

UCLA

UCLA Electronic Theses and Dissertations

Title

Sexual Minority Mental Health Service Utilization

Permalink

<https://escholarship.org/uc/item/18n2z812>

Author

Nasuti, Laura Jean

Publication Date

2014

Peer reviewed|Thesis/dissertation

**UNIVERSITY OF CALIFORNIA
Los Angeles**

Sexual Minority Mental Health Service Utilization

**A dissertation submitted in partial satisfaction of the requirements
for the degree Doctor of Philosophy in Epidemiology**

by

Laura Jean Nasuti

2014

**© Copyright by
Laura Jean Nasuti
2014**

ABSTRACT OF THE DISSERTATION

Sexual Minority Mental Health Service Utilization

by

Laura Jean Nasuti

Doctor of Philosophy in Epidemiology

University of California, Los Angeles, 2014

Professor Susan D. Cochran, Chair

Although there are population-based studies that find that sexual minorities are at increased risk for psychological distress and mental health disorders compared to heterosexuals, there have been few studies examining the way sexual minorities utilize mental health services within the U.S. health care system. With the reversal of the Defense of Marriage Act (DOMA) in 2013 and the Patient Protection and Affordable Care Act (PPACA), sexual minorities will have unprecedented access to health insurance coverage. The impact of this expanded coverage on mental health service utilization and cost is not known.

This dissertation examines sexual minority mental health service utilization over three studies and two data sets. The first two studies examined sexual minority mental health service utilization using two different national data sets over several years: the National Health and Nutrition Examination Surveys (NHANES) from 2001-2010 and the Medical Expenditure Panel Surveys (MEPS) from 1996-2010. The third study used the MEPS to examine differences in out-

of-pocket and total expenditures between individuals in same-sex couples compared to individuals in different-sex couples.

This research found that sexual minorities were more likely to use mental health services compared to heterosexuals. In particular, sexual minorities were found to be primarily accessing this care in office-based visits and through psychopharmaceutical prescriptions. Despite this increase in access, sexual minorities were not more likely to receive minimally adequate care after initiating mental health services compared to heterosexuals. This increased utilization of care did translate into increased out-of-pocket mental health care expenditures and total mental health care expenditures for individuals in same-sex couples as compared to individuals in different-sex couples.

This dissertation found that sexual minorities are accessing and using mental health services differently than heterosexuals. With the enactment of PPACA and the reversal of DOMA, sexual minorities should have unprecedented access to mental health services. Due to the limited research in this area, it remains unclear if there will be enough access to culturally competent mental health providers and how this access will impact overall access to already-scarce mental health services. Sexual minority and health policy researchers will need to seek novel data sets to examine the impact of this increased utilization on both mental health outcomes as well as health care expenditures.

The dissertation of Laura Jean Nasuti is approved.

Onyebuchi A. Arah

Gerald F. Kominski

Teresa Seeman

Susan D. Cochran, Committee Chair

University of California, Los Angeles

2014

Table of Contents

Chapter 1: Overview of Mental Health Utilization by Sexual Minorities.....	1
1.1 Sexual Minorities, MHSA, and MHSA Health Services Utilization.....	2
1.2 MHSA Health Services Utilization.....	7
1.3 Assessing Sexual Orientation in Data Sets.....	8
1.4 Current State of Sexual Orientation Data Collection for Health Services Research.....	13
1.5 Overview of Dissertation Studies.....	14
Chapter 2: Sexual Minority Use of Mental Health Care Services in a Nationally Representative Survey.....	16
2.1 Introduction.....	16
2.2 Methods.....	20
2.3 Results.....	36
2.4 Discussion.....	60
2.5 Conclusion.....	64
Chapter 3: Describing Mental Health Treatment Patterns Among Individuals in Same-Sex Couples in a National Sample.....	65
3.1 Introduction.....	65
3.2 Methods.....	69
3.3 Results.....	90
3.4 Discussion.....	106
3.5 Conclusion.....	112
Chapter 4: The Cost of Mental Health Care Services for Individuals in Same-Sex Couples.....	113
4.1 Introduction.....	113
4.2 Methods.....	117
4.3 Results.....	132
4.4 Discussion.....	151
4.5 Conclusion.....	155
Chapter 5: Summary of Findings and Conclusions.....	156
5.1 Summary of Findings.....	156
5.2 Overall Strengths & Limitations.....	159
5.3 Public Health Implications & Future Research.....	160
Chapter 6: Appendices.....	162
Chapter 7: References.....	163

List of Tables

Table 2.1 Missing Data (unweighted), by sexual orientation, NHANES (2001-2010).....	35
Table 2.2a Demographic characteristics of U.S. adult men, age 20 to 59 years, by sexual orientation, NHANES (2001-2010): Single Imputation	38
Table 2.3 Demographic characteristics of U.S. adult women, age 20 to 59 years, by sexual orientation, NHANES (2001-2010): Single Imputation.....	39
TABLE 2.4A Mental health status among U.S. adults, age 20 to 59 years, by gender and sexual orientation, NHANES (2001-2010): Current prevalence based on single imputation shown.....	41
TABLE 2.4B Mental health status among U.S. adults, age 20 to 59 years, by gender and sexual orientation, NHANES (2001-2010): Partial results of logistic regression analyses based on single imputation shown.....	42
TABLE 2.5A Mental health status among U.S. adults, age 20 to 59 years, by gender and sexual orientation, NHANES (2001-2010): Prevalence results include missing data	43
TABLE 2.5B Mental health status among U.S. adults, age 20 to 59 years, by gender and sexual orientation, NHANES (2001-2010): Partial results of logistic regression analyses are based on multiple imputations.....	44
TABLE 2.6A Mental health services utilization among U.S. adult men, age 20 to 59 years, by sexual orientation, NHANES (2001-2010): Prevalence based on single imputation shown.....	46
TABLE 2.6B Mental health services utilization among U.S. adult men, age 20 to 59 years, by sexual orientation, NHANES (2001-2010): Partial results of logistic regression analyses based on single imputation shown.....	47
TABLE 2.7A Mental health services utilization among U.S. adult women, age 20 to 59 years, by gender and sexual orientation, NHANES (2001-2010): Prevalence based on single imputation shown.....	48
TABLE 2.7B Mental health services utilization among U.S. adult women, age 20 to 59 years, by gender and sexual orientation, NHANES (2001-2010): Partial results of logistic regression analyses based on single imputation shown.....	49
TABLE 2.8A Mental health services utilization among U.S. adult men, age 20 to 59 years, by sexual orientation, NHANES (2001-2010): Prevalence results include missing data	50
TABLE 2.8B Mental health services utilization among U.S. adult men, age 20 to 59 years, by sexual orientation, NHANES (2001-2010): Partial results of logistic regression analyses from based on multiple imputations shown.....	51
TABLE 2.9A Mental health services utilization among U.S. adult women, age 20 to 59 years, by sexual orientation, NHANES (2001-2010): Prevalence results include missing data	52
TABLE 2.9B Mental health services utilization among U.S. adult women, age 20 to 59 years, by sexual orientation, NHANES (2001-2010): Partial results of logistic regression analyses by multiple imputations shown.....	53
TABLE 2.10 Psychopharmaceutical drug use in the past 30 days among U.S. adults, age 20 to 59 years, by gender and sexual orientation, NHANES (2001-2010): Weighted prevalence shown..	56
TABLE 2.11A HIV subanalysis: mental health and mental health services utilization among U.S. adults men, age 20 to 49 years, by gender and sexual orientation, NHANES (2001-2010): Prevalence based on single imputation for show	58

TABLE 2.11B HIV subanalysis: mental health and mental health services utilization among U.S. adults men, age 20 to 49 years, by gender and sexual orientation, NHANES (2001-2010): Partial results of logistic regression analyses shown based on single imputation shown.....	59
Table 3.1 MEPS Sample by Year, MEPS 1996-2010, unweighted.....	76
Table 3.2 Missing data by couple status, MEPS (1996-2010), unweighted. Data only include those eligible for the final study sample.....	90
Table 3.3 Predisposing demographics, predisposing social factors, enabling factors and need of U.S. adults in same-sex couples or married different-sex couples, age 18 to 64 years, MEPS (1996-2010): Weighted prevalence shown.....	92
Table 3.4 Predisposing demographics, predisposing social factors, enabling factors and need of U.S. adults in same-sex couples or married different-sex couples, age 18 to 64 years, REFERENT ONLY, MEPS (1996-2010): Weighted prevalence shown.....	93
Table 3.5 Predisposing demographics, predisposing social factors, enabling factors and need of U.S. adults in same-sex couples or married different-sex couples, age 18 to 64 years, by sex, MEPS (1996-2010): Weighted prevalence shown.....	94
Table 3.6 Mental health service utilization among U.S. adults, by sexual minority status, MEPS (1996-2010): Weighted prevalence shown.....	97
Table 3.7 Mental health service utilization among U.S. adults, by sexual minority status, REFERENT ONLY, MEPS (1996-2010): Weighted prevalence shown.....	97
Table 3.8 Mental health service utilization among U.S. adults, by sexual minority status and sex, MEPS (1996-2010): Weighted prevalence shown.....	98
Table 3.9 Detailed mental health service utilization among U.S. adults, by sexual minority status, MEPS (1996-2010): Weighted prevalence shown.....	100
Table 3.10 Comparison of logistic regression and four propensity score methods on estimating mental health service utilization by sexual minority status, MEPS (1996-2010).....	103
Table 3.11 Comparison of logistic regression and four propensity score methods on estimating mental health service utilization by sexual minority status REFERENTS ONLY, MEPS (1996-2010).....	104
Table 4.1 MEPS Eligible Sample by Year, MEPS 1996-2010, unweighted.....	123
Table 4.2. Demographics and descriptive characteristics of U.S. adults in same-sex couples or married different-sex couples, age 18 to 64 years, MEPS (1996-2010): Weighted prevalence shown.....	134
Table 4.3. Demographics and descriptive characteristics of U.S. adults in same-sex couples or married different-sex couples REFERENT ONLY, age 18 to 64 years, MEPS (1996-2010): Weighted prevalence shown.....	135
Table 4.4. Mental health (MH) service utilization among U.S. adults in same-sex relationships or married different-sex relationships, by sexual minority status, MEPS (1996-2010): Weighted prevalence shown.....	136
Table 4.5 Mental health (MH) service utilization among U.S. adults in same-sex relationships or married different-sex relationships, REFERENT ONLY, by sexual minority status, MEPS (1996-2010): Weighted prevalence shown.....	137
Table 4.6 Mental health service expenditures among U.S. adults in same-sex relationships or married different-sex relationships who received mental health care services, by sexual minority status, MEPS (1996-2010): Weighted means shown.....	138

Table 4.7 Mental health service expenditures among U.S. adults in same-sex relationships or married different-sex relationships, REFERENTS ONLY, who received mental health care services, by sexual minority status, MEPS (1996-2010): Weighted means shown.....	138
Table 4.8. Results of Weighted Logit Model Predicting Mental Health Service Utilization among U.S. adults in same-sex relationships or married different-sex relationships, MEPS (1996-2010).....	142
Table 4.9 Results of Weighted Regression Analysis with Log Transformation Estimating Out-of-Pocket Mental Health Related Medical Expenditures among U.S. adults in same-sex relationships or married different-sex relationships with at least one mental health event, MEPS (1996-2010).....	143
Table 4.10 Results of Weighted Logit Model Predicting Mental Health Service Utilization among U.S. adults in same-sex relationships or married different-sex relationships REFERENT ONLY, MEPS (1996-2010).....	144
Table 4.11 Results of Weighted Regression Analysis with Log Transformation Estimating Out-of-Pocket Mental Health Related Medical Expenditures among U.S. adults in same-sex relationships or married different-sex relationships with at least one mental health event REFERENT ONLY, MEPS (1996-2010).....	145
Table 4.12 Results of Weighted Logit Model Predicting Mental Health Service Utilization among U.S. adults in same-sex relationships or married different-sex relationships, MEPS (1996-2010).....	138
Table 4.13 Results of Weighted Regression Analysis with Log Transformation Estimating Out-of-Pocket Mental Health Related Medical Expenditures among U.S. adults in same-sex relationships or married different-sex relationships with at least one mental health event, MEPS (1996-2010).....	139
Table 4.14 Results of Weighted Logit Model Predicting Mental Health Service Utilization among U.S. adults in same-sex relationships or married different-sex relationships REFERENT ONLY, MEPS (1996-2010).....	140
Table 4.15 Results of Weighted Regression Analysis with Log Transformation Estimating Total Mental Health Related Medical Expenditures among U.S. adults in same-sex relationships or married different-sex relationships with at least one mental health event REFERENT ONLY, MEPS (1996-2010).....	141
Table 4.16 Summary of two part model expenditures for both out-of-pocket mental health care expenditures and total mental health care expenditures among U.S. adults in same-sex relationships or married different-sex relationships, by sexual minority status, MEPS 1996-2010.....	151

List of Figures

Figure 2.1 Final Study Sample from NHANES, 2001-2010.....	22
Figure 3.1. Andersen’s Behavior Model for Vulnerable Populations Adapted for Study #2.....	66
Figure 3.2 Results of logistic model predicting that individuals were in same-sex couples using sex, race/ethnicity, age, veteran status, % <200% below federal poverty line, insurance status, receipt of public assistance, perceived mental health status, perceived physical health status, family size, living in a metropolitan statistical area, region of the country, and MEPS survey panel (MEPS, 1996-2010).....	101
Figure 4.1. Unweighted Out-of-Pocket Mental Health Related Expenditures by Presence of Mental Health ICD-9 Code.....	139
Figure 4.2 Unweighted Total Mental Health Related Expenditures by Presence of Mental Health ICD-9 Code.....	140
Figure 4.3 Incremental Mental Health Care Expenditure Increase for Individuals in SS Couples compared to Individuals in DS Couples for Out-of-Pocket (OOP) and Total MH Expenditures (Total).....	151

List of Appendices

Appendix 6.1 Multum Lexicon Therapeutic Classifications Used in Study #1.....	162
Appendix 6.2 3-digit ICD-9-CM Codes Mental Health Codes Used in Study #2 and #3.....	162

ACKNOWLEDGEMENTS

There are several professors and colleagues at UCLA without whom I would have not been able to undertake this graduate work. First, I would like to thank my graduate advisor and dissertation chair, Dr. Susan Cochran, for her support and guidance. You encouraged me to enter the doctoral program, challenged me in ways that encouraged my growth as a researcher, and always advocated on my behalf. You also shaped me to be a better writer and to never settle after a first (or second) draft. The career experiences you shared and the skills you emphasized during our meetings allowed me to succeed in my first professional public health position. Thank you for supporting me at UCLA and I look forward to future collaboration.

I am also thankful for the guidance and support of my committee members: Drs. Onyebuchi Arah, Gerald Kominski, and Teresa Seeman. Thank you for taking the time to read my proposal and dissertation, providing thoughtful suggestions to improve this research, and the input for future manuscripts.

I want to also thank several teaching assistants and fellow graduate students at UCLA for their guidance, support, thoughtful conversation, and, in some cases, study snacks: Giridhar Babu, Brian Chen, Tanmay Mahapatra, Sanchita Mahapatra, Nguyen B. Nguyen, Caroline Thompson, Kaitlin O'Keefe, Tasneem Motola, Alanna Hirz, Shauna Stahlman, and Gaby Parkinson.

The Massachusetts Department of Public Health has been instrumental in my completion of this degree. In particular, Thomas Land, my supervisor and advocate, has constantly provided me new opportunities to grow as both a public health professional and researcher. I also want to thank Bonnie Andrews and Joshua Vogel for their interest and support of my work.

