in the general population and a range of 0–100. Higher scores indicate better functioning. Lastly, healthcare use was assessed with four items that asked participants to indicate the number of times in the past year they had stayed overnight in the hospital, the number of days they had been hospitalized, the number of visits to hospital emergency rooms for medical treatment, and the number of severe injuries that required medical attention.

Sociodemographic variables were sex, age, marital status, education, race/ethnicity, annual household income, and employment status while sexual orientation, participation of religious service and the importance of religious beliefs in daily lives were

also measured and analyzed by multiple logistic regression. Sexual orientation was measured by asking participants, "Which of the categories best describes you?" with the following options: heterosexual, gay or lesbian, bisexual, and not sure while the participation of religious was assessed by asking them whether they currently attended religious services at church, synagogue, mosque, or other place of worship. Lastly the importance of religious belief in daily life was obtained by asking participants "How important are religious or spiritual beliefs in your daily life" with 4-point scale ranging from 1 = very important to 4 = not important at all. The results are presented in Table 1 as Odds Ratios (ORs) with 99 % Confidence Intervals (CI).

Statistical Analysis

First, weighted percentages were computed to derive the sociodemographic characteristics of individuals with and without lifetime abstention of sexual intercourse. The difference in sociodemographic characteristics, sexual orientation, and two items related to religion between the two groups was compared with logistic regression models. Second, logistic regression models were calculated to assess the association of lifetime abstinence from sexual intercourse status with lifetime Axis I and II psychiatric disorders before and after adjusting for potentially confounding sociodemographic characteristics. Third, adjusted logistic regression models were used to examine the associations of lifetime abstinence from sexual intercourse and 12-month Axis I disorders before and after controlling for sociodemographic characteristics. Fourth, adjusted logistic regression models tested the association of lifetime abstinence from sexual intercourse status with 14 medical conditions and obesity. Lastly, multiple regression models tested the association of lifetime abstinence from sexual intercourse status with the 10 indicators of health-related quality of life and four measures of healthcare use after adjusting for sociodemographic variables.

Data were analyzed using SUDAAN 9.0, a software program that uses Taylor-series linearization to adjust for the design effects of the complex sampling methodology of the NESARC. To adjust for multiple tests, we set the significance level for all tests at $p < .01$. This reduces Type-I errors and increases the likelihood that we report effects that are more likely to be replicated in future studies. All standard errors and 99 % confidence intervals were adjusted for the design effects of the Wave 2 NESARC sample.

Results

Sociodemographic Characteristics

The prevalence of lifetime abstinence from sexual intercourse was 0.90 % in individuals aged 40 years and older (0.88 % for males; 1.00 % for females) and no significant gender difference

was found, $\chi^2(1) < 1$. Table 1 shows the distribution of sociodemographic variables, sexual orientation, attendance of religious services, and the importance of religious belief in daily life among individuals with and without lifetime abstinence from sexual intercourse. Logistic regression revealed that statistically significant differences between those who abstained from sexual intercourse and those who did not in marital status, race/ethnicity, household income, employment status, and sexual orientation. Not surprisingly, compared with people currently married, single people had increased likelihood of lifetime abstinence from sexual intercourse but surprisingly, 7.3 % of individuals with lifetime abstinence from sexual intercourse were currently married. It could be because these individuals were sexually incompetent or they had stressful jobs and long working hours. Black individuals had lower odds of lifetime abstinence from sexual intercourse than White individuals. Having higher household income was associated with lower odds of lifetime abstinence from sexual intercourse while being employed (compared to being unemployed) was associated with decreased odds of lifetime abstinence from sexual intercourse. Lastly, those who abstained from sexual intercourse were more likely to report that they were not sure about their sexual orientation than those who did not. There were no significant differences for gender, age, education, participation in religious services, and the perceived importance of religious beliefs in daily life.

Lifetime DSM-IV Axis I and II Disorders

Table 2 shows the odds ratios for the relationship between lifetime abstinence from sexual intercourse and lifetime psychiatric disorders. After adjusting for sociodemographic characteristics, people who abstained from sexual intercourse were significantly less likely to report any lifetime Axis I psychiatric disorder, any substance-use disorder, alcohol-use disorder, alcohol-abuse disorder, nicotine dependence, drug-use disorder, or drug-abuse disorder. However, they were more likely to report lifetime avoidant and dependent personality disorders.

Past-year Axis I Disorders

As shown in Table 3, before adjusting for sociodemographic variables, individuals who abstained from sexual intercourse were less likely to report any 12-month Axis I disorder, any substance-use disorder, or alcohol-abuse disorder, but they were more likely to report dysthymic disorder. However, the association of lifetime abstention of sexual intercourse with dysthymic disorder became non-significant after adjusting for sociodemographic variables.