Finally, I want to thank my family and extended family. Their love, support, and humor have sustained me throughout my graduation education. My parents, Rich and Susan Nasuti, have never questioned my potential to succeed (and might have also told everyone else in the world). Thank you to my uncle and pediatrician, Dr. Floyd Nasuti, for always taking every opportunity to remind me that he would “really like there to be another Dr. Nasuti”. Also thank you to my sister, Claire, and brother, Sam, for letting me take my place officially as the favorite child (ok, favorite oldest child). I also want to thank Amanda Beeson, Carrie Brown, and Jen Deboer for supporting me throughout the turmoil that is writing a dissertation with moral support, work dates, hot tubs, sailing, and delicious food. I want to extend a special thank you to my husband, Ben Hagberg, whose constant support and uncanny ability to call me out on my procrastination allowed me to push through final drafts.

VITA

EDUCATION

- 2009 Masters of Public Health, Epidemiology
School of Public Health, University of California Los Angeles, Los Angeles, CA
- 2004 S.B. Brain and Cognitive Science
Massachusetts Institute of Technology, Cambridge, MA

WORK and RESEARCH EXPERIENCE

- 08/13-Present Massachusetts Department of Public Health, Boston, MA
Deputy Director, Office of Statistics & Evaluation
- 01/12-08/13 Massachusetts Department of Public Health, Boston, MA
Epidemiologist II
- 06/10-09/10 Amgen, Thousand Oaks, CA
Summer Pharmacoepidemiology Intern
- 01/09-06/10 University of California Los Angeles, Los Angeles, CA
Graduate Student Research Assistant
- 09/06-08/08 Theravance Inc., South San Francisco, CA
Research Associate I, Research Assistant

TEACHING EXPERIENCE

- 03/11-06/11 Special Reader I for Epidemiology 100: Introduction to Epidemiology,
01/10-03/10 University of California Los Angeles
- 09/10-3/11 Special Reader II for Epidemiology 200A Methods I: Basic Concepts and Study
Designs, Epidemiology 200B Methods II: Prediction and Validity, University of
California Los Angeles

HONORS AND AWARDS

- 06/11-09/11 Graduate Student Research Mentorship for Summer 2011
- 05/10, 05/11 Nominated for Public Teaching Assistant of the Year, Public Health
12/09, 03/11 Health Resources and Services Administration Public Health Traineeship
11/10 Walter J. Lear Outstanding Student Research Award, LGBT Caucus

PAPERS

Sarah Moody-Thomas, **Laura Nasuti**, Yong Yi, Michael D. Celestin, Jr., Ronald Horswell, Thomas G. Land. Effect of systems change and EHR use on quit rates among tobacco users in a public hospital system. (in review).

PRESENTATIONS

Nasuti LJ. Enhancing Community-Clinical Linkages through an Open-Source, Bi-directional Electronic Referral System: Massachusetts e-Referral Project. *CDC Vital Signs* September, 2013.

Nasuti LJ, Daly P, Pinzon A, Hafer E, Kreil J, Josephson M, Land TG. Using Electronic Health Records to Drive Quality Improvement in Blood Pressure Control and Other Million Hearts Measures for Disparate Populations. American Public Health Association Annual Meeting, Boston, MA 2013

POSTERS

Nasuti LJ, Cochran SD. Sexual Minority Use of Mental Health Services in a Nationally Representative Survey. American Public Health Association Annual Meeting, San Francisco, CA 2012

Nasuti LJ, Cochran SD, Mays VM. Sexual Orientation and suicide attempts: Results from the California Quality of Life Survey. American Public Health Association Annual Meeting, Denver, CO 2010

Chapter 1: Overview of Mental Health Utilization by Sexual Minorities

Although population-based studies have found that sexual minorities appear to be at higher risk for mental health and substance abuse disorders than heterosexuals, research is only beginning to examine the impact of this increased risk on mental health and substance abuse (MHSA) service utilization. Sexual minority status has been positively associated with major depression, generalized anxiety disorder, panic attacks, alcohol abuse, substance abuse, and personality disorders as well as increased psychological distress [1-9]. The limited population-based research into MHSA treatment utilization of sexual minorities as compared to heterosexuals suggests that sexual minorities are using mental health services at increased rates compared to their heterosexual counterparts [10-13]. Indeed, some studies have found even when sexual minorities do not evidence mental disorders, they are still more likely to seek mental health treatment than heterosexuals [3, 11]. With 9 million U.S. citizens identifying as LGBT and close to 19 million U.S. adults reporting a history of same-sex sexual experiences[14], sexual minority mental health disparities could potentially represent substantial burden on the mental health services system as well as mental health services cost. The goal of this proposal is to examine sexual minority treatment patterns for mental health care services and the financial burden of this service use on the U.S. healthcare system.

The US Department of Health and Human Services put forth a call to address sexual minority health disparities in their Healthy People 2020 goals[15]. Healthy People 2020 is the first Healthy People publication that explicitly targeted health concerns affecting the LGBT community. Among its' goals, Healthy People 2020 specifically lists increasing mental well-

being and reducing health care costs for sexual minorities. Following the Healthy People 2020 release, the Institute of Medicine (IOM) indicated that the health needs of the LGBT population are not currently being met in the U.S. healthcare system in their report “The Health of Lesbian, Gay, Bisexual, and Transgender People” [16]. Both of these publications express a need for more LGBT mental health research. Thus far, the majority of the LGBT mental health research reports disease rates and risk factors for mental health and substance abuse disorders within the sexual minority population [17, 18]. There is little research on how these known mental health disparities are addressed in the U.S. healthcare system [11, 17]. Future research needs to answer the call of both the IOM and Healthy People 2020 reports to understand when sexual minorities are accessing MHSAs and how they are using the healthcare system to address their MSA treatment needs.

This dissertation examines sexual minority MSA utilization through three papers. The first paper estimates rates of mental health treatment and psychopharmaceutical prescriptions by sexual orientation status in the National Health and Nutrition Surveys (NHANES). The second and third papers employ the Medical Expenditure Panel Surveys (MEPS), a large set of surveys on U.S. healthcare and healthcare costs, to assess MSA treatment patterns and MSA treatment expenditures among individuals in same-sex couples compared to individuals in different-sex couples.

1.1 Sexual Minorities, MSA, and MSA Health Services Utilization

The majority of sexual minority MSA research has primarily described mental health and substance abuse problems in this population [1-9, 19-23]. Even though a large literature exists pertaining to mental health and substance abuse disorders among sexual minorities, there is a paucity of research using high quality population-based data sets that has examined when

and how sexual minorities utilize mental healthcare services. The following sections offer a synopsis of MHSA disorders in the sexual minority community and an overview of what is known regarding sexual minority mental healthcare services utilization.

Mental health and substance abuse among sexual minorities

The population-based research literature repeatedly finds that sexual minority status is a risk factor for some mental health and substance abuse disorders [1-9, 19-23]. These findings have been repeated in studies that identify sexual minorities by same-sex partnership, sexual behavior, by self-identification, and measures using both self-identification and sexual behavior [1, 4, 17]. Studies have reported that sexual minorities are more at risk for major depression, generalized anxiety disorder, panic attacks, alcohol abuse, substance abuse, and personality disorders compared to heterosexuals [1-7, 9]. Several studies across different populations have also shown higher levels of distress for sexual minorities [7, 17, 19, 24] and increased rates of suicidality [20, 25-29] compared to their heterosexual counterparts.

As with heterosexuals, gender plays an important role in substance abuse and mental health among sexual minorities [30-32]. Women reporting that they had same-sex sexual relations have been found to have more drug and alcohol dependency compared to exclusively heterosexual women [3, 21, 33]. As for men, a study by Stall et al. reported that men reporting same-sex sexual experiences had a high prevalence of alcohol-related problems[34], but sexual minority men did not appear at an elevated risk for alcohol-related problems when compared to heterosexual men[3]. Being a sexual minority woman has been associated with increased rates of simple phobia, post-traumatic stress disorder, and generalized anxiety disorder compared to heterosexual women[17, 20]. Sexual minority men have been shown to be at increased risk for certain psychiatric disorders compared to heterosexual men. Sexual minority men have also been

found to be at increased risk for panic attacks and substance use disorders [17, 20]. Both sexual minority men and women have been found to be at increased risk for depression [2, 4, 20] and suicidal behavior compared to their heterosexual counterparts [20, 25-29].

In addition to gender differences for risk of certain MHSA disorders, this increased susceptibility does not appear to be uniform across all sexual minorities [4, 7, 27, 35-38]. Indeed, the Urban Men's Health study found that distress and depression were increased for homosexually-experienced men who did not self-identify as a sexual minority compared to self-identified sexual minorities [7]. Among women, research has hinted that bisexual women may be at greater risk for suicidality compared to lesbians [37]. The PATH Through Life Project in Australia found that bisexuals had higher mental distress for anxiety and depression, as well as increased risk for suicidality, compared to homosexuals [38].

There are many hypotheses for why these mental health disparities appear to exist and persist in the sexual minority population. Perceived discrimination has been found to be positively associated with having a psychological disorder and having current psychological distress among sexual minorities [19]. Gay-related harassment is also associated with negative health outcomes including HIV infection, depression, and intimate-partner violence among gay men [39]. As for substance abuse, some of the increased risk of alcohol and illicit drug use has been associated with social norms and community-based behavior [40, 41]. Sexual minority men and women have been found to frequent bars more often than heterosexuals [6]. Specifically, sexual minority women are more likely to use bars and clubs as social resources compared to heterosexual women [42]. As for sexual minority men, an early community-based sample of gay men found that these men did not seem to adhere to sex-role stereotypes and age-related changes

in alcohol and illicit drug use perhaps resulting in higher rates of their use. For example, they did not appear to age-out of these behaviors like what is seen in heterosexual populations [40].

Current state of MHSA health services utilization in sexual minorities

The majority of MHSA health service utilization research concerning sexual minorities has been conducted using non-population based sampling [8, 43-46] with relatively few studies examining representative population-based samples of sexual minorities [2, 10, 12, 13, 17, 47]. These community-based studies often find that gay men, lesbians, and bisexuals reported higher rates of ever entering therapy or seeking help for an emotional problem compared to heterosexuals [8, 43-46]. For example, a national sample of lesbians found that almost 75% of respondents were either in counseling or had received mental health services in their lifetime [48]. Lesbians are also more likely to have been in recovery or have had treatment for alcohol-use-related problems compared to heterosexual women [8]. Although these community-based studies may not have been representative of the whole LGB population, they hint that sexual minorities may be using mental health services differently than heterosexuals. First, sexual minorities may have a more positive view toward seeking mental health care compared to heterosexuals[44]. Jones and Gabriel found that 86% of the LGB respondents in their study had favorable views therapy[49]. Second, sexual minorities may be more likely to both initiate treatment for mental health problems and have more mental health visits than heterosexuals[43, 45, 48].

As more researchers started using population-based data sets to examine sexual minority mental health services, many of the findings supported the prior research indicating that sexual minorities were more likely to use mental health services than heterosexuals[2, 10, 12, 13, 17, 47, 50, 51]. Using the National Household Survey on Drug Abuse, Cochran and Mays reported

that both men who had male sexual partners and women who had female sexual partners were more likely to have used mental health services in the year prior to interview[2]. This finding was replicated in the Midlife in the United States Survey (MIDUS); self-identified gay and bisexual men were more likely to have seen a mental health provider in the year prior to interview (19% versus 8%). Likewise, self-identified lesbian and bisexual women were more likely to have seen a mental health provider in the year prior to interview (33% versus 11%) [17]. Lesbians and bisexual women have also reported seeking help for alcohol-related problems at higher rates than heterosexual women[51].

Although sexual minorities are seeking mental health treatment at higher rates than heterosexuals, it is not clear if they this increase in mental health service utilization is solely the result of increased psychiatric morbidity[10]. Lack of stigma surrounding mental health treatment, positive views of mental health treatment, and differential social support systems have all been implicated in the increased utilization of mental health care by this population [45, 49, 52]. The stigma surrounding psychiatric illness influences treatment seeking for many people in need of mental health services [53, 54]. However there is some evidence that the LGB population does not attach as much stigma to mental illness as heterosexuals which may make treatment seeking easier for the sexual minority population [52]. Furthermore, some sexual minorities may lack social supports from family and community that could result in entering mental health care earlier [45].

This higher rate of treatment seeking among sexual minorities compared to heterosexuals exists despite the many obstacles sexual minorities encounter when seeking mental health care. Historically, there has been a reluctance for sexual minorities to enter treatment because some health professionals had provided inappropriate treatments[55]. Additionally, sexual minorities

are less likely to have insurance and financial resources associated with seeking mental health care [56]. They are also more likely to face employment-related discrimination leading to less insurance coverage and lower socioeconomic status[57]. Diamant found that sexual minority women in LA were less likely to have received needed mental health care than heterosexual women; this difference was partially explained by lack of financial resources [58].

1.2 MHSA Health Services Utilization

One important aspect of MHSA health services utilization research examines people who are not getting the care they need [59-61]. The National Comorbidity Survey found that that 59% of people who perceive a need for mental health services seek it, but only 44% of them receive that care from a mental health professional [62]. Although the rates of seeking mental health care keep rising in the population, most people with mental disorders remain untreated[31]. As found among those with mental health disorders, the majority of those with SA disorders do not receive treatment [63, 64]. People with SA disorders are more likely to receive treatment if there is a co-occurring mood disorder [64, 65]. However when anxiety and mood disorders were found together, subjects are more likely to seek help for the mood and anxiety disorders and not their SA disorders [65]. People who are drug-dependent are more likely to receive help than those who are alcohol dependent[64]. Only a small number of people with alcohol dependence or alcohol use problems ever enter treatment for their disorder [66, 67]. As for sexual minorities, they appear to access services more often in the presence of a mental disorder than their heterosexual counterparts [11].

In MHSA health services research there appears to be not only be unmet need for treatment, there also appears to be large number of people in treatment who do not appear to need MHSA health services [68]. Kessler et al also found that only about half of people who

receive mental health treatment actually meet diagnostic criteria for a disorder[31]. Again sexual minorities appear different than heterosexuals in their service utilization. Sexual minorities also appear more likely to use MHSAs services in the absence of a mental health disorder than heterosexuals[11].

1.3 Assessing Sexual Orientation in Data Sets

Sexual orientation is ascertained using to different methods in the following chapters. In the first study, I assess sexual orientation using both self-identified sexual orientation and sexual behavior. In the second and third studies, I assess sexual orientation by identifying individuals in same-sex and different-sex couples using a data set with no individual markers of sexual orientation. The following subsections detail the methods, advantages, and limitations to assessing sexual orientation in the two ways I assess sexual orientation for my data set.

Surveys and data sets that include sexual orientation-related questions

Because sexual orientation can encompass attraction, sexual behavior, and self-identity, methods for the assessment of sexual orientation remains a topic of research [69-71]. Currently, researchers use several methods to assess sexual orientation in surveys. These different ways of assessing sexual orientation may lead to different implications for future research and interventions[72]. Sexual orientation can be assessed using questions relating to self-identification, sexual behavior, or sexual attraction [70]. In addition to asking about these three dimensions of sexual orientation, there are several different metrics that researchers employ to identify sexual orientation status of respondents even when they are being asked the same question(s) in different surveys [72]. Understanding how public health researchers are assessing and interpreting the measures of sexual orientation in each study is important in understanding a specific study result and whether the conclusions drawn from the study were appropriate.