Past-year Medical Conditions and Obesity

Table 4 shows the medical condition correlates of lifetime abstinence from sexual intercourse and it indicated no significant

Table 1 Odds ratios of sociodemographic characteristics by absence of sexual intercourse status in middle-aged and older adults

Characteristic	Celibate ($n^a = 240$)		Non-celibate ($n^a = 22,589$)			
	%	SE	%	SE	OR	99 % CI
Marital status						
Married	7.3	2.7	69.1	0.5	1 [Reference]	
Widowed	0.3	0.3	10.9	0.2	0.27	0.02–4.87
Separated/divorced	3.4	1.7	13.9	0.3	2.31	0.48–11.23
Single	89.0	3.4	6.0	0.3	139.86	44.69–437.70
Gender						
Male	43.8	3.8	47.0	0.5	1 [Reference]	
Female	56.2	3.8	53.0	0.5	1.14	0.75–1.73
Age (years)						
40–49	37.0	3.5	33.1	0.5	1 [Reference]	
50–59	23.3	3.1	27.5	0.4	0.76	0.46–1.26
60–69	16.9	2.8	17.7	0.3	0.85	0.48–1.51
≥70	22.9	2.9	21.7	0.4	0.94	0.59–1.51
Education level						
<High school	18.1	3.1	15.1	0.5	1 [Reference]	
High school	25.7	3.4	29.3	0.6	0.73	0.39–1.38
≥College	56.3	4.0	55.6	0.8	0.85	0.47–1.53
Race/ethnicity						
White	82.8	3.1	75.4	1.4	1 [Reference]	
Black	4.1	1.1	10.2	0.6	0.37	0.18–0.76
Hispanic	9.4	2.7	8.4	1.0	1.01	0.48–2.15
Others[b]	3.7	1.3	5.9	0.5	0.57	0.21–1.53
Household income (annual)						
<$40,000	69.0	3.4	43.8	0.8	1 [Reference]	
$40,000–$69,999	20.3	2.8	25.6	0.5	0.50	0.32–0.80
≥ $70,000	10.7	2.7	30.7	0.8	0.22	0.11–0.47
Employment status						
Not employed	52.9	3.8	42.3	0.5	1.00	(Ref)
Employed	47.1	3.8	57.7	0.5	0.65	0.44–0.98
Sexual orientation						
Heterosexual, homosexual, or bisexual	90.8	2.2	99.6	0.1	1.00	(Ref)
Not sure	9.2	2.2	0.4	0.1	28.63	12.90–63.53
Religious services						
Not currently attend religious services	40.8	3.9	43.2	0.6	1.00	(Ref)
Currently attend religious services	59.2	3.9	56.8	0.6	1.11	0.71–1.72
Importance of religious beliefs in daily life						
Somewhat important, not very important, or not important at all	31.3	3.3	38.4	0.7	1.00	(Ref)
Very important	68.7	3.3	61.6	0.7	1.36	0.90–2.06

OR odds ratio, *CI* confidence interval

[a] Sample sizes are unweighted numbers; proportions are weighted

[b] Others included Native American, Asian, and Pacific Islanders

Table 2 Lifetime prevalence and odds ratios of DSM-IV Axis I and II psychiatric disorders by absence of sexual intercourse status in middle-aged and older adults

Disorder	% (SE)		OR (99 % CI)	AOR[b] (99 % CI)
	Celibate (n^a = 240)	Non-celibate (n^a = 22,589)		
Any Axis I psychiatric disorder	39.2 (3.7)	59.7 (0.7)	0.44 (0.29–0.66)	0.37 (0.23–0.59)
Any mood disorder	21.5 (3.2)	25.6 (0.4)	0.88 (0.53–1.47)	0.76 (0.45–1.27)
Major depressive disorder	19.8 (2.9)	20.8 (0.4)	0.94 (0.58–1.55)	0.78 (0.47–1.31)
Dysthymic disorder	6.6 (1.7)	5.2 (0.2)	1.27 (0.60–2.68)	1.01 (0.46–2.20)
Bipolar disorder	3.7 (1.4)	6.1 (0.2)	0.59 (0.20–1.69)	0.45 (0.15–1.36)
Any anxiety disorder	22.6 (3.3)	27.3 (0.5)	0.78 (0.47–1.29)	0.67 (0.39–1.15)
Panic disorder	5.2 (1.7)	7.2 (0.2)	0.70 (0.28–1.77)	0.58 (0.22–1.52)
Social phobia	6.9 (2.4)	6.4 (0.2)	1.07 (0.39–2.91)	0.89 (0.31–2.53)
Specific phobia	10.0 (2.3)	14.5 (0.4)	0.66 (0.34–1.28)	0.60 (0.30–1.16)
Generalized anxiety disorder	7.2 (1.5)	7.6 (0.3)	0.94 (0.51–1.72)	0.76 (0.40–1.43)
PTSD	5.5 (1.8)	9.5 (0.3)	0.56 (0.22–1.40)	0.45 (0.18–1.14)
Any substance-use disorder	15.6 (2.8)	42.5 (0.8)	0.25 (0.14–0.44)	0.19 (0.10–0.37)
Alcohol use disorder	9.4 (2.5)	31.9 (0.7)	0.22 (0.10–0.48)	0.17 (0.07–0.42)
Alcohol abuse disorder	8.7 (2.5)	30.7 (0.7)	0.21 (0.09–0.49)	0.17 (0.07–0.43)
Alcohol dependence disorder	4.9 (2.2)	11.6 (0.3)	0.39 (0.11–1.37)	0.29 (0.08–1.14)
Nicotine dependence	9.8 (2.6)	22.0 (0.5)	0.38 (0.17–0.86)	0.29 (0.12–0.70)
Drug-use disorder	2.3 (1.2)	9.4 (0.3)	0.23 (0.06–0.91)	0.17 (0.04–0.72)
Drug-abuse disorder	2.3 (1.2)	9.3 (0.3)	0.23 (0.06–0.93)	0.17 (0.04–0.73)
Drug-dependence disorder	0.7 (0.5)	2.4 (0.1)	0.27 (0.04–1.80)	0.20 (0.03–1.29)
Any personality disorder	18.3 (3.0)	18.6 (0.4)	0.98 (0.58–1.66)	0.86 (0.49–1.50)
Paranoid personality disorder	3.6 (1.3)	3.3 (0.2)	1.12 (0.41–3.07)	0.88 (0.31–2.47)
Schizoid personality disorder	2.7 (1.2)	2.7 (0.1)	1.01 (0.30–3.40)	0.85 (0.25–2.86)
Schizotypal personality disorder	3.9 (1.2)	3.3 (0.2)	1.16 (0.48–2.80)	0.90 (0.37–2.22)
Histrionic personality disorder	0.7 (0.7)	1.0 (0.1)	0.64 (0.04–9.25)	0.49 (0.03–7.30)
Narcissistic personality disorder	3.6 (1.1)	5.0 (0.2)	0.71 (0.29–1.73)	0.66 (0.27–1.64)
Borderline personality disorder	3.0 (1.1)	4.7 (0.2)	0.64 (0.23–1.76)	0.45 (0.16–1.28)
Antisocial personality disorder	1.3 (1.0)	2.6 (0.2)	0.50 (0.06–3.86)	0.35 (0.04–2.89)
Avoidant personality disorder	7.8 (2.0)	1.7 (0.1)	4.82 (2.26–10.26)	3.66 (1.61–8.31)
Dependent personality disorder	2.0 (1.2)	0.3 (0.0)	7.70 (1.56–38.13)	4.75 (0.93–24.23)
Obsessive–compulsive personality disorder	8.3 (2.1)	7.8 (0.3)	1.06 (0.50–2.22)	0.98 (0.46–2.09)
Schizophrenia or psychotic illness	3.5 (1.7)	3.5 (0.2)	1.91 (0.87–4.16)	1.59 (0.71–3.56)
Attempted suicide	2.5 (1.3)	2.8 (0.1)	0.90 (0.23–3.49)	0.63 (0.15–2.61)

OR odds ratio, *AOR* adjusted odds ratio, *CI* confidence interval

[a] Sample sizes are unweighted numbers; proportions are weighted

[b] Odds ratios adjusted for gender, age, education, race, household income, and employment status

association between lifetime abstinence from sexual intercourse and any of 14 medical conditions we assessed. However, after adjusting for sociodemographic variables, lifetime abstinence from sexual intercourse was still positively associated with obesity.

Health-related Quality of Life and Healthcare Use

Finally, as shown in Table 5, we found no significant association between lifetime absence of sexual intercourse and past-month physical, past-month mental health-related quality of life, or past-year healthcare service use.