Self-identification questions are questions in which the respondent identifies themselves as a specific sexual orientation[72]. These questions ask the respondent to self-identify as a particular sexual orientation. The main responses for this type of questions are often options such as lesbian, gay, homosexual, bisexual, and heterosexual. Some questionnaires also allow responses such as transgender, straight, other, or queer. These self-identification questions are important to sexual minority research because these questions allow researchers to assess how respondents identify themselves, independent of their sexual activity. This type of question is especially useful for assessing teenage sexuality where there might not have been opportunity for sexual experiences[71, 72]. Self-identification questions also confirm that the respondent perceives themselves as being part of a specific sexual orientation group, which has potential ramifications for mental health outcomes [7, 35]. But assessing sexual orientation this way can be challenging because respondents may either not understand the terms given or choose terms that do not match their sexual behavior.

Assessing sexual attraction allows the respondent to indicate his or her attraction to same, opposite, or both sexes[72]. This measure is especially useful for adolescents as they may not identify themselves as a specific sexual orientation, but may report the attraction to others[71]. Although attraction is considered a better measure for adolescent populations, younger adolescents may have not yet experienced any physical or sexual attractions[72]. In addition, assessing sexual orientation status by sexual attraction responses is not sufficient for any research on sexually transmitted diseases, such as HIV.

Questions about sexual behavior that are used to classify for sexual orientation include those that ask the respondent about the sex of their previous sexual partners over varying time periods [72]. This method of obtaining information is essential for studies pertaining to risk of

HIV infection and sexually transmitted diseases. However, this method fails to capture self-identity. For example, many homosexually experienced individuals identify as heterosexuals.

According to guidelines produced from a panel of experts the most ideal measure would capture multiple aspects of sexual orientation [72]. Depending on the research topic and questions available, researchers incorporate self-identity and sexual behavior into one measure of orientation [10, 11, 51]. One could argue that sexual behavior is the most relevant dimension for studies of sexually transmitted diseases, however studies have shown differences in rates of HIV among MSM who identify as gay and those who do not express a sexual minority status[73]. Despite guidelines and two decades of research, sexual orientation is still being assessed in a variety of ways across studies. These different assessments of sexual orientation may influence the interpretation of results and make cross-study comparisons infeasible.

Furthermore, the term “sexual minority” can encompass many different types of sexual minorities such as bisexuals or self-identified heterosexuals with same-sex sexual histories. The William Institute’s Guidelines recommend separating bisexuals from gay or lesbian respondents whenever possible for analysis. Within the limited research that does separate sexual minority subgroups, it appears that there is heterogeneity of risk among sexual minority subgroups for depression, suicide, alcohol abuse, and obesity [27, 33, 35, 38]. However few studies examine sexual minority subgroups independently; this is in part due to a lack of statistical power. Few population-based surveys oversample for sexual minorities; the California Quality of Life Survey I & II are two rare population-based surveys that do oversample for sexual minority status[11, 74]. Because there are relatively few sexual minorities in most population-based samples, researchers are often forced to combine across subgroups in order to generate enough statistical power for their analysis. This combining of groups, if the groups are not truly homogenous for

risk, can alter the results in two ways: either artificially make it seem that all sexual minorities are at increased risk leading to misallocation of resources for interventions or produce results toward the null that are in fact hiding a true a risk for a subgroup.

Assessing sexual orientation in data sets without explicit individual sexual orientation markers

Several national data sets do not explicitly ask about sexual orientation however they have still been used in sexual minority research. Despite the lack of questions on the identification, attraction or sexual behavior, a select set of these surveys include information on household members and the relationships of household members to others in the household. This allows researchers to generate sexual orientation classification measures. If respondents are able to report living in marriage-like relationship and if they also report the gender of that partner, the information needed to infer same-sex households is present. For example, researchers have used the U.S. Census to estimate the number U.S. same-sex couples since the 1990 census [75]. Some health researchers have used similar methodology to identify sexual minorities in the National Health Interview Survey (NHIS) and Medical Expenditure Panel Survey (MEPS), two national data sets that lack explicit individual markers of sexual orientation [76-78]. These are two very rich and complex data sets that are collected by the National Center for Health Statistics and the Agency for Health Research and Quality. They have been used to track changes in health and health services use for the civilian, non-institutionalized U.S. population, but have, to date, only been used in a few studies to examine sexual minority health [76-78].

Despite the lack of sexual orientation questions, researchers have successfully used both the NHIS and MEPS data sets to study sexual minority health and health services use in a population-based sample with more representative data on U.S. health services than any other

dataset. In addition, because the MEPS collects information on family structure as well as health services information for all household respondents, MEPS can also be used to study same-sex families.

There are several limitations to conducting studies of sexual minorities in data sets where sexual orientation is not explicitly addressed. One of these limitations is that these data sets only allow researchers to examine same-sex couples (not individual sexual minorities) who are living together. A large majority of the sexual minority population is left out when only examining sexual minority couples. When only individuals in same-sex couples are eligible to be identified as sexual minorities in a study, individuals in marriages or in different-sex partnerships should be used as a comparison group for two main reasons. First, legalized marriage is not universally available to those in same-sex relationships. Several studies relate marriage to positive mental health status; it is necessary to obtain the appropriate heterosexual referent group for same-sex couples [79-81]. Legalized marriage is also associated with insurance benefits and financial benefits [56, 57, 82]. Both insurance benefits and higher income are associated with better health status [83-85]. Second, it is important to restrict the sample to only people in same-sex or different-sex couples to minimize sexual minorities in the heterosexual sample. Because the only way to ascertain sexual orientation is through a current relationship, I am not able to compare individuals in same-sex relationships to all other individuals because I have no mechanism for ascertaining non-coupled sexual minorities. Unfortunately, there may still be sexual minorities among those in different-sex couples, such as bisexuals or homosexually-experienced individuals. Because the majority of U.S. population-based samples are exclusively heterosexual (92%)[14], even if “hidden” sexual minorities end up in the heterosexual sample they are most likely not a very substantial portion of heterosexual respondents. In contrast, due to the

extremely limited number of same-sex couples in these population-based datasets, any misclassification of different-sex couples into the same-sex couples would have the potential to greatly distort the results. In any data set where it is possible to confirm other markers of sex (as in many health data sets) it is essential to confirm these markers of sex in order to minimize the misclassification error.

1.4 Current State of Sexual Orientation Data Collection for Health Services Research

In addition to the IOM report on the state of LGBT health, the IOM created a companion document to Healthy People 2020 entitled “Leading Health Indicators for Healthy People 2020”[86]. Both IOM reports stressed the need for better data collection in order to better track the health of the LGBT population[16, 86]. Currently the NHANES collects information on both health and sexual orientation; it also contains limited information on health services utilization. Perhaps the richest public resource for understanding health services utilization, the Medical Expenditure Panel Survey, does not currently assess sexual orientation at the individual level.

The sexual minority research goals in both the IOM publications as well as Healthy People 2020 require data sources link sexual orientation and health service utilization. Researchers can track health service consumption for the non-institutionalized U.S. population through both insurance claims databases and in large surveys of health services such as the Medical Expenditure Panel Survey (MEPS). For mental health service utilization specifically, there are several additional surveys such as National Comorbidity Surveys (NCS, NCS-R) and National Survey of Substance Abuse Treatment (N-SSATS).

Since 1996, the Medical Expenditure Panel Survey has surveyed a representative sample of the U.S. population to monitor their health care costs and usage. Although MEPS does not measure sexual orientation explicitly, it does allow respondents to identify themselves as an

individual in a same-sex couple [78]. In addition the MEPS contains extensive data on healthcare utilization. I employ the MEPS to examine healthcare in two of my dissertation studies.

1.5 Overview of Dissertation Studies

Study #1: Sexual Minority Use of Mental Health Care Services in a Nationally Representative Survey

In Study #1, I examine the use of the mental health services among sexual minorities and heterosexuals using the NHANES. Because the NHANES contains information on both sexual orientation and sexual history, I classify respondents as gay/lesbian/bisexual, homosexually-experienced heterosexuals, and exclusive heterosexuals. I produce U.S. population estimates for use of psychotherapy/counseling services in the past year and psychopharmaceutical use in the past 30 days by sexual minority status. In addition, I examine rates of underutilization of mental health treatment and non-indicated use of mental health treatment by sexual orientation.

Study #2: Describing Mental Health Treatment Patterns Among Individuals in Same-sex Couples in a National Sample

Using the MEPS, I examine mental health treatment patterns among individuals in same-sex couples compared to individuals in opposite-sex couples. I estimate rates of use of psychotherapy/counseling services, filled psychopharmaceutical prescriptions, and combination therapy (both psychotherapy and psychopharmaceutical prescriptions) conceptualized within the frame of Andersen's Behavior Model for Vulnerable Populations[87]. This model predicts health services utilization and is described in more detail in Study #2. Because the MEPS does not contain information on sexual orientation or sexual behavior, I can only identify sexual minorities if they report themselves as being married/partnered to someone of the same-sex. My sample only includes individuals in same-sex or different-sex couples. Despite this limited

generalizability, I am using one of the most comprehensive sources of healthcare data in the U.S. [88] to produce detailed estimates of treatment patterns for a vulnerable population.

Study #3: The Cost of Mental Health Care Services for Individuals in Same-sex Couples

The final study in my dissertation examines mental health care expenditures for individuals in same-sex couples as compared to individuals in opposite-sex couples. This is my second study using MEPS data. Using a two-part model, I estimate if there are substantial differences between out-of-pocket and total expenditures for mental health related services for individuals in same-sex couples compared to individuals in different-sex couples. This paper attaches an estimate of cost to mental health care utilization patterns for individuals in same-sex compared to individuals in different-sex couples.

Chapter 2: Sexual Minority Use of Mental Health Care Services in a Nationally Representative Survey (Study #1)

2.1 Introduction

Individuals with minority sexual orientation (e.g. lesbian, gay, bisexual, and homosexually experienced persons, collectively referred to hereafter as LGB) are at somewhat higher risk for several mental health and substance use disorders as compared to similar heterosexual persons [1-9, 19-23]. This is commonly attributed to the harmful effects of lifetime exposure to anti-gay stigma, victimization, and discrimination [89-92]. The literature hints that sexual minorities are also more likely to have used mental health and substance abuse (MHSA) services, however much of this research has been conducted using non-population based sampling [8, 43-46] with relatively few studies examining representative population-based samples of sexual minorities [2, 10, 12, 13, 17, 47]. These community-based studies often find that gay men, lesbians, and bisexuals reported higher rates of ever entering therapy or seeking help for an emotional problem compared to heterosexuals [8, 44, 46]. For example, a national sample of lesbians found that almost 75% of respondents were either in counseling or had received mental health services in their lifetime [48]. Lesbians were also more likely to have been in recovery or to have been in treatment for alcohol-use-related problems as compared to heterosexual women [8].

Although these community-based studies may not have been representative of the whole LGB population, they raised suspicions that sexual minorities may be using mental health services differently than heterosexuals. There are at least two potential reasons for this different use of services. One difference might be a greater willingness to seek services due to a more positive view toward seeking mental health care compared to heterosexuals[44]. Indeed, Jones

and Gabriel found that 86% of the LGB respondents in their study had favorable views of therapy[49]. A second difference might be greater need as evidenced by higher rates of initiating treatment for more prevalent mental health problems and receiving more mental health visits than heterosexuals [43, 45, 48].

As population-based data sets became increasingly available, researchers began to examine sexual minorities' use of mental health services. Several studies indicated that sexual minorities were more likely to use mental health services than heterosexuals [2, 10, 12, 13, 17, 47, 50, 51]. These findings were often replicated across data sets. Both a study using the National Household Survey on Drug Abuse and a study using the 1996 Midlife in the United States Survey (MIDUS), found that sexual minority men and sexual minority women were more likely to have used mental health services in the year prior to interview [2, 17]. Also sexual minority women appear to seek treatment for alcohol-related problems at higher rates than heterosexual women [51]. Based on this evidence, the following hypothesis is suggested:

Hypothesis 1: Sexual minorities are more likely to have seen a mental health professional in the past 12 months compared to exclusive heterosexuals.

Over the past decade research has shown a relationship between sexual minority status and increased risk for MHPA disorders compared to heterosexuals [2, 93]. This greater need appears to be matched with greater utilization of mental health care; sexual minorities appear to be using mental health care at higher rates than their heterosexual counterparts [12, 13, 32, 50]. However, to date, the majority of this research has focused on receiving any mental health services treatment [2, 10-12, 82, 94] with only a few studies of psychopharmaceutical use among HIV patient populations [95-97]. Approximately 15% of the U.S. population have seen a mental health professional within the past year[98] while 8.1% of the population have filled at least one

psychopharmaceutical prescription for a MHSA disorder [99]. With the rise of use of prescription drugs even in the absence of a psychiatric diagnosis [100], research has just begun to emerge hinting that LGB individuals are also more likely to receive psychiatric prescriptions [101]. Based on this evidence, the following hypothesis is suggested:

Hypothesis 2: Sexual minorities are more likely to report using a recent psychoactive prescription medication as compared to exclusive heterosexuals.

In addition to understanding the prevalence of MHSA utilization among the LGB population as compared to the heterosexual population, another aspect of studying MHSA treatment utilization is examining who receives treatment when there is a need for treatment. The construct of unmet need quantifies the proportion of people who are in need of MHSA treatment, but who are not receiving this treatment [102]. Researchers use unmet need as a marker of health disparities among marginalized groups [85, 103, 104]. Additionally, estimating unmet need can help policymakers decide how to allocate treatments, identify potential subgroups for targeting interventions, and identify where interventions may be most cost-effective [102, 105]. This area of research has elucidated disparities in care by type of mental disorder, by severity of mental disorders, and by certain demographic factors. For example, people with mood disorders are most likely to receive any kind of mental healthcare, while those with alcohol dependence appear to be most likely to have unmet need [105]. Research has also found that people with more severe MHSA disease states are more likely to have sought any professional mental health care compared to people with milder forms of mental health disorders [102]. As for demographic factors, higher rates of unmet need have been associated with living in rural areas, living alone, being young, not knowing how to access mental health care, and being unemployed [62, 105, 106]. Gender has also been associated with having greater unmet mental health needs; women

are more likely than men to have greater unmet mental health care needs [105]. Wells et al. documented greater unmet need for MHSA treatment among non-Hispanic blacks and Hispanics compared to non-Hispanic whites [104]. Low income has also been related to unmet need for mental health services. People who are either eligible for Medicaid or have middle to higher income had relatively little unmet need for mental health care compared to people who were near poor but not eligible for Medicaid [107]. Grella et al. found that sexual minorities evidence less unmet need for mental health counseling services than their heterosexual counterparts [10].

Based on this information, the following hypothesis is suggested:

Hypothesis 3: Sexual minority men and women have less unmet need for any mental health services as compared to their heterosexual counterparts.

Although unmet need is an important concept in understanding when people are not accessing the health care system when in need, studies of the general population have also found that there are people seeking treatment for emotional problems who do not meet any diagnostic criteria [98, 108-110]. Some researchers posit that use of mental health care in the absence of a mental disorder may be serving as preventative care or treatment maintenance for people with a history of mental disorders[111]. Examining the use of MHSA services in the absence of evident need could elucidate differences in the way the LGB population uses the health care system compared to heterosexuals. Limited research has suggested that sexual minorities are more likely to seek mental health treatment in the absence of a mental disorder compared to heterosexuals [10, 11].

Hypothesis 4: Sexual minority men and women have more non-indicated mental health service use compared to their exclusive heterosexual counterparts.

In order to test these hypotheses, the current study uses the National Health and Nutrition Examination Survey (NHANES). The NHANES is a nationally representative sample of the U.S. population that has been collecting information on sexual orientation, sexual behavior, mental health care professional visits, and prescription drug use since 2001. The aims of this study are to explore in more detail the use of mental health services (both counseling and psychotropic prescriptions) by sexual orientation status within the NHANES. In addition, this study also examines absence of mental health service used in the presence of an indicated need for mental health services (unmet need) and the utilization of mental health services in the absence of an indicated need for mental health services (non-indicated need) by sexual orientation status. Through utilization of a large, nationally representative population-based sample with a clearly measured marker of sexual orientation, this study evaluates the relation of sexual orientation with MHS services utilization within the U.S. population.

2.2 Methods

Data

I used the publicly available data in the National Health and Nutrition Examination Survey (NHANES) for this study. The NHANES is a continuous population-based health survey that samples from the civilian, non-institutionalized United States population. The Continuous NHANES started collecting data in 1999 with the aim of assessing the health and nutritional status of the U.S. civilian population. The specific NHANES surveys that I used in this study include surveys that were administered both in the household and in the mobile examination center (MEC) as well as laboratory results for both pregnancy tests and HIV infection.

The demographic, health insurance, medication and healthcare utilization questionnaires were all administered at the respondent's household by trained interviewers. The reproductive health and current health status questionnaires were administered via computer assisted personal interview (CAPI) at the MEC. The reproductive health measure also included an imputed variable for current pregnancy status. This variable was imputed by the NCHS based on self-response and pregnancy testing in the laboratory component of the NHANES. Last, the sexual behavior questionnaire included sensitive information that was ascertained via audio computer-assisted self-interview (ACASI) during the MEC examination.

Study Sample

The Continuous NHANES has been collecting data in 2 year waves since 1999. Because sexual orientation identity has only been ascertained since 2001, I have used five survey cycles (2001-2010) in the present study. In addition, only a subsample of the entire NHANES sample is examined in the MEC, I have included survey respondents who were also included in the MEC portion of the survey. Figure 2.1 illustrates how respondents entered into the proposed study.

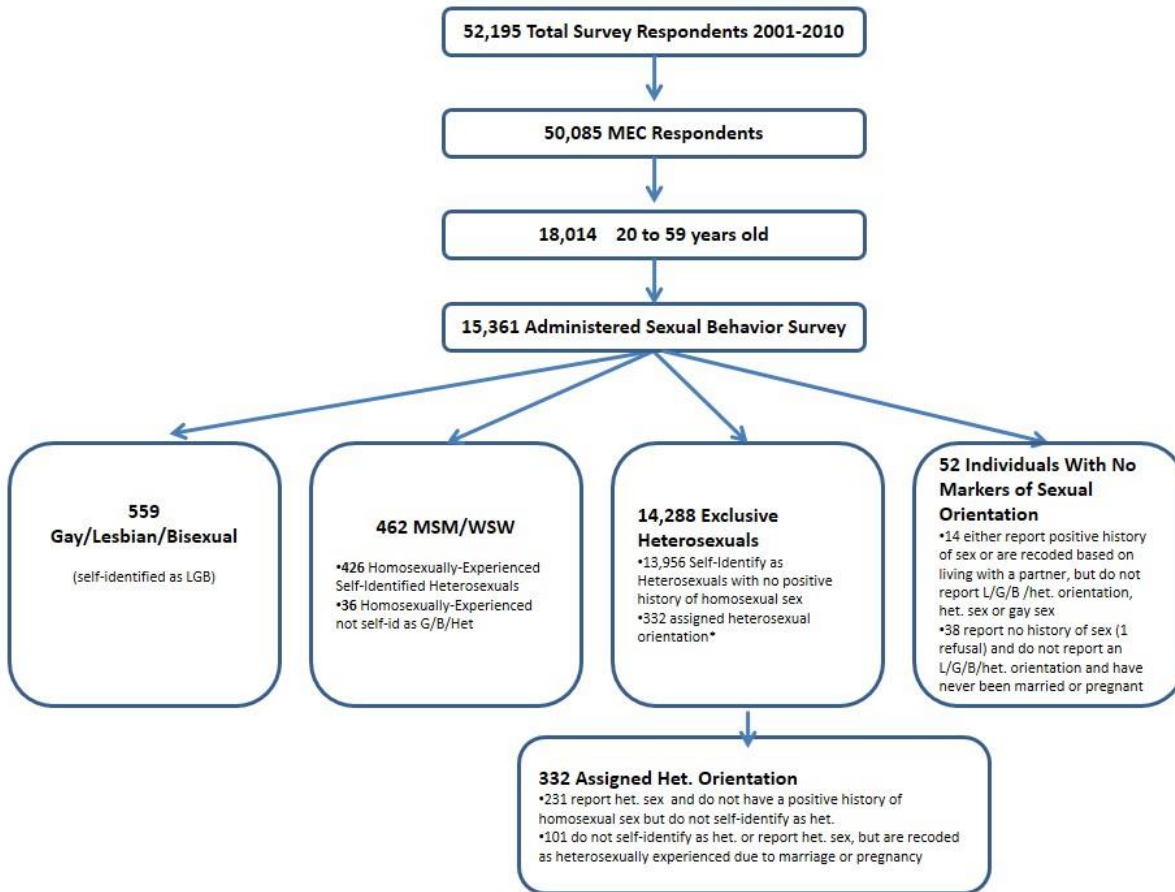


Figure 2.1 Final study sample from the NHANES 2001-2010

Starting in 1999 an age restricted sample has been administered a module assessing histories of sexual behavior and starting in 2001 this module has included a question on sexual orientation identity. I used both sexual orientation and sexual behavior to identify sexual minorities in this study as recommended by the William’s Institute report on Best Practices for Asking Sexual Orientation on Surveys [72]. The sexual behavior questionnaire was administered to MEC respondents ages 14 and 59 for years 2001-2006 and to MEC respondents ages 14 to 69 years for 2007-2010. However, sexual behavior data was only publicly released for those respondents 20 years and older. I further restricted my sample to those who are ages 20 and older. Because respondents’ ages 60-69 were only asked about sexual behavior (but not sexual orientation) in the last two survey cycles included in this study (2007-2010), I further restricted

my sample to those between 20 and 59 years of age. I restricted age in this manner because age is associated with use of health services [98, 112] and needs to be adjusted for in any analyses. This final age restriction excluded an additional 1,660 respondents.

Finally the sexual behavior questionnaire excluded individuals who could not complete the A-CASI in either English or Spanish due to either language difficulties or mental impairment. These individuals are excluded as well. Thus the final sample includes participants of both the in-home and MEC components of 2001-2010 NHANES who were ages 20-59 at the time of the interview, were interviewed in either English or Spanish, and were not mentally or physically impaired to the point where they could not directly answer questions (n=15,361).

Study Variables

Main Explanatory Variable: Sexual Orientation

Sexual orientation is the main predictive variable for these analyses. Sexual orientation is assigned based on self-reported orientation and sexual behavior.

Self-reported sexual orientation

Sexual orientation identity was ascertained by a separate question for men and for women. For men the question was “Do you think of yourself as heterosexual or straight (that is sexually attracted only to women); homosexual or gay (that is, sexually attracted only to men); bisexual (that is, sexually attracted to men and women); something else; or you’re not sure?”

The question for women was similar: “Do you think of yourself as heterosexual or straight (that is, sexually attracted only to men); homosexual or lesbian (that is, sexually attracted only to women); bisexual (that is, sexually attracted to men and women); something else; or you’re not sure?”

Sexual behavior history

The first question on the sexual behavior survey asked respondents if they had ever had sexual intercourse. If the respondent said yes, he or she was then asked if they had had sex with members of the opposite-sex in their lifetime. If a positive lifetime history was reported, they were then asked about partners in the past twelve. The respondents were then asked the same questions but in regards to having sex with members of the same sex. These questions changed slightly over the course of the continuous NHANES. During 2001-2004 survey cycles respondents were initially told that sex included vaginal, oral, or anal sex. However in ascertaining sexual partners, the respondents were only asked about “sex”. For example the question would read “In your lifetime, with how many men have you had sex?” This changed in 2005-2006 and an example question asked of women read: “In your lifetime, with how many males have you had vaginal, anal, or oral sex?” For the 2007-2010 cycles the questions reverted to the same format as had been used in 2001-2004.

Due to the increased prevalence for respondents indicating that they had never had sex, including those who were pregnant during the MEC examination, the NHANES has recommended recoding all those who are pregnant, have a history of pregnancy, or self-report being married, divorced, widowed, separated or living with a partner as having a positive sexual history[113]. For the purposes of this study, women or men who indicated that they had never had sex but were currently married, separated, divorced, or widowed were also assigned a positive history of heterosexual sex. Women who were pregnant at the time of exam or who reported prior pregnancies but reported never having had sex were also recoded as having had sex and having had heterosexual sex. Finally those who reported never having had sex but were cohabiting with a relationship partner were coded as having had sex though not specifically as having had heterosexual sex.

Assignment of sexual orientation status

For the purposes of this study respondents who reported being gay, lesbian, bisexual, or homosexual in response to the sexual orientation question were coded as gay/lesbian/bisexual (GLB) regardless of their sexual behavior. There are 559 individuals in the continuous NHANES survey 2001-2010 who are eligible for this study and have a positive self-identification of gay, lesbian, or bisexual.

If a respondent answered that they were “something else”, “not sure”, “heterosexual”, “didn’t know”, or refused to answer, I took into account their sexual behavior history when I assigned sexual orientation. If respondents did not self-identify as GLB and reported a positive history of homosexual sex, I assigned them a label of homosexually-experienced heterosexuals. For this study, homosexually experienced women without a GLB self-identification are coded as WSW (n=307). Men who are homosexually experienced without a GLB self-identification are coded as MSM (n=155).

Of the remaining 14,340 respondents eligible for the study, 13,956 self-identified as heterosexual and did not report any history of homosexual sex. Another 332 respondents were assigned a status of exclusive heterosexual despite not self-identifying as heterosexual for one of two reasons: (a) respondent reported different-sex, but no same-sex, sexual partners, and did not self-identify as LGB (n=231); (b) respondent was logically recoded as having had different-sex sexual partners (n=101).

Finally, there were 52 individuals for whom there were no usable markers of sexual orientation. Fourteen of these individuals either reported a positive history of sex or were recoded as having had sex based on living with a partner. The remaining 38 respondents report

no history of sex and did not report a LGB or heterosexual sexual orientation. These 52 individuals had their sexual orientation status imputed via single imputation.

Outcome (Dependent) Variables

Mental health need

In the NHANES, there are two survey questions that can be used as markers of mental health need and that were consistently administered across all survey years used in this study. The first marker used here to indicate an individual's need for mental health service was frequent mental distress (FMD). FMD is derived from a single question contained in the CDC's Healthy Days Measure [114-116]. This question reads: "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?" Respondents then indicated how many days during the past thirty days were days when they felt their mental health was not good. The response options for this variable were 0-30, don't know, or refused. Respondents were classified as having FMD if they reported having 14 or more days where their mental health was not good. This cut-point of 14 days was used because both clinical researchers and clinicians often use a two week period as a marker for clinical depression and anxiety disorders [117, 118]. FMD has been shown to have a strong correlation with perceived need for mental health care as well as indicating psychological distress [119].

The second measure of mental health need is mental health disability. A respondent was considered as possibly having a mental health disability if he or she responded being limited in any way in any activity due to a physical, emotional or mental problem. Respondents were then asked about limitations on specific activities and what contributed to those limitations. Respondents who answered that depression, anxiety, or an emotional problem was responsible

for the limitation were categorized as have a mental health disability. Respondents who reported no limitations due to a physical, emotional or mental problem or limitations not due to depression, anxiety or an emotional problem were categorized as not having a mental health disability.

Seen any healthcare provider in the past year

All respondents were asked if they had seen a doctor or other healthcare professional in the past twelve months. The explicit question was, “During the past 12 months ... how many times have you seen a doctor or other health care professional about your health at a doctor’s office, clinic, hospital, emergency room, at home or at some other place? Do not include times you were hospitalized overnight” Respondents gave a numerical value that was recoded as a binary variable indicating either that that they had seen a doctor or other healthcare professional in the past twelve months or they had not seen any healthcare professional in that time period.

Seen any mental health professional in past year

All respondents were asked if they had seen a mental health professional in the past year. The explicit question was, “During the past 12 months ... have you seen or talked to a mental health professional such as a psychologist, psychiatrist, psychiatric nurse or clinical social worker about your health?” Respondents gave a yes/no answer.

Psychopharmaceutical prescriptions

Using both the individual level prescription medication files and the NHANES drug information files, I used the Multum therapeutic classification scheme to identify agents that were potentially used as psychopharmaceuticals for mental health problems [120]. These therapeutic categories are antidepressants, antipsychotics, and anxiolytics, sedatives, and hypnotics. In addition, I included anticonvulsants with the exception of those that had no

indicated use for psychiatric purposes and no known basis for off-label use (Ethosuximide, Phenytoin sodium, Zonisamide) [121]. All the classifications considered in this analysis are listed in Appendix 6.1. The respondents were asked for prescription medicines they had taken in the month prior to interview.

Unmet Need for Mental Health Services

For this study I defined unmet need as no reported mental health service use among those who indicating a need of for mental health services. In order to assess unmet need, I created two variables: an indicator of any mental health service use and an indicator of need for mental health services.

My indicator of any mental health service use was dichotomized yes/no. If a respondent reported either a positive history of seeing a mental health professional in the past twelve months or a positive history of having taken a prescription psychopharmaceutical in the past 30 days, he or she was assigned a positive history of any mental health service use.

My indicator of need for mental health services was frequent mental distress (FMD) and/or mental health disability. By this definition of unmet need, only respondents who indicated need for mental health services were eligible to have unmet need. Only a subset of the sample is used in this analysis, specifically, only respondents with FMD (14 days or more of self-reported days of poor mental health in the past 30 days) or with a self-reported mental health disability were considered as having a need for mental health services. If a respondent reported either seeing a mental health professional or having had a psychopharmaceutical prescription then the respondent was considered as having their mental healthcare needs met. Otherwise respondents were considered as having an unmet need.

Non-indicated Use of Mental Health Services

To understand the non-indicated use of mental health services, I used the same two variables created assessing unmet need for mental health services: any mental health service use and FMD. Non-indicated use of mental health services was defined as use of any mental health service among those without FMD or a self-reported mental health disability. This measure attempts to capture the use of mental health services among those with no discernible need for mental health services.

Potential Confounders and Moderators

Several additional variables are included in the analysis due to their relation to both the explanatory variable of interest (sexual orientation status) and outcome variables (mental health service utilization, unmet need, and non-indicated need). These variables are age, education, foreign birth, insurance status, marital status, poverty, race/ethnicity, and presence of a chronic disease. In addition, gender has been found to be associated with use of mental health services. Some studies find that women are more likely to use services, while others find that men are more likely to use these services [122, 123]. Among sexual minorities, female gender is associated with less unmet need compared to heterosexual women. This association was not found in men [10]. For these analyses, I examined gender as a potential effect modifier because the impact of gender on mental health services utilization may work differently for sexual minorities as compared to heterosexuals. Descriptions of the remaining potential confounders are found below.