Discussion

To our knowledge, this was the first study to examine the prevalence and health correlates of lifetime abstinence from sexual intercourse in a nationally representative sample of middle-aged and older Americans aged 40 years and older. The major findings

Table 3 Twelve-month prevalence and odds ratios of DSM-IV Axis I psychiatric disorders by absence of sexual intercourse status in middle-aged and older adults

Disorder	% (SE)		OR (99 % CI)	AOR[b] (99 % CI)
	Celibate (n^a = 240)	Non-celibate (n^a = 22,589)		
Any Axis I disorder	22.0 (3.5)	31.5 (0.5)	0.61 (0.35–0.67)	0.49 (0.27–0.88)
Any mood disorder	10.3 (2.7)	8.8 (0.3)	1.18 (0.55–2.54)	0.93 (0.42–2.07)
Major depressive disorder	7.3 (2.0)	7.3 (0.2)	1.00 (0.46–2.15)	0.78 (0.35–1.70)
Dysthymic disorder	3.2 (1.2)	1.1 (0.1)	2.98 (1.00–8.87)	2.09 (0.67–6.52)
Bipolar disorder	1.7 (1.1)	2.3 (0.1)	0.70 (0.11–4.31)	0.51 (0.08–3.34)
Any anxiety disorder	10.8 (2.2)	15.4 (0.3)	0.67 (0.37–1.20)	0.55 (0.30–1.00)
Panic disorder	1.0 (0.6)	2.3 (0.1)	0.41 (0.09–2.00)	0.29 (0.06–1.47)
Social phobia	3.8 (1.4)	2.1 (0.1)	1.84 (0.67–5.01)	1.40 (0.50–3.94)
Specific phobia	2.7 (1.1)	7.0 (0.2)	0.37 (0.12–1.11)	0.33 (0.11–0.99)
Generalized anxiety disorder	2.8 (1.1)	3.6 (0.2)	0.77 (0.27–2.20)	0.59 (0.21–1.61)
PTSD	3.2 (1.6)	6.3 (0.2)	0.50 (0.13–1.91)	0.39 (0.10–1.51)
Any substance-use disorder	8.9 (2.4)	17.8 (0.4)	0.45 (0.20–1.00)	0.34 (0.14–0.81)
Alcohol-use disorder	3.4 (1.8)	6.6 (0.2)	0.50 (0.12–2.14)	0.44 (0.10–2.03)
Alcohol-abuse disorder	1.7 (0.8)	5.6 (0.2)	0.30 (0.09–0.99)	0.27 (0.08–0.91)
Alcohol-dependence disorder	2.4 (1.7)	2.7 (0.1)	0.90 (0.13–6.31)	0.64 (0.09–4.71)
Nicotine dependence	7.5 (2.3)	12.8 (0.4)	0.55 (0.22–1.37)	0.41 (0.15–1.07)
Drug-use disorder	0.4 (0.4)	1.3 (0.1)	0.29 (0.02–4.11)	0.17 (0.01–2.46)
Drug-abuse disorder	0.4 (0.4)	1.2 (0.1)	0.31 (0.02–4.42)	0.18 (0.01–2.57)
Drug-dependence disorder	0.4 (0.4)	0.4 (0.1)	0.91 (0.06–13.19)	0.53 (0.04–7.75)

OR odds ratio, *AOR* adjusted odds ratio, *CI* confidence interval

[a] Sample sizes are unweighted numbers; proportions are weighted

[b] Odds ratios adjusted for gender, age, education, race, household income, and employment status

from this study show: (1) the prevalence of lifetime abstinence from sexual intercourse was very low (0.90 %); (2) the risk of lifetime Axis I and substance-use disorders were lower for those who abstained from sexual intercourse than those who did not; (3) the rates of avoidant and dependent personality disorders were higher for those who abstained from sexual intercourse than those who did not; and (4) lifetime abstention of sexual intercourse was associated with increased odds of obesity. Results suggest that lifetime abstinence from sexual intercourse had a mixed relationship with psychiatric disorders.

In our study, the prevalence of lifetime abstention of sexual intercourse in middle-aged and older adults was very low (0.90 %). It was much lower than the prevalence of behavioral asexuality (i.e. abstinence from vaginal, oral, and anal sex) of Americans aged between 15 and 44 years (about 5.5 %) (Poston & Baumle, 2010). Obviously, the reason for the discrepancy was due to the age difference between two samples. On the other hand, our rate was close to the prevalence of asexuality in the general population in the United Kingdom (about 1.0 %) (Bogaert, 2004). However, it should be noted asexuality and abstention of sexual intercourse are not exactly the same, although the two groups do overlap. Our results revealed that only about 9.2 % of celibates reported that they were not sure about their sexual orientation.

Moreover, we found that being single (vs. married), being white (vs. black), having low household income, and not being employed were associated with increased likelihood of lifetime abstention of sexual intercourse. These findings were consistent with the findings that abstinence from sex was negatively associated with being employed and ever married (Poston & Baumle, 2010). Although it has been argued that the supposedly bad health of asexual people may lead to economic hardship (Bogaert, 2004), we did not find significant differences in physical health indicators between those who abstained from sexual intercourse and those who did not. There were also no significant differences in gender or education between those who abstained from sexual intercourse and those who did not.