Age

Older age has been shown to be associated with use of health services and mental health services [112]. Sexual minorities usually have a younger age distribution compared to

heterosexuals in population-based surveys [21, 101, 124]. Age was calculated using self-reported birth and time of interview. The NHANES then verified ages by confirming with the respondent or proxy the correct age. Age was used as a categorical variable in this study (20-29, 30-39, 40-49, 50-59).

Education

Higher education is associated with both minority sexual orientation status and greater mental healthcare utilization [10, 98]. The NHANES released education for all years coded in the following categories: less than 9th grade, 9-11th grade, high school graduate/GED, some college/AA degree, college graduate or higher. Because keeping all these education categories would result in loss of statistical power due to extremely small numbers at each education level, education has been dichotomized into high school and less or more than high school in this analysis.

Foreign Birth

Foreign birth status is negatively associated with use of health services; it has also been found to be a marker of insurance coverage and income, two other confounders between sexual minority status and outcomes in this study [125-127]. Sexual minorities in the United States are also less likely to be foreign born than their heterosexual counterparts[4, 17].

Insurance coverage

Sexual orientation is associated with a lack of health insurance coverage because sexual minorities are less likely to receive health insurance due to social inequities [56, 57, 82]. Health insurance coverage is also a predictor of healthcare utilization [83, 84].

Marital/Cohabitation Status

Marital status is positively related to insurance coverage which in turn is associated with health care utilization [56]. Sexual minorities are less likely to be married or in a cohabitating relationship than their heterosexual counterparts [128]. For this study, I included a dichotomous variable for married/cohabiting or not married/cohabiting in my adjusted analyses.

Poverty

Poverty has been shown to be positively related to deficits in mental health care utilization and higher rates of unmet need [85, 129]. Sexual minorities are disproportionately affected by poverty, especially gay and lesbian couples as compared to heterosexual couples [130]. To capture poverty, I used the poverty income ratio (PIR) variable provided by the NHANES. The PIR divides the reported family income by the poverty threshold for that same year. A PIR of less than 1 indicates that the person's income was below the poverty level. I dichotomized this variable into $PIR < 2.0$ and $PIR \geq 2.0$ (individuals living at less than 200% of the poverty level and individuals living above 200% of the poverty level).

Race/Ethnicity

Race/ethnicity has been shown to be associated both with sexual orientation and health services utilization and as such was included in regression models [131-133]. Race and ethnicity were ascertained separately in the screener questionnaire for the continuous NHANES. Although race/ethnicity was captured in greater detail within the survey questionnaire depending on the year of the survey, for the current study race has been categorized into Hispanic, non-Hispanic white, and other in the publicly available dataset.

Chronic Disease Marker

The presence of one or more chronic diseases is associated with increased utilization of health care [134, 135]. Because of this association, a marker of chronic disease is included in

analyses examining health care utilization. Certain sub-groups of sexual minorities have been shown to have higher rates of chronic diseases than their heterosexual counterparts. Specifically, lesbians and bisexual women have been found to have higher rates of cardiovascular disease than heterosexual women [136], while gay men have a much higher prevalence of HIV infection than heterosexual men[73]. For this study, a binary marker was created that captured whether the respondent had one or more chronic disease vs. not. A respondent was defined as having a chronic disease if he or she self-reported any of the following chronic diseases: angina, arthritis, asthma, congestive heart failure, coronary heart disease, chronic bronchitis, diabetes, emphysema, failing kidneys, or liver problems [137-139].

In addition to these self-reported chronic diseases, I also included a positive HIV test result as a marker of chronic disease because sexual minority men have a higher rate of HIV infection than heterosexual men and all women [73, 140, 141]. The NHANES only tested for HIV and did not ask for it as a self-report. Of the 15,361 respondents eligible for this study, 18.9% of them did not receive an HIV test. An additional 8 respondents received an HIV test, but had an indeterminate test result. Respondents without an HIV test or with an indeterminate test result have been excluded from planned HIV sub-analyses.

Statistical Analysis

The NHANES utilizes a complex, multistage probability sampling design. All statistical analyses were done using the weights and design information provided by the NHANES. The NHANES provides clear and thorough documentation on how to use their person-level weights when combining across survey years. For these analyses, I have used both SAS version 9.3 and STATA version 12. Both of these statistical software packages have the capacity to analyze complex survey designs appropriately.

Univariate analysis was conducted on all the variables previously mentioned in order to provide a description of the sample characteristics and distributions of each variable. Each variable was also examined in relation to gender and assigned sexual orientation status: gay male, bisexual male, homosexually-experienced heterosexual male (MSM), exclusive heterosexual male, lesbian, bisexual female, homosexually-experienced heterosexual female (WSW), and exclusive heterosexual female. Rao-Scott chi-square tests were used to compare the demographic and potential confounding variables across same-gender sexual orientation groups.

For the dichotomous outcome variables (frequent mental distress, mental health disability, mental health specialty care within past year, use of psychoactive medication in past 30 days, unmet need for mental health services, non-indicated use of mental health services) I used logistic regression methods to calculate odds ratios (ORs) and 95% confidence intervals (95% CI). Because the literature suggests that gender is an effect modifier [10, 122, 123], I used within gender contrasts between GB males, MSM, and male heterosexuals, as well as between LB females, WSW, and female heterosexuals. Initially a crude model was estimated, followed by a model adjusted with known confounders for mental health or healthcare utilization. With the exception of poverty and HIV testing results, there is less than 1% missing data for all variables in this study (6.0% and 18.9%, respectively) (Table 1). I performed both single imputation and multiple imputations. Due to the low numbers of missing data, there should not be very much of a difference in results between the single imputation and multiple imputations. For the single imputation, I used the SAS procedure PROC MI to create 1 imputed data set for any of my missing exposure variables, outcome variables and covariates. For single imputation, I rounded my binary variables to 0 or 1. Although single imputation has been shown to be biased when rounded [142], it is unlikely that it impacted my results due to the extremely low

prevalence of missing data. Nevertheless I also performed multiple imputation analyses using a series of chained equations (ICE) to confirm that my single imputation approach did not influence my results. Unlike Proc MI which uses Markov Chain Monte Carlo sampling methods that require assumptions of normal distributions [143], ICE does not require this assumption to be met[144]. I executed my multiple imputations in STATA version 12.

The 52 individuals who had no markers of sexual orientation were imputed (0.3% of the eligible sample). I also performed a single imputation among the 14 respondents who had a history of sexual behavior to predict the sexual orientation classification (Gay/Lesbian/Bisexual, MSM/WSW, Exclusive Heterosexual). The remaining 38 individuals who reported no history of sex were also imputed as either GLB or exclusively heterosexual through single imputation. They are not eligible to be imputed as MSM/WSW because MSM/WSW respondents had to affirmatively indicate being sexually experienced with members of the same-sex. All other variables were both singly and multiply imputed for analyses performed in this study.

This study has been given exemption status from the UCLA Office for the Protection of Research Subjects.

Table 2.1 Missing Data (unweighted), by sexual orientation, NHANES (2001-2010).

	Gay Men (n=129)	Bisexual Men (n=109)	Homosexually- experienced Men (n=155)	Exclusively Heterosexual Men (n=7,040)	Lesbian Women (n=93)	Bisexual Women (n=228)	Homosexually -experienced Women (n=307)	Exclusively Heterosexual Women (n=7,300)
Missing data								
Age	0	0	0	0	0	0	0	0
Race	0	0	0	0	0	0	0	0
Foreign-born	0	0	0	0	0	0	0	0
Education	0	0	0	5	0	0	0	4
Married/Cohabiting	1	0	0	5	0	0	0	4
Poverty	5	4	8	449	6	7	11	448
Insurance	1	0	0	35	0	1	2	33
HIV testing	17	23	36	1401	14	14	44	1361
Seen healthcare provider in past year	0	0	0	0	0	0	0	0
Frequent Mental Distress	0	0	0	4	0	0	0	9
Mental health disability*	0	0	0	0	0	0	0	1
Seen a mental health professional	0	0	0	1	0	0	0	3

*Self-reported a limitation due to mental health

2.3 Results

After accounting for the complex survey design, 6.8% of the sample was classified as sexual minority (95% CI: 6.1, 7.3), including 1.7% who self-identified as gay or lesbian (95% CI: 1.3, 2.0) and 2.1% who identified as bisexual (95% CI: 1.7, 2.4). An additional 3.0% were classified as MSM/WSW based on their reports of same-sex sexual experiences (95% CI: 2.6, 3.5). All respondents with missing markers of sexual orientation and behavior were singly imputed as exclusive heterosexuals. Only the singly imputed results are discussed below except for a few results that merit discussion due to differences between the single and multiple imputation results.

Characteristics of the Sample

In comparison to exclusive heterosexuals, sexual minorities were less likely to be foreign-born or currently married/living with a partner (Table 2.2, 2.3). Sexual minorities were also more likely than heterosexuals to be younger and to have completed at least a high school education. Overall, sexual minorities were slightly less likely to have health insurance coverage as compared to heterosexuals, but this effect varied across sexual orientation status and gender. Among men, gay men had the highest proportion of insured individuals (88.8%) while bisexual men were less likely to have insurance compared to heterosexual men (65.3% and 74.1%, respectively). Among women, sexual minorities as compared to heterosexuals, were less likely to have current health insurance (74.4% vs 81.1%, Rao-Scott Chi-Square value of $p < 0.001$). Again, this disparity was not uniform across all sexual minority women. Both lesbian and bisexual women had a lower proportion of their respective populations covered by insurance than either heterosexual women or homosexually-experienced heterosexual women.

Table 2.2 Demographic characteristics of U.S. adult men, age 20 to 59 years, by sexual orientation, NHANES (2001-2010).

Characteristics, %	Gay Men (n = 129)		Bisexual Men (n = 109)		Homosexually- experienced Men (n = 155)		Exclusively heterosexual Men (n = 7,040)	
	%	(SE)	%	(SE)	%	(SE)	%	(SE)
Age*								
20-29	17.26	(3.10)	23.37	(5.25)	13.96	(3.10)	25.49	(0.63)
30-39	33.85	(5.28)	27.56	(5.20)	29.83	(4.97)	24.20	(0.59)
40-49	28.46	(5.25)	23.48	(5.59)	27.20	(4.86)	27.39	(0.61)
50-59	20.43	(5.12)	25.58	(5.13)	29.02	(4.65)	22.92	(0.75)
Education*								
HS or less	9.88	(2.86)	41.46	(5.54)	29.68	(4.26)	43.75	(1.04)
More than HS	90.12	(2.86)	58.54	(5.54)	70.32	(4.26)	56.25	(1.04)
Race/ethnicity								
Non-Hispanic White	74.36	(4.37)	67.19	(5.69)	69.34	(3.73)	69.11	(1.44)
Hispanic	25.64	(4.37)	32.81	(5.69)	30.66	(3.73)	14.90	(1.18)
Other	15.27	(3.56)	15.69	(3.32)	14.19	(2.74)	15.99	(0.85)
Currently Insured								
Yes	88.76	(2.74)	65.34	(4.90)	70.86	(3.82)	74.11	(0.74)
Married or Cohabiting*								
Yes	35.65	(6.68)	30.91	(4.64)	59.05	(4.73)	67.72	(0.83)
Income								
<200% of the poverty line	16.81	(3.38)	42.85	(4.62)	32.25	(3.93)	30.96	(0.83)
Born outside of the U.S.*	10.68	(2.67)	17.20	(4.03)	13.83	(2.75)	17.62	(1.08)
Positive for HIV*	13.72	(3.59)	6.72	(2.07)	0.64	(0.64)	0.20	(0.05)
Reports 1 or more chronic diseases (including HIV)*	36.44	(4.63)	46.19	(5.95)	33.10	(4.52)	26.87	(0.82)
Reports 1 or more chronic diseases (no HIV)*	27.56	(3.68)	42.73	(5.81)	32.61	(4.52)	26.82	(0.83)

Note. Weighted percentages and standard errors shown. SE = Standard error; NHANES = National Health and Nutrition Examination Survey. 1,477 respondents were uncodable for current HIV status either due to indeterminate lab result (n=5), no blood sample to perform the analysis, refused the test, or were outside the age range being tested for HIV (n=1,433). This variable was coded as tested positive or did not test positive (including missing and indeterminate). Chronic disease was defined as a positive self-report for one or more of the following conditions: angina, arthritis, asthma, congestive heart failure, coronary heart disease, chronic bronchitis, diabetes, emphysema, failing kidneys, liver problems.

*Rao-Scott Chi-Square Test $p < 0.05$

Table 2.3 Demographic characteristics of U.S. adult women, age 20 to 59 years, by sexual orientation, NHANES (2001-2010).

Characteristics, %	Lesbian Women (n = 93)		Bisexual Women (n = 228)		Homosexually- experienced Women (n = 307)		Exclusively Heterosexual Women (n = 7,300)	
	%	(SE)	%	(SE)	%	(SE)	%	(SE)
Age*								
20-29	28.44	(5.60)	43.63	(4.20)	29.80	(2.87)	23.65	(0.66)
30-39	27.97	(4.80)	27.46	(3.79)	24.85	(2.77)	24.39	(0.72)
40-49	28.25	(6.14)	19.80	(2.71)	26.32	(2.94)	28.14	(0.68)
50-59	15.34	(5.10)	9.11	(2.21)	19.03	(3.15)	23.82	(0.67)
Education*								
HS or less	34.15	(5.80)	42.44	(4.07)	30.05	(3.27)	37.61	(0.92)
More than HS	65.85	(5.80)	57.56	(4.07)	69.95	(3.27)	62.39	(0.92)
Race/ethnicity*								
Non-Hispanic White	72.62	(5.23)	73.67	(2.84)	72.14	(3.10)	68.27	(1.56)
Hispanic	27.38	(5.23)	26.33	(2.84)	27.86	(3.10)	13.65	(1.06)
Other	18.72	(4.08)	18.02	(2.48)	19.91	(2.49)	18.08	(1.11)
Currently Insured*								
Yes	69.20	(5.13)	67.95	(3.60)	80.65	(2.49)	81.12	(0.78)
Married or Cohabiting*								
Yes	24.20	(7.05)	46.38	(3.40)	57.20	(3.12)	65.98	(0.84)
Income*								
<200% of the poverty line	41.95	(6.35)	48.63	(4.31)	37.36	(2.99)	33.40	(0.88)
Born outside of the U.S.*	9.86	(3.60)	4.07	(1.10)	9.09	(1.77)	15.21	(0.92)
Positive for HIV	0.74	(0.74)	0.56	(0.51)	NA	NA	0.20	(0.05)
Reports 1 or more chronic diseases (including HIV)	42.99	(5.74)	38.90	(3.92)	32.73	(3.42)	33.93	(0.90)
Reports 1 or more chronic diseases (no HIV)	42.37	(5.65)	38.85	(3.92)	32.73	(3.42)	33.81	(0.90)

Note. Weighted percentages and standard errors shown. SE = Standard error; NHANES = National Health and Nutrition Examination Survey. 1,436 respondents were uncodable for current HIV status either due to indeterminate lab result (n=3), no blood sample to perform the analysis, refused the test, or were outside the age range being tested for HIV (n=1,433). This variable was coded as tested positive or did not test positive (including missing and indeterminate). Chronic disease was defined as a positive self-report for one or more of the following conditions: angina, arthritis, asthma, congestive heart failure, coronary heart disease, chronic bronchitis, diabetes, emphysema, failing kidneys, liver problems.

Sexual minorities were also more likely to report at least one chronic disease (angina, arthritis, asthma, congestive heart failure, coronary heart disease, chronic bronchitis, diabetes, emphysema, failing kidneys, liver problems) compared to heterosexuals (35.1% vs 30.3%). Among women, lesbian and bisexual women had a higher prevalence of at least one chronic disease compared to heterosexual women. Prior to incorporating HIV testing results into the analysis, gay men had a similar prevalence of chronic disease to heterosexual men (27.6% vs 26.8%) while bisexual men and homosexually-experienced heterosexual men had a higher prevalence of at least one chronic disease (42.7% and 32.6%, respectively). After adding HIV testing results to include a positive HIV result into the chronic disease indicator, all male sexual minority subgroups had much higher prevalence of at least one chronic disease compared to heterosexuals (36.4% for gay men, 46.2% for bisexual men, 33.1% for homosexually-experienced heterosexuals, and 26.8% for heterosexuals).

Mental health status and mental health care utilization

As anticipated based on prior research, sexual minorities were more likely than heterosexuals to evidence mental health need (23.5% vs 13.2%, Rao-Scott Chi-Square value of $p < 0.001$) where mental health need was defined as experiencing frequent mental distress or reporting a mental health disability. There were only slight differences in the point estimates and confidence intervals between the single imputation and the multiple imputations for FMD, mental health disability, and having either FMD or mental health disability (Tables 2.4A, 2.4B, 2.5A, 2.5B). Dichotomizing sexual minority status masked the heterogeneity of associations between sexual minority orientation and mental health need. Among men, sexual orientation-related differences were present in comparisons between bisexual and exclusively heterosexual

men, where bisexual men evidenced a higher odds of both frequent mental distress and mental health disability after adjusting for confounding (OR: 2.1, 95% CI: 1.4, 3.1). Homosexually-experienced heterosexual men also had higher odds of reporting any mental health need than heterosexual men in the single imputation analyses (OR: 1.6, 95% CI: 1.03, 2.36) but not in the multiple imputation analyses (OR: 1.5, 95% CI: 0.98, 2.37). Gay men did not appear to differ significantly from exclusively heterosexual men in their levels of mental distress or mental health disability. Similarly, among women, bisexual women as compared to heterosexual women had higher odds of reporting frequent mental distress or mental health disability after adjusting for confounding (OR: 2.9, 95% CI: 2.1, 4.0). Bisexual and homosexually-experienced heterosexual women had higher odds of reporting a mental health disability or FMD than exclusive heterosexual women even after adjusting for suspected confounders (OR: 2.7, 95% CI: 2.0, 3.6 and OR: 1.9, 95% CI: 1.3, 2.6, respectively). But lesbians did not differ substantially from heterosexual women in their levels of mental distress or disability.

TABLE 2.4A Mental health status among U.S. adults, age 20 to 59 years, by gender and sexual orientation, NHANES (2001-2010): Current prevalence based on single imputation shown.

Mental health status	Prevalence							
	Gay/lesbian		Bisexual		Homosexually experienced		Exclusively heterosexual	
	%	(SE)	%	(SE)	%	(SE)	%	(SE)
<u>Men</u>								
Frequent mental distress past 30 days	12.31	(3.34)	24.68	(4.26)	18.28	(3.45)	9.44	(0.44)
Mental health disability	4.83	(2.34)	10.11	(3.39)	4.95	(1.93)	2.09	(0.16)
Either one	13.99	(3.47)	29.36	(4.55)	19.64	(3.47)	10.41	(0.44)
<u>Women</u>								
Frequent mental distress past 30 days	12.98	(3.53)	30.34	(3.41)	19.99	(2.99)	14.48	(0.49)
Mental health disability	8.29	(3.10)	12.60	(2.84)	6.68	(1.51)	3.78	(0.29)
Either one	17.67	(4.16)	33.32	(3.55)	23.13	(3.02)	16.14	(0.51)

Note. Weighted percentages and standard errors shown. Sample size for men: 129 gay, 109 bisexual, 155 homosexually experienced, 7,040 exclusively heterosexual; for women: 93 gay, 228 bisexual, 307 homosexually experienced, 7,300 exclusively heterosexual. CI = 95% Confidence interval; NHANES = National Health and Nutrition Examination Survey

TABLE 2.4B Mental health status among U.S. adults, age 20 to 59 years, by gender and sexual orientation, NHANES (2001-2010): Partial results of logistic regression analyses based on single imputation shown.

Mental health status	Unadjusted Odds Ratio (CI) ¹			Adjusted Odds Ratio (CI) ¹		
	Gay / Lesbian	Bisexual	Homosexually experienced	Gay / Lesbian	Bisexual	Homosexually experienced
<u>Men</u>						
Frequent mental distress past 30 days	1.04 (0.56, 1.91)	2.40 (1.55, 3.79)	1.85 (1.26, 2.71)	1.13 (0.62, 2.07)	2.12 (1.35, 3.32)	1.61 (1.03, 2.52)
Mental health disability	1.69 (0.62, 4.57)	3.73 (1.79, 7.79)	1.73 (0.76, 3.93)	1.9 (0.68, 5.29)	2.69 (1.21, 5.98)	1.48 (0.64, 3.44)
Either one	1.07 (0.61, 1.88)	2.73 (1.78, 4.17)	1.60 (1.04, 2.47)	1.05 (0.60, 1.87)	2.07 (1.38, 3.09)	1.56 (1.03, 2.36)
<u>Women</u>						
Frequent mental distress past 30 days	1.10 (0.60, 2.04)	3.22 (2.34, 4.44)	1.85 (1.26, 2.71)	0.95 (0.51, 1.76)	2.87 (2.07, 3.97)	1.78 (1.19, 2.63)
Mental health disability	3.00 (1.33, 6.75)	4.79 (2.91, 7.87)	2.38 (1.44, 3.92)	2.2 (0.93, 5.24)	4.16 (2.40, 7.22)	2.11 (1.25, 3.55)
Either one	1.41 (0.80, 2.48)	3.28 (2.40, 4.48)	1.97 (1.39, 2.79)	1.02 (0.54, 1.92)	2.67 (1.96, 3.63)	1.86 (1.31, 2.64)

Note. Weighted percentages and standard errors shown. Sample size for men: 129 gay, 109 bisexual, 155 homosexually experienced, 7,040 exclusively heterosexual; for women: 93 gay, 228 bisexual, 307 homosexually experienced, 7,300 exclusively heterosexual. Differences evaluated by specified levels multivariate logistic regression models adjusting for possible confounding due to age, race/ethnicity, education, family income, foreign birth, and marital/cohabiting status. CI = 95% Confidence interval; NHANES = National Health and Nutrition Examination Survey

¹Referent is exclusive heterosexual.

TABLE 2.5A. Mental health status among U.S. adults, age 20 to 59 years, by gender and sexual orientation, NHANES (2001-2010): Prevalence results include missing data.

Mental health status	Prevalence							
	Gay/lesbian		Bisexual		Homosexually experienced		Exclusively heterosexual	
	%	(SE)	%	(SE)	%	(SE)	%	(SE)
<u>Men</u>								
Frequent mental distress past 30 days	12.31	(3.34)	23.68	(4.26)	18.28	(3.45)	9.41	(0.44)
Mental health disability	4.83	(2.34)	10.11	(3.39)	4.95	(1.93)	2.10	(0.16)
Either one	13.99	(3.47)	29.36	(4.54)	19.64	(3.47)	10.39	(0.44)
<u>Women</u>								
Frequent mental distress past 30 days	12.98	(3.53)	30.35	(3.41)	19.99	(2.99)	14.46	(0.50)
Mental health disability	8.29	(3.08)	12.60	(2.84)	6.68	(1.51)	3.78	(0.29)
Either one	17.67	(4.16)	33.32	(3.55)	23.13	(3.02)	16.14	(0.51)

Note. Weighted percentages and standard errors shown. Sample size for men: 129 gay, 109 bisexual, 155 homosexually experienced, 7,040 exclusively heterosexual; for women: 93 gay, 228 bisexual, 307 homosexually experienced, 7,300 exclusively heterosexual. SE = Standard error; NHANES = National Health and Nutrition Examination Survey

TABLE 2.5B Mental health status among U.S. adults, age 20 to 59 years, by gender and sexual orientation, NHANES (2001-2010): Partial results of logistic regression analyses are based on multiple imputations.

Mental health status	Unadjusted Odds Ratio (CI) ¹			Adjusted Odds Ratio (CI) ¹		
	Gay / Lesbian	Bisexual	Homosexually experienced	Gay / Lesbian	Bisexual	Homosexually experienced
Men						
Frequent mental distress past 30 days	1.04 (0.56, 1.93)	2.42 (1.54, 3.82)	1.65 (1.05, 2.62)	1.13 (0.61, 2.08)	2.11 (1.34, 3.34)	1.6 (1.02, 2.53)
Mental health disability	1.69 (0.61, 4.65)	3.73 (1.77, 7.89)	1.73 (0.75, 3.98)	1.89 (0.68, 5.25)	2.66 (1.17, 6.02)	1.45 (0.61, 3.42)
Either one	1.07 (0.59, 1.90)	2.73 (1.77, 4.20)	1.60 (1.03, 2.49)	1.13 (0.64, 1.99)	2.31 (1.48, 3.62)	1.53 (0.98, 2.37)
Women						
Frequent mental distress past 30 days	1.10 (0.59, 2.06)	3.22 (2.33, 4.46)	1.85 (1.25, 2.73)	0.94 (0.50, 1.76)	2.86 (2.06, 3.99)	1.78 (1.19, 2.66)
Mental health disability	3.00 (1.32, 6.84)	4.78 (2.88, 7.93)	2.38 (1.43, 3.95)	2.16 (0.89, 5.20)	4.14 (2.35, 7.27)	2.11 (1.24, 3.58)
Either one	1.41 (0.79, 2.51)	3.28 (2.39, 4.51)	1.97 (1.39, 2.81)	1.16 (0.64, 2.10)	2.9 (2.10, 4.00)	1.8 (1.31, 2.72)

Note. Weighted percentages and standard errors shown. Sample size for men: 129 gay, 109 bisexual, 155 homosexually experienced, 7,040 exclusively heterosexual; for women: 93 gay, 228 bisexual, 307 homosexually experienced, 7,300 exclusively heterosexual. Differences evaluated by specified levels multivariate logistic regression models adjusting for possible confounding due to age, race/ethnicity, education, family income, foreign birth, and marital/cohabiting status. CI = 95% Confidence interval; NHANES = National Health and Nutrition Examination Survey

¹Referent is exclusive heterosexual.

Overall sexual minorities were more likely to report seeing a healthcare provider in the past year compared to heterosexuals (85.5% vs 80.6%, Rao-Scott Chi-square $p < 0.001$). Focusing specifically on mental health care, sexual minorities reported using mental health services much more than heterosexuals reported using services (see tables 2.6A, 2.6B, 2.7A, 2.7B). Among men, gay, bisexual, and homosexually-experienced men all indicated greater use of mental health specialty care and psychoactive medications compared to heterosexual men. After adjusting for possible confounding, bisexual men had higher odds of reporting a mental health care specialty visit within the past year compared to exclusive heterosexual men (OR: 3.0; 95% CI: 1.7, 5.2%). Among women, bisexual and homosexually-experienced women had higher odds of receiving treatment from a mental health specialist in the past year after adjusting for confounding (OR: 2.9; 95% CI: 1.8, 4.5 and OR: 2.7, 95% CI: 1.9, 3.8, respectively). And lesbian and bisexual women, as compared to heterosexual women, had higher odds of taking a psychoactive prescription medication in the prior 30 days (OR: 2.5; 95% CI: 1.5, 4.6 and OR: 2.5, 95% CI: 1.7, 3.7, respectively).

TABLE 2.6A Mental health services utilization among U.S. adult men, age 20 to 59 years, by sexual orientation, NHANES (2001-2010):
Prevalence based on single imputation shown.

Services use	Prevalence							
	Gay		Bisexual		Homosexually experienced		Exclusively heterosexual	
	%	(SE)	%	(SE)	%	(SE)	%	(SE)
Men								
Saw HCP past yr	84.6	(3.6)	86.9	(3.6)	72.9	(4.0)	72.6	(0.7)
Received mental health specialty care past yr	17.0	(3.8)	26.2	(5.4)	11.3	(3.3)	6.8	(0.3)
Took psychoactive medication past 30 days	18.9	(4.0)	17.6	(3.8)	15.5	(3.4)	8.7	(0.4)
Specialty or medication MH treatment	25.9	(5.3)	30.4	(5.4)	21.1	(4.2)	12.3	(0.5)
Did not receive MH services in the presence of indicated need ¹	43.7	(12.5)	49.2	(10.7)	62.4	(12.3)	64.7	(1.6)
Received MH services in absence of indicated need ²	22.1	(5.1)	24.2	(5.8)	17.6	(4.1)	10.0	(0.5)

Note. Weighted percentages and standard errors shown. Sample size for men: 129 gay, 109 bisexual, 155 homosexually experienced, 7,040 exclusively heterosexual.

SE = Standard error

¹Unweighted sample size of respondents who report either FMD or a mental disability is 876 men.

²Non-indicated need is defined as reporting neither a mental health disability nor frequent mental distress; Sample size for men: 6,557.

TABLE 2.6B Mental health services utilization among U.S. adult men, age 20 to 59 years, by sexual orientation, NHANES (2001-2010): Partial results of logistic regression analyses based on single imputation shown.

Services use	Unadjusted Odds Ratio (CI) ¹			Adjusted Odds Ratio (CI) ¹		
	Gay	Bisexual	Homosexually experienced	Gay	Bisexual	Homosexually experienced
Men						
Saw HCP past yr	1.30 (0.76, 2.31)	1.60 (0.87, 3.00)	0.65 (0.44, 0.97)	0.97 (0.52, 1.81)	1.86 (1.03, 3.38)	0.63 (0.39, 1.02)
Received mental health specialty care past yr	2.29 (1.33, 3.92)	3.96 (2.29, 6.85)	1.42 (0.75, 2.70)	1.62 (0.93, 2.81)	2.98 (1.7, 5.2)	1.26 (0.68, 2.35)
Took psychoactive medication past 30 days	1.58 (0.93, 2.67)	1.46 (0.87, 2.44)	1.25 (0.74, 2.10)	1.31 (0.77, 2.22)	1.20 (0.71, 2.02)	1.20 (0.74, 1.95)
Specialty or medication MH treatment	1.74 (1.01, 3.00)	2.17 (1.32, 3.59)	1.33 (0.81, 2.17)	1.39 (0.81, 2.40)	1.81 (1.08, 4.10)	1.25 (0.78, 2.00)
Did not receive MH services in the presence of indicated need ²	0.55 (0.20, 1.49)	0.68 (0.29, 1.58)	1.17 (0.42, 3.24)	0.64 (0.23, 1.81)	0.81 (0.31, 2.08)	0.94 (0.31, 2.86)
Received MH services in absence of indicated need ³	1.78 (0.99, 3.17)	1.88 (0.96, 3.71)	1.38 (0.78, 2.45)	1.37 (0.76, 2.49)	1.76 (0.90, 3.42)	1.25 (0.68, 2.31)

Note. Weighted percentages and standard errors shown. Sample size for men: 129 gay, 109 bisexual, 155 homosexually experienced, 7,040 exclusively heterosexual. Differences evaluated by specified levels multivariate logistic regression models adjusting for possible confounding due to age, race/ethnicity, education, family income, foreign birth, marital/cohabiting status, current insurance status, and presence of at least one chronic disease (Chronic disease was defined as a positive self-report for one or more of the following conditions: angina, arthritis, asthma, congestive heart failure, coronary heart disease, chronic bronchitis, diabetes, emphysema, failing kidneys, liver problems, HIV). CI = 95% Confidence Interval

¹Referent is exclusive heterosexual.