We do not know the proportion of those who abstained from sexual intercourse due to religious reasons. However, our results showed that 59 % of those who abstained from sexual intercourse currently attended religious services and 69 % reported that religious or spiritual belief in their daily life were very important. In other words, it seems that almost two-thirds of these individuals were religious. Although depressive symptoms have been reported to be more common in priests who did not have sexual intercourse (Rausch, 1992; Virginia, 1998), previous studies had not examined the specific contribution of abstinence from sexual intercourse to a wide range of psychiatric disorders in middle-

Table 4 Twelve-month prevalence and odds ratios of medical condition and obesity by absence of sexual intercourse status in middle-aged and older adults

Medical condition	% (SE)		OR (99 % CI)	AOR[b] (99 % CI)
	Celibate (n^a = 240)	Non-celibate (n^a = 22,589)		
Arteriosclerosis	4.7 (1.9)	2.9 (0.2)	1.64 (0.54–4.96)	1.63 (0.48–5.47)
Hypertension	35.1 (3.6)	34.5 (0.5)	1.02 (0.68–1.54)	0.96 (0.62–1.48)
Diabetes mellitus	14.9 (2.5)	11.4 (0.3)	1.36 (0.80–2.29)	1.35 (0.79–2.33)
Cirrhosis	1.5 (1.2)	0.3 (0.1)	5.23 (0.59–46.3)	2.71 (0.34–21.45)
Noncirrhotic liver disease	1.3 (0.8)	0.9 (0.1)	1.46 (0.29–7.43)	1.13 (0.21–5.97)
Angina pectoris	5.3 (1.7)	5.3 (0.2)	0.98 (0.38–2.57)	0.85 (0.33–2.18)
Tachycardia	4.6 (1.6)	6.0 (0.2)	0.75 (0.29–1.96)	0.64 (0.24–1.72)
Myocardial infarction	2.0 (1.1)	1.2 (0.1)	1.63 (0.36–7.41)	1.47 (0.31–7.02)
Hypercholesterolemia	33.2 (3.6)	28.2 (0.4)	1.27 (0.82–1.96)	1.30 (0.84–2.02)
Other heart disease	5.0 (1.4)	3.9 (0.2)	1.30 (0.57–2.94)	1.19 (0.51–2.81)
Stomach ulcer	3.5 (1.4)	2.6 (0.1)	1.36 (0.43–4.26)	1.08 (0.34–3.42)
Gastritis	6.0 (2.0)	6.1 (0.2)	0.98 (0.39–2.47)	0.87 (0.34–2.21)
Arthritis	32.8 (3.4)	30.6 (0.5)	1.11 (0.73–1.69)	1.01 (0.62–1.64)
Stroke	1.6 (0.8)	1.1 (0.1)	1.41 (0.33–5.96)	1.29 (0.29–5.71)
Obesity	39.7 (4.0)	28.6 (0.4)	1.64 (1.05–2.57)	1.64 (1.03–2.59)

OR Odds ratio, *AOR* adjusted odds ratio, *CI* confidence interval

[a] Sample sizes are unweighted numbers; proportions are weighted

[b] Odds ratios adjusted for gender, age, education, race, household income, and employment status

Table 5 Health-related quality of life and health service use by absence of sexual intercourse status in middle-aged and older adults

	Mean (*SE*)		Adjusted regression coefficients
	Celibate (n^a = 240)	Non-celibate (n^a = 22,589)	
Health-related quality of life (assessed by SF-12)			
Physical functioning component	45.6 (1.0)	47.7 (0.1)	−2.03 (ns)
Mental functioning component	51.2 (0.8)	51.7 (0.1)	0.57 (ns)
Physical functioning	46.8 (1.0)	48.6 (0.1)	−2.25 (ns)
Role physical	45.9 (1.1)	48.2 (0.1)	−0.95 (ns)
Bodily pain	48.0 (1.1)	48.9 (0.1)	−2.09 (ns)
General health	45.5 (1.0)	47.6 (0.2)	−0.81 (ns)
Vitality	50.6 (0.8)	51.4 (0.1)	−1.17 (ns)
Social functioning	49.9 (1.0)	51.1 (0.1)	−1.91 (ns)
Role emotional	46.5 (1.1)	48.6 (0.1)	−2.06 (ns)
Mental health	52.2 (0.9)	52.0 (0.1)	0.21 (ns)
Health service use			
Overnight hospitalization	0.2 (0.1)	0.3 (0.01)	−0.01 (ns)
Hospital days	0.3 (0.1)	0.4 (0.1)	−0.07 (= .06)
Emergency room visit	2.1 (0.8)	1.2 (0.1)	0.83 (ns)
Injury needing medical attention	0.3 (0.1)	0.3 (0.01)	−0.06 (ns)

[a] Sample sizes are unweighted numbers

aged and older adults. In this study, the overall lifetime prevalence rates of any Axis I disorder, any substance-use disorder, alcohol-use disorder, alcohol-abuse disorder, nicotine dependence, drug use, and abuse disorder were significantly lower for those who abstained from sexual intercourse than those who did not. All these relationships remained significant even after adjusting for sociodemographic characteristics.