²Unweighted sample size of respondents who report either FMD or a mental disability is 876 men.

³Non-indicated need is defined as reporting neither a mental health disability nor frequent mental distress; Sample size for men: 6,557.

TABLE 2.7A Mental health services utilization among U.S. adult women, age 20 to 59 years, by sexual orientation, NHANES (2001-2010): Weighted prevalence and partial results of logistic regression analyses for women based on single imputation shown.

Services use	Prevalence							
	Lesbian		Bisexual		Homosexually experienced		Exclusively heterosexual	
	%	(SE)	%	(SE)	%	(SE)	%	(SE)
<u>Women</u>								
Saw HCP past yr	82.5	(4.3)	89.8	(2.7)	89.4	(2.1)	88.9	(0.5)
Received mental health specialty care past yr	17.6	(5.2)	24.0	(4.3)	21.8	(3.0)	9.7	(0.5)
Took psychoactive medication past 30 days	28.8	(5.1)	25.7	(3.7)	18.6	(2.6)	17.1	(0.5)
Specialty or medication MH treatment	36.2	(4.9)	35.9	(4.7)	31.4	(3.5)	21.3	(0.6)
Did not receive MH services in the presence of indicated need ¹	33.4	(11.3)	36.3	(7.8)	41.8	(6.0)	54.7	(1.7)
Received MH services in absence of indicated need ²	30.9	(5.1)	22.7	(4.5)	25.1	(3.5)	17.2	(0.6)

Note. Weighted percentages and standard errors shown. Sample size for women: 93 gay, 228 bisexual, 307 homosexually experienced, 7,300 exclusively heterosexual. SE = Standard error

¹Unweighted sample size of respondents who report either FMD or a mental disability is 1,415 women.

²Non-indicated need is defined as reporting neither a mental health disability nor frequent mental distress; sample size: 6,513.

TABLE 2.7B Mental health services utilization among U.S. adult women, age 20 to 59 years, by sexual orientation, NHANES (2001-2010): Partial results of logistic regression analyses for women based on single imputation shown.

Services use	Unadjusted Odds Ratio (CI) ¹			Adjusted Odds Ratio (CI) ¹		
	Lesbian	Bisexual	Homosexually experienced	Lesbian	Bisexual	Homosexually experienced
Women						
Saw HCP past yr	1.13 (0.63, 2.03)	2.13 (1.20, 3.80)	2.04 (1.32, 3.15)	1.15 (0.63, 2.09)	2.37 (1.32, 4.25)	1.84 (1.14, 2.96)
Received mental health specialty care past yr	2.39 (1.18, 4.85)	3.51 (2.20, 5.62)	3.11 (2.21, 4.38)	1.58 (0.72, 3.43)	2.86 (1.8, 4.5)	2.69 (1.89, 3.83)
Took psychoactive medication past 30 days	2.75 (1.68, 4.51)	2.32 (1.59, 3.38)	1.55 (1.10, 2.20)	2.50 (1.37, 4.55)	2.52 (1.72, 3.68)	1.48 (0.99, 2.19)
Specialty or medication MH treatment	2.82 (1.84, 4.30)	2.78 (1.86, 4.15)	2.28 (1.64, 3.17)	2.35 (1.41, 3.91)	2.74 (1.83, 4.10)	2.20 (1.53, 3.15)
Did not receive MH services in the presence of indicated need ²	0.35 (0.13, 0.96)	0.40 (0.21, 0.78)	0.51 (0.31, 0.82)	0.32 (0.09, 1.14)	0.39 (0.20, 0.76)	0.48 (0.28, 0.84)
Received MH services in absence of indicated need ³	2.82 (1.75, 4.54)	1.88 (1.11, 3.21)	2.05 (1.35, 3.10)	2.36 (1.38, 4.04)	2.06 (1.19, 3.57)	1.97 (1.28, 3.03)

Note. Weighted percentages and standard errors shown. Sample size for women: 93 gay, 228 bisexual, 307 homosexually experienced, 7,300 exclusively heterosexual. Differences evaluated by specified levels multivariate logistic regression models adjusting for possible confounding due to age, race/ethnicity, education, family income, foreign birth, marital/cohabiting status, current insurance status, and presence of at least one chronic disease (Chronic disease was defined as a positive self-report for one or more of the following conditions: angina, arthritis, asthma, congestive heart failure, coronary heart disease, chronic bronchitis, diabetes, emphysema, failing kidneys, liver problems, HIV). CI = 95% Confidence Interval

¹Referent is exclusive heterosexual.

²Unweighted sample size of respondents who report either FMD or a mental disability is 1,415 women.

³Non-indicated need is defined as reporting neither a mental health disability nor frequent mental distress; sample size: 6,513.

TABLE 2.8A Mental health services utilization among U.S. adult men, age 20 to 59 years, by sexual orientation, NHANES (2001-2010): Prevalence results included missing data.

Services use	Prevalence							
	Gay		Bisexual		Homosexually experienced		Exclusively heterosexual	
	%	(SE)	%	(SE)	%	(SE)	%	(SE)
<u>Men</u>								
Saw HCP past yr	84.7	(3.6)	86.9	(3.6)	72.9	(4.0)	72.6	(0.7)
Received mental health specialty care past yr	17.0	(3.8)	26.2	(5.4)	11.3	(3.3)	6.8	(0.3)
Took psychoactive medication past 30 days	18.9	(4.0)	17.6	(3.8)	15.5	(3.4)	8.7	(0.4)
Specialty or medication MH treatment	25.9	(5.3)	30.4	(5.4)	21.1	(4.2)	12.3	(0.5)
Did not receive MH services in the presence of indicated need ¹	43.7	(12.5)	49.2	(10.7)	62.4	(12.3)	65.2	(1.6)
Received MH services in absence of indicated need ²	21.0	(4.8)	21.9	(5.9)	17.1	(4.1)	9.7	(0.5)

Note. Weighted percentages and standard errors shown. Sample size for men: 129 gay, 109 bisexual, 155 homosexually experienced, 7,040 exclusively heterosexual. SE = Standard error

¹Unweighted sample size of respondents who report either FMD or a mental disability is 876 men.

²Non-indicated need is defined as reporting neither a mental health disability or frequent mental distress; Sample size for men: 6,557.

TABLE 2.8B Mental health services utilization among U.S. adult men, age 20 to 59 years, by sexual orientation, NHANES (2001-2010): Partial results of logistic regression analyses from based on multiple imputations shown.

Services use	Unadjusted Odds Ratio (CI) ¹			Adjusted Odds Ratio (CI) ¹		
	Gay	Bisexual	Homosexually experienced	Gay	Bisexual	Homosexually experienced
Men						
Saw HCP past yr	1.33 (0.76, 2.32)	1.6 (0.86, 2.98)	0.65 (0.43, 0.97)	0.96 (0.51, 1.81)	1.86 (1.02, 3.41)	0.63 (0.39, 1.03)
Received mental health specialty care past yr	2.3 (1.33, 3.97)	3.98 (2.28, 6.94)	1.43 (0.74, 2.73)	1.5 (0.89, 2.53)	2.99 (1.70, 5.29)	1.26 (0.67, 2.37)
Took psychoactive medication past 30 days	1.58 (0.93, 2.69)	1.46 (0.86, 2.46)	1.25 (0.74, 2.12)	1.32 (0.77, 2.22)	1.19 (0.70, 2.02)	1.19 (0.73, 1.95)
Specialty or medication MH treatment	1.74 (1.00, 3.03)	2.18 (1.31, 3.62)	1.33 (0.81, 2.19)	1.32 (0.78, 2.24)	1.81 (1.07, 3.06)	1.25 (0.77, 2.01)
Did not receive MH services in the presence of indicated need ²	0.54 (0.20, 1.50)	0.68 (0.29, 1.59)	1.16 (0.41, 3.26)	0.64 (0.23, 1.81)	0.79 (0.30, 2.09)	0.93 (0.30, 2.93)
Received MH services in absence of indicated need ³	1.78 (0.99, 3.20)	1.88 (0.95, 3.75)	1.38 (0.77, 2.47)	1.3 (0.71, 2.32)	1.76 (0.89, 3.44)	1.25 (0.67, 2.33)

Note. Weighted percentages and standard errors shown. Sample size for men: 129 gay, 109 bisexual, 155 homosexually experienced, 7,040 exclusively heterosexual. Differences evaluated by specified levels multivariate logistic regression models adjusting for possible confounding due to age, race/ethnicity, education, family income, foreign birth, marital/cohabiting status, current insurance status, and presence of at least one chronic disease (Chronic disease was defined as a positive self-report for one or more of the following conditions: angina, arthritis, asthma, congestive heart failure, coronary heart disease, chronic bronchitis, diabetes, emphysema, failing kidneys, liver problems, HIV). CI = 95%

¹Referent is exclusive heterosexual.

²Unweighted sample size of respondents who report either FMD or a mental disability is 876 men.

³Non-indicated need is defined as reporting neither a mental health disability or frequent mental distress; Sample size for men: 6,557.

TABLE 2.9A Mental health services utilization among U.S. adult women, age 20 to 59 years, by sexual orientation, NHANES (2001-2010): Prevalence results include missing data.

Services use	Prevalence							
	Lesbian		Bisexual		Homosexually experienced		Exclusively heterosexual	
	%	(SE)	%	(SE)	%	(SE)	%	(SE)
<u>Women</u>								
Saw HCP past yr	82.5	(4.3)	89.8	(2.7)	89.4	(2.1)	88.8	(0.5)
Received mental health specialty care past yr	17.6	(5.2)	24.0	(4.3)	21.8	(3.0)	9.7	(0.5)
Took psychoactive medication past 30 days	28.8	(5.1)	25.4	(3.7)	18.6	(2.6)	17.1	(0.5)
Specialty or medication MH treatment	36.9	(4.9)	35.9	(4.7)	21.5	(3.5)	21.2	(0.6)
Did not receive MH services in the presence of indicated need ¹	33.4	(11.3)	36.3	(7.8)	41.8	(6.0)	54.7	(1.7)
Received MH services in absence of indicated need ²	29.6	(5.0)	22.0	(4.6)	23.4	(3.7)	16.6	(0.6)

Note. Weighted percentages and standard errors shown. Sample size for women: 93 gay, 228 bisexual, 307 homosexually experienced, 7,300 exclusively heterosexual. SE = Standard error

¹Unweighted sample size of respondents who report either FMD or a mental disability is 1,415 women.

²Non-indicated need is defined as reporting neither a mental health disability nor frequent mental distress; sample size: 6,513.

TABLE 2.9B Mental health services utilization among U.S. adult women, age 20 to 59 years, by sexual orientation, NHANES (2001-2010): Partial results of logistic regression analyses by multiple imputations shown.

Services use	Unadjusted Odds Ratio (CI) ¹			Adjusted Odds Ratio (CI) ¹		
	Lesbian	Bisexual	Homosexually experienced	Lesbian	Bisexual	Homosexually experienced
Women						
Saw HCP past yr	1.13 (0.63, 2.05)	2.13 (1.19, 3.83)	2.04 (1.31, 3.17)	1.15 (0.63, 2.11)	2.36 (1.31, 4.27)	1.82 (1.12, 2.96)
Received mental health specialty care past yr	2.4 (1.17, 4.93)	3.53 (2.19, 5.68)	3.13 (2.20, 4.34)	1.57 (0.71, 3.47)	2.87 (1.80, 4.60)	2.61 (1.83, 3.73)
Took psychoactive medication past 30 days	2.75 (1.66, 4.55)	2.32 (1.58, 3.40)	1.55 (1.09, 2.21)	2.48 (1.34, 4.57)	2.51 (1.70, 3.69)	1.51 (0.99, 2.28)
Specialty or medication MH treatment	2.82 (1.83, 4.35)	2.79 (1.86, 4.18)	2.29 (1.64, 3.19)	2.34 (1.39, 3.94)	2.74 (1.82, 4.13)	2.16 (1.51, 3.09)
Did not receive MH services in the presence of indicated need ²	0.35 (0.13, 0.96)	0.4 (0.20, 0.78)	0.5 (0.31, 0.82)	0.31 (0.08, 1.15)	0.38 (0.19, 0.76)	0.48 (0.27, 0.84)
Received MH services in absence of indicated need ³	2.8 (1.74, 4.58)	1.89 (1.10, 3.24)	2.05 (1.34, 3.13)	2.35 (1.36, 4.07)	2.06 (1.18, 3.59)	1.9 (1.24, 2.90)

Note. Weighted percentages and standard errors shown. Sample size for women: 93 gay, 228 bisexual, 307 homosexually experienced, 7,300 exclusively heterosexual. Differences evaluated by specified levels multivariate logistic regression models adjusting for possible confounding due to age, race/ethnicity, education, family income, foreign birth, marital/cohabiting status, current insurance status, and presence of at least one chronic disease (Chronic disease was defined as a positive self-report for one or more of the following conditions: angina, arthritis, asthma, congestive heart failure, coronary heart disease, chronic bronchitis, diabetes, emphysema, failing kidneys, liver problems, HIV). SE = Standard error; CI = 95%

¹Referent is exclusive heterosexual.

²Unweighted sample size of respondents who report either FMD or a mental disability is 1,415 women.

³Non-indicated need is defined as reporting neither a mental health disability nor frequent mental distress; sample size: 6,513.

Efficiency of mental healthcare utilization

Only 13.9% of respondents in the total sample were categorized as evidencing a need for mental health services (95% CI: 13.2, 14.7%), either through reporting frequent mental distress in the past month or mental disability in the past year. Among those with an indicated need for mental health services, 58.7% of heterosexuals and 43.1% of sexual minorities reported not receiving any mental healthcare (Rao-Scott Chi-Square $p < 0.001$). After adjusting for both demographic and health-related confounding, sexual minority women had lower odds of having unmet need for mental health care as compared to heterosexual women (OR: 0.45, 95% CI: 0.29, 0.69).

Among the nearly 86.1% of individuals who did not evidence need for mental healthcare, 13.6% nevertheless reported either visiting a mental health professional in the prior year or taking a prescription psychopharmaceutical agent in the prior month (95% CI: 12.8, 14.3%). This differed significantly by sexual orientation. Only 13.0% of heterosexuals without evident need for mental health care received mental health services from specialty providers as compared to 22.3% of sexual minorities (Rao-Scott Chi Square $p < 0.001$). Even after accounting for demographic factors, insurance coverage, and chronic disease, sexual minorities had higher odds of receiving care in the absence of need as compared to heterosexuals (OR: 1.8, 95% CI 1.4, 2.3). In particular, lesbians, bisexual women, and homosexually-experienced heterosexual women had higher odds of seeking mental health services in the absence of indicated need compared to heterosexual women (Table 2.7B, 2.9B).

Psychopharmaceutical Utilization

This higher utilization of non-indicated mental health services was in part driven by the use of psychopharmaceutical agents. In general, sexual minorities reported taking any

prescription medication in the past 30 days more often than exclusive heterosexuals (56.1% vs 52.1%, Rao-Scott Chi-Square $p=0.04$). But overall a higher proportion of sexual minorities reported taking a psychopharmaceutical prescriptions in the past 30 days compared to exclusive heterosexuals (20.5% vs 12.8%, Rao-Scott Chi-Square $p<0.0001$). The increased prevalence of psychopharmaceutical use by sexual minorities is evident across all four Multum Therapeutic sub-classifications used in these analyses: anti-anxiety medication (5.0% vs 3.6% , Rao-Scott Chi-Square $p=0.03$), anti-depression medication (15.9% vs 10.6% , Rao-Scott Chi-Square $p<0.0001$), anti-convulsant medication (7.0% vs 3.9% , Rao-Scott Chi-Square $p<0.001$), and anti-psychotic medication (3.2% vs 1.2% , Rao-Scott Chi-Square $p<0.0001$). Almost 1 out of 4 lesbians in this study reported having taken an anti-depressant in the past 30 days (24.1%, 95% CI: 14.0, 34.1%). Additional results of analyses evaluating medication usage by sexual orientation are given in Table 2.10.