One plausible reason that individuals who abstained from sexual intercourse were less likely to abuse substances was their religious commitment. Greater attachment to God has been

found to be a significant moderator in the relationship between stress and depressive symptoms in older residents in religious monasteries (Bishop, 2008), and it may be a protective factor for substance-use disorder in middle-aged and older adults in the general population. However, a recent study found a positive relationship between problematic attachment to God and substance use in college students (Horton, Ellison, Loukas, Downey, & Barrett, 2012). In contrast, the current study found no significant differences between those with lifetime abstention of sexual intercourse status and those without in past-year disorders, any Axis I disorder, any alcohol-use disorder, and alcohol abuse disorder. This change may be due to the "maturing out" phenomenon, whereby alcohol problems and dependence symptoms reach the highest levels in the early 20s and then decline rapidly in the 30s (Chan, Neighbors, Gilson, Larimer, & Marlatt, 2007; Littlefield, Sher, & Wood, 2009; Verges et al., 2012).

The novel finding of this study was that middle-aged and older adults who abstained from sexual intercourse were significantly more likely to report lifetime avoidant and dependent personality disorders than those who did not. Due to the cross-sectional data examined in this study, the causal relationship between personality disorder and abstinence from sexual intercourse could not be established. However, this finding was consistent with previous studies that found a harmful effect of social anxiety disorders on sexual relationships in the general population, since social anxiety disorders are highly related to both avoidant and dependent personality disorders. However, it is surprising that this study found no significant association between lifetime abstention of sexual intercourse and social phobia (both lifetime and past-year). The relationship between lifetime absence of sexual intercourse, social phobia, and avoidant and dependent personality disorders should be examined in more detail in future studies.

For past-year Axis I disorders, the association of lifetime abstinence from sexual intercourse was mixed. On the one hand, lifetime abstention of sexual intercourse was associated with decreased risk of any Axis I disorder, any substance-use disorder, and alcohol-abuse disorder. On the other hand, abstinence from sexual intercourse was associated with an increased likelihood of reporting dysthymic disorder, although this association disappeared after adjusting for sociodemographic characteristics. Again, the association between lifetime abstinence from sexual intercourse and past-year alcohol abuse disorder may be due to religious commitment. On the other hand, the relationship between lifetime abstinence from sexual intercourse and past-year dysthymic disorder was in line with studies of priests (Rausch, 1992; Virginia, 1998). However, other possible explanations for these patterns are beyond the scope of the current data; future investigations into the underlying mechanism would be of interest.

It is noteworthy that there was no significant association between lifetime abstinence from sexual intercourse and medical conditions, health-related quality of life, and healthcare use. It seems that, although lifetime abstinence from sexual inter-

course was highly related to mental health, the impact of lifetime abstinence from sexual intercourse on physical health, health-related quality of life, and healthcare use was minimal. Obesity was the one exception. Obesity is a severe public health issue in the United States (Flegal, Carroll, Ogden, & Johnson, 2002; Ogden et al., 2006) and it might lead to numerous detrimental physical and mental health consequences (Calle, Rodriguez, Walker-Thurmond, & Thun, 2003; Ford, Giles, & Dietz, 2002; Jee et al., 2006; Yusuf et al., 2005). Therefore, this finding should not be neglected. One plausible reason is that people who abstain from sexual intercourse do not actively engage in sufficient physical activity to keep them at optimal weight. However, future studies must be undertaken to replicate this finding and examine the reasons behind it.

From a public health perspective, the findings of this study were important because they indicate that lifetime abstinence from sexual intercourse was associated with higher risk avoidant personality disorder. More interestingly, this study found that those who abstained from sexual intercourse were more likely to report obesity and dysthymic disorder in middle-aged and older adults. Therefore, future studies may need to examine the impact of lifetime abstinence from sexual intercourse on health more thoroughly in future studies. From a theoretical point of view, our findings were consistent with what has argued that the abstention of sexual behavior is not necessarily describing a pathological or health-comprised state (Bogaert, 2006). Future studies must be undertaken to examine its impact on distress and interpersonal difficulty which are criteria for determining a pathological state.

Findings from this study should be interpreted in light of several important limitations. First, although NESARC is the largest U.S. psychiatric epidemiological survey ever conducted, its power to detect differences between those who abstained from sexual intercourse and those who did not is limited in some rare psychiatric disorders because of the low prevalence of lifetime abstinence from sexual intercourse as well as the lifetime histrionic personality disorders and past-year panic and drug-dependence disorders. Second, the NESARC did not assess the reasons for abstinence from sexual intercourse and the item used to assess abstention of sexual intercourse referred to the term of "had sex" which may also include other sexual behavior such as masturbation or oral sex. Future studies must be undertaken to replicate the current findings by using more precise definitions on sexual intercourse. Third, medical conditions were based on self-reports of physician-diagnosed conditions and were not confirmed by independent sources. Although this procedure has been used in other research (Afifi, Cox, Martens, Sareen, & Enns, 2010), it is possible that some people may have reported a medical condition that would not match a physician diagnosis. Additionally, some conditions may have been underreported if people had the condition, but had not yet been given a physician diagnosis. Fourth, although this study assessed 14 medical conditions, this is not a comprehensive list. Fifth, due to the cross-sectional design, the temporal order between psychopathology and

abstention of sexual intercourse could not be established in this study. Finally, the lifetime diagnoses of psychiatric disorders were retrospectively self-reported, which makes them susceptible to recall bias.

Despite these limitations, the NESARC is the largest nationally representative survey to date to include information on psychiatric disorders, medical conditions, health-related quality of life, and healthcare use among those who abstained from sexual intercourse. The prevalence of lifetime abstinence from sexual intercourse is low, and its relationship with health is mixed. Specifically, it is related to a lower risk of substance-use disorders, but a higher risk for avoidant and dependent personality disorder, dysthymic disorder, and obesity. Therefore, it is too early to draw a conclusion that abstinence from sexual intercourse is good or bad for health. Moreover, future studies must be undertaken to confirm our findings and examine the underlying mechanisms associated with the link between abstinence from sexual intercourse and health. As a consequence, healthcare practitioners could screen people who abstain from sexual intercourse for possible mood and personality disorders, as well as obesity and its associated medical conditions in order to minimize the comorbidity of abstention of sexual intercourse.

References

Afifi, T. O., Cox, B. J., Martens, P. J., Sareen, J., & Enns, M. W. (2010). The relation between types and frequency of gambling activities and problem gambling among women in Canada. *Canadian Journal of Psychiatry, 55*, 21–28.

Bishop, A. J. (2008). Stress and depression among older residents in religious monasteries: Do friends and God matter? *International Journal of Aging and Human Development, 67*, 1–23.

Bodinger, L., Hermesh, H., Aizenberg, D., Valevski, A., Marom, S., Shiloh, R., … Weizman, A. (2002). Sexual function and behavior in social phobia. *Journal of Clinical Psychiatry, 63*, 874–879.

Bogaert, A. F. (2004). Asexuality: Prevalence and associated factors in a national probability sample. *Journal of Sex Research, 41*, 279–287.

Bogaert, A. F. (2006). Toward a conceptual understanding of asexuality. *Review of General Psychology, 10*, 241–250.

Brotto, L. A., Knudson, G., Inskip, J., Rhodes, K., & Erskine, Y. (2010). Asexuality: A mixed-methods approach. *Archives of Sexual Behavior, 39*, 599–618.

Calle, E. E., Rodriguez, C., Walker-Thurmond, K., & Thun, M. J. (2003). Overweight, obesity, and mortality from cancer in a prospectively studied cohort of US adults. *New England Journal of Medicine, 348*, 1625–1638.

Chan, K. K., Neighbors, C., Gilson, M., Larimer, M. E., & Marlatt, G. A. (2007). Epidemiological trends in drinking by age and gender: Providing normative feedback to adults. *Addictive Behaviors, 32*, 967–976.

Chou, K. L. (2009). Age at onset of generalized anxiety disorder in older adults. *American Journal of Geriatric Psychiatry, 17*, 455–464.

Cox, B. J., Turnbull, D. L., Robinson, J. A., Grant, B. F., & Stein, M. B. (2011). The effect of avoidant personality disorder on the persistence of generalized social anxiety disorder in the general population: Results from a longitudinal, nationally representative mental health survey. *Depression and Anxiety, 28*, 250–255.

Ernst, C., Foldenyi, M., & Angst, J. (1993). The Zurich Study.21. Sexual dysfunction and disturbances in young adults: Data of a longitudinal epidemiologic study. *European Archives of Psychiatry and Clinical Neuroscience, 243*, 179–188.

Figueira, I., Possidente, E., Marques, C., & Hayes, K. (2001). Sexual dysfunction: A neglected complication of panic disorder and social phobia. *Archives of Sexual Behavior, 30*, 369–377.

Flegal, K. M., Carroll, M. D., Ogden, C. L., & Johnson, C. L. (2002). Prevalence and trends in obesity among US adults, 1999-2000. *Journal of the American Medical Association, 288*, 1723–1727.

Ford, E. S., Giles, W. H., & Dietz, W. H. (2002). Prevalence of the metabolic syndrome among US adults: Findings from the Third National Health and Nutrition Examination Survey. *Journal of the American Medical Association, 287*, 356–359.

Grant, B. F., Dawson, D. A., Stinson, F. S., Chou, P. S., Kay, W., & Pickering, R. (2003). The Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADIS-IV): Reliability of alcohol consumption, tobacco use, family history of depression and psychiatric diagnostic modules in a general population sample. *Drug and Alcohol Dependence, 71*, 7–16.

Grant, B. F., Stinson, F. S., Dawson, D. A., Chou, S. P., Dufour, M. C., Compton, W., … Kaplan, K. (2004). Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry, 61*, 807–816.

Horton, K. D., Ellison, C. G., Loukas, A., Downey, D. L., & Barrett, J. B. (2012). Examining attachment to God and health risk-taking behaviors in college students. *Journal of Religion and Health, 51*, 552–566.

Jee, S. H., Sull, J. W., Park, J., Lee, S., Ohrr, H., Guallar, E., & Samet, J. M. (2006). Body-mass index and mortality in Korean men and women. *New England Journal of Medicine, 355*, 779–787.

Knox, S., Virginia, R. A., & Lombardo, J. P. (2002). Depression and anxiety in Roman Catholic secular clergy. *Pastoral Psychology, 50*, 258–345.

Leary, M. R., & Dobbins, S. E. (1983). Social anxiety, sexual-behavior, and contraceptive use. *Journal of Personality and Social Psychology, 45*, 1347–1354.

Littlefield, A. K., Sher, K. J., & Wood, P. K. (2009). Is "maturing out" of problematic alcohol involvement related to personality change? *Journal of Abnormal Psychology, 118*, 360–374.

Ogden, C. L., Carroll, M. D., Curtin, L. R., McDowell, M. A., Tabak, C. J., & Flegal, K. M. (2006). Prevalence of overweight and obesity in the United States, 1999-2004. *Journal of the American Medical Association, 295*, 1549–1555.

Poston, D. L., & Baumle, A. K. (2010). Patterns of asexuality in the United States. *Demographic Research, 23*, 509–530.

Prause, N., & Graham, C. A. (2007). Asexuality: Classification and characterization. *Archives of Sexual Behavior, 36*, 341–356.

Raj, A., & Dean, K. E. (2005). Burnout and depression among Catholic priests in India. *Pastoral Psychology, 54*, 15.

Rausch, T. P. (1992). *Priesthood today*. New York: Paulist Press.

Ruan, W. J., Goldstein, R. B., Chou, S. P., Smith, S. M., Saha, T. D., Pickering, R. P., … Grant, B. F. (2008). The Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADIS-IV): Reliability of new psychiatric diagnostic modules and risk factors in a general population sample. *Drug and Alcohol Dependence, 92*, 27–36.

Simon, G. E., Von Korff, M., Saunders, K., Miglioretti, D. L., Crane, P. K., van Belle, G., & Kessler, R. C. (2006). Association between obesity and psychiatric disorders in the US adult population. *Archive of General Psychiatry, 63*, 824–830.

Verges, A., Jackson, K. M., Bucholz, K. K., Grant, J. D., Trull, T. J., Wood, P. K., & Sher, K. J. (2012). Deconstructing the age-prevalence curve of

alcohol dependence: Why "maturing out" is only a small piece of the puzzle. *Journal of Abnormal Psychology, 121*, 511–523.

Virginia, R. A. (1998). Burnout and depression among Roman Catholic secular, religious, and monastic clergy. *Pastoral Psychology, 47*, 49–67.

Ware, J., Kosinski, M., & Keller, S. D. (1996). 12-item short-form health survey: construction of scales and preliminary tests of reliability and validity. *Medical Care, 34*, 220–233.

Yusuf, S., Hawken, S., Ounpuu, S., Bautista, L., Franzosi, M. G., Commerford, P., Investigators, INTERHEART Study. (2005). Obesity and the risk of myocardial infarction in 27,000 participants from 52 countries: A case-control study. *Lancet, 366*, 1640–1649.