TABLE 2.10 Psychopharmaceutical prescription* drug use in the past 30 days among U.S. adults, age 20 to 59 years, by gender and sexual orientation, NHANES (2001-2010): Weighted prevalence shown.

Prescription drug use	Prevalence							
	Gay/lesbian		Bisexual		Homosexually experienced		Exclusively heterosexual	
	%	(SE)	%	(SE)	%	(SE)	%	(SE)
Men								
Any prescription medication	56.7	(4.39)	53.9	(4.81)	50.9	(4.81)	43.6	(0.89)
Antianxiety medication use	5.9	(2.42)	2.7	(1.39)	6.2	(2.84)	2.7	(0.32)
Antidepressant medication use	13.9	(3.55)	18.2	(4.37)	6.1	(2.36)	6.5	(0.39)
Anticonvulsant medication use	5.7	(2.43)	3.6	(2.04)	4.9	(2.56)	3.1	(0.25)
Antipsychotic medication use	2.1	(1.57)	6.5	(2.93)	4.3	(2.48)	1.2	(0.16)
Women								
Any prescription medication	53.6	(6.20)	57.6	(4.41)	59.7	(3.70)	60.7	(0.78)
Antianxiety medication use	4.8	(2.81)	4.2	(1.85)	5.5	(1.14)	4.4	(0.36)
Antidepressant medication use	24.1	(5.05)	21.1	(3.51)	14.6	(2.74)	14.6	(0.58)
Anticonvulsant medication use	16.6	(4.16)	7.9	(2.32)	6.2	(1.56)	4.6	(0.35)
Antipsychotic medication use	6.0	(3.03)	2.3	(1.23)	2.1	(0.93)	1.3	(0.17)

*Prescription drug classification defined by Multum Therapeutic Classification. Anticonvulsant medication excluded 3 drugs with no indicated use for psychiatric purposes and no indicated off-label use (Ethosuximide, Phenytoin sodium, Zonisamide).

Impact of HIV on Mental Health and Mental Health Service Utilization

A sub-analysis was performed exclusively on men who had received HIV testing. Overall, men with a positive test for HIV had a higher prevalence of seeing a mental health professional in the last year (24.4%) compared to men without a positive HIV test (6.6%). This difference was not seen for taking a psychotropic medication within the past 30 days (9.2% for HIV positive men, 7.7% for men without a positive HIV test). Although more men with a HIV positive test reported seeing a mental health professional in the past year than men without an HIV positive test, there was not a statistically significant difference between mental health need between these two groups (15.9% vs. 10.6%, Rao-Scott Chi-Square $p=0.24$). Even after examining this difference in need within a logistic regression that controlled for sexual minority

status, a positive HIV status was not related to higher odds of an increased mental health need compared to those men without a positive HIV status (OR=1.3, 95% CI: 0.54, 2.98). However, those who identified as a sexual minority or those with histories of same-sex sexual partners still had higher odds of a mental health need after controlling for HIV status, marital status, foreign birth, age, education, race, and income (OR: 2.4, 95% CI: 1.58, 3.71). Results of these HIV-specific sub-analyses can be seen in Table 2.11. HIV status never achieved statistical significance in any of the logistic regressions either as an independent variable or when tested as a statistical interaction with sexual minority status.

TABLE 2.11A HIV subanalysis: mental health and mental health services utilization among U.S. adults men, age 20 to 49 years, by gender and sexual orientation, NHANES (2001-2010): Prevalence based on single imputation shown.

	Prevalence among HIV positive men*						Prevalence among non-HIV positive men*					
	Gay		<i>Bisexual</i>		<i>Exclusively heterosexual</i>		Gay		<i>Bisexual</i>		<i>Exclusively heterosexual</i>	
	%	(SE)	%	(SE)	%	(SE)	%	(SE)	%	(SE)	%	(SE)
-	(n=18)	(n=11)	n=(19)			(n=94)	(n=75)	n=5620				
Frequent mental distress past 30 days	9.17	(6.96)	25.98	(12.89)	13.22	(7.22)	12.09	(3.89)	29.4	(5.68)	9.34	(0.52)
Mental health disability	6.69	(6.51)	32.95	12,35	8.43	(6.14)	4.85	(2.71)	10.7	(4.17)	1.81	(0.18)
Indicated MH need	9.17	(6.96)	32.95	(12.35)	18.59	(9.21)	14.42	(4.16)	34.57	(6.01)	10.2	(0.53)
Received mental health specialty care past yr	25.5	(11.57)	33.4	(12.41)	18.6	(9.87)	19.6	(5.03)	26.3	(6.42)	6.1	(0.37)
Took psychoactive medication past 30 days	6.7	(6.51)	28.6	(13.50)	4.2	(3.86)	22.6	(5.51)	12.9	(4.20)	7.3	(0.39)
Specialty or medication MH treatment	25.5	(4.63)	42.6	(12.69)	18.6	(9.87)	29.4	(6.73)	26.7	(6.43)	10.9	(0.45)
Did not receive MH services in the presence of indicated need ²	9.2	(1.33)	19.9	(17.70)	54.7	(20.09)	39.8	(13.44)	51.7	(12.05)	69.3	(1.98)
Received MH services in absence of indicated need ³	17.9	(10.87)	24.2	(14.46)	12.4	(8.18)	24.2	(6.50)	15.2	(6.24)	8.6	(0.45)

*These analyses excluded homosexually experienced men because there was only one HIV positive man in the sample.

Note. Weighted percentages and standard errors shown. Sample size for men with a HIV test result: 112 gay, 86 bisexual, 5,639 exclusively heterosexual. SE = Standard error

TABLE 2.11B HIV subanalysis: mental health and mental health services utilization among U.S. adults men, age 20 to 49 years, by gender and sexual orientation, NHANES (2001-2010): weighted prevalence and partial results of logistic regression analyses shown based on single imputation for covariates.

	Unadjusted Odds Ratio (CI)¹	Adjusted Odds Ratio (CI)¹
	<i>Sexual Minority</i>	<i>Sexual Minority</i>
Frequent mental distress past 30 days	2.16 (1.47, 3.17)	2.25 (1.53, 3.31)
Mental health disability	4.5 (2.4, 8.6)	3.47 (1.59, 5.82)
Indicated MH need	2.4 (1.58, 3.65)	2.42 (1.58, 3.71)
Received mental health specialty care past yr	4.51 (2.95, 6.89)	3.18 (2.00, 5.04)
Took psychoactive medication past 30 days	2.78 (1.85, 4.18)	2.36 (1.41, 3.96)
Specialty or medication MH treatment	3.26 (2.21, 4.81)	2.57 (1.65, 3.99)
Did not receive MH services in the presence of indicated need ²	0.35 (0.19, 0.65)	0.61 (0.28, 1.36)
Received MH services in absence of indicated need ³	2.82 (1.74, 4.58)	2.45 (1.41, 4.25)

*These analyses excluded homosexually experienced men because there was only one HIV positive man in the sample.
 Note. Weighted percentages and standard errors shown. Sample size for men with a HIV test result: 112 gay, 86 bisexual, 5,639 exclusively heterosexual. Differences in MH and MH need evaluated by specified levels multivariate logistic regression models adjusting for possible confounding due to age, race/ethnicity, education, family income, foreign birth, marital/cohabiting status. In addition differences in MH service utilization adjusted current insurance status and presence of at least one chronic disease (Chronic disease was defined as a positive self-report for one or more of the following conditions: angina, arthritis, asthma, congestive heart failure, coronary heart disease, chronic bronchitis, diabetes, emphysema, failing kidneys, liver problems). CI = 95%

¹Referent is exclusive heterosexual.

2.4 Discussion

Emerging work in this area indicates that sexual minorities are more likely to use mental health services than their heterosexual counterparts. Using the National Household Survey on Drug Abuse, Cochran and Mays reported that both men who had 1 year histories of male sexual partners and women who had female sexual partners were more likely to have used mental health services in the year prior to interview than men and women reporting only different gender sex partners [2]. This finding was replicated using data available in the Midlife in the United States Survey (MIDUS). There self-identified gay and bisexual men were more likely than heterosexual men to have seen a mental health provider in the year prior to interview (19% versus 8%). Likewise, self-identified lesbian and bisexual women were more likely than heterosexual women to have seen a mental health provider in the year prior to interview (33% versus 11%) [17]. But both of these studies were hampered by extremely small sample sizes.

In the current study, sexual minorities were almost twice as likely to seek mental healthcare compared to exclusive heterosexuals (30.4% versus 16.8%) and also more likely to take a prescription psychopharmaceutical (20.5% vs 12.8%, Rao-Scott Chi-Square $p < 0.0001$). Supportive of other findings, I did find that sexual minority women, but not men, were less likely to have unmet need for mental health services compared to their heterosexual counterparts [10]. Finally, although sexual minorities are known to have higher levels of psychological distress [11, 47, 145], even those who do not evidence high levels of distress are accessing mental health services and using psychotropic medications at higher rates than similar heterosexuals.

The majority of studies examining the use of mental health services show that these services are underutilized for the majority of the population. There are multiple reasons for this

underutilization: lack of access to culturally and linguistically appropriate mental health care, lack of adequate insurance coverage for mental health care, and social stigma attached to receiving mental health care [146, 147]. However, this study finds that sexual minorities are using both mental health counseling services and psychotropic medications at higher rates than heterosexuals. This may be in part because sexual minorities may be more likely to have positive views of mental health treatment, a lack of stigma around treatment, and different social support systems that lead to seeking treatment [45, 49, 52].

While high rates of unmet need for mental health services represent a health disparity in the general population, sexual minorities do not appear to have a higher rate of unmet need than their heterosexual counterparts. In the current study, sexual minorities were more likely to have received counseling or to have taken a prescription psychotropic drug than exclusive heterosexuals. Sexual minorities were also more likely to receive these services in the absence of indicated need for mental health treatment compared to heterosexuals. Due to limitations in this data set, I cannot directly assess why sexual minorities are showing this increased utilization in the absence of indicated need but several possibilities seem relevant. The first possibility is that sexual minorities have a positive social norm towards seeking mental health care and so are more likely to seek care in the absence of an indicated need. This type of service seeking would be a burden on the current healthcare system at a time when behavioral providers are already limited [148]. A second potential cause of this increased utilization is that the markers of mental health need used in this study do not effectively capture the true need for mental health services in this population. Some prior research on the topic of non-indicated use for mental health services has speculated that people may not indicate current need (either based on a mental health screen or a psychological distress indicator), but that they are receiving mental health care as preventive or

maintenance service [98]. Additionally, these psychological need measures used in surveys may not meaningfully capture the impact of discrimination and social stigmatization. This may be especially true for sexual minorities who are more likely to report discrimination related to their sexual orientation [5]. However, some racial minority groups report both higher rates of discrimination related to their race as well as higher rates of unmet need for mental health services[149, 150].

There are several limitations in the current study. First, this study used a survey taken at one point in time for all subjects and asked respondents questions that pertain to different periods in time. This cross-sectional study design cannot be used to assess causation. Second, for the analysis of unmet need and non-indicated need for mental healthcare, the two measures used to calculate unmet need were assessing slightly different time periods (prescription drug use in the past 30 days and being seen by a mental health professional in the past 12 months). This difference in time frame does have a precedent in the unmet need literature [151], but is not the ideal way to assess unmet need. Finally, the primary purpose of examining prescription pharmaceutical use in this study was to examine patterns in prescription drug use for mental illness. However many psychopharmaceutical prescriptions are prescribed for indications other than mental illness. Because the NHANES does not ascertain the conditions for which drugs are being prescribed, there is a potential to misclassify persons as receiving mental health treatment in the form of prescription drugs when they were prescribed a psychopharmaceutical medication for reasons other than having a mental health condition. In addition mental health care is increasingly being delivered by providers who are not specialty mental health care providers, including an increase in patients receiving some form of counseling from their primary care

providers[31, 152]. In the current study, I was limited to asking about the receipt of counseling services from a specialty provider.

However despite these limitations, this study showed that there most likely are differences in the ways sexual minorities use mental health care as compared to heterosexuals. This study used a population-based probability survey with clear markers of sexual orientation to assess the prevalence of mental health care counseling and psychopharmaceutical use of sexual minorities for the U.S. non-institutionalized civilian population. Sexual orientation was measured using both self-identity and self-reported sexual behavior history which has been recommended as a way to accurately assess sexual orientation [72]. In addition, due to the combination of five NHANES cycles (10 years of data) there are a sufficient number of sexual minorities to power examination of health services utilization and prescription drug use patterns. The main outcomes of interest for this study are health utilization variables. These variables have been asked in a consistent manner over all survey years used in this study. In addition, the method the NHANES uses to collect prescription drug information results in minimum misclassification of prescription drug usage. Because I was able to examine both the receipt of services from a mental health provider and prescription drug use into the analyses of mental health care utilization, this study provides a much better snapshot of mental health treatment utilization patterns among sexual minorities in the U.S. than has been previously reported.

This study comes at a time when there is an increased need to understand how people are using healthcare services due to the Affordable Care Act as well as the increased emphasis on cost containment and payment reform. Several of the demonstration projects coming out of the Centers for Medicaid and Medicare Services seek to better understand the role of behavioral health in new payment landscapes, including the role of behavioral health in accountable care

organizations (<http://innovation.cms.gov/>). Due to the limited nature of the health services information contained in the NHANES, the current study can only highlight that sexual minorities may be using mental health services in a different manner compared to heterosexuals. Currently the main national survey used to understand health care utilization and cost in the United States, the Medical Expenditure Panel Survey (MEPS), does not assess sexual orientation. Likewise, insurance claims databases which are used to understand treatment patterns also do not collect information on sexual orientation status. Although some sexual minorities can be identified in these data sets through information about the nature of their close relationships, similar to studies using census data to study sexual minorities [75], these studies are not representative of the entire sexual minority population. Without a clear mechanism to assess sexual orientation in these data sets, there are limitations to examining sexual minorities' access and use of mental health care services in the nation.

2. 5 Conclusion

With the increased emphasis on the role of mental health care within payment reform, as well as a shortage of mental health providers in certain areas, there is an urgent need to understand why and how mental health services are being accessed by different populations. This study takes an important step to identify that mental health services appear to be more highly accessed by sexual minorities, but does not explore these services in more detail because of limitations in the data set.

Chapter 3: Describing Mental Health Treatment Patterns Among Individuals in Same-Sex Couples in a National Sample (Study #2)

3.1 Introduction

The overall aim of this study was to investigate outpatient mental health treatment patterns among individuals in same-sex couples as compared to individuals in different-sex couples. Thus far the literature on sexual minorities' mental health treatment patterns (in terms of types of services used as opposed to any use) is primarily limited to studies of HIV patients [153-155] and community samples [48, 156]. This may be due in part to the lack of adequate data sources to describe mental health treatment utilization in detail for this population. Traditionally, studies of treatment patterns for mental health and substance abuse disorders have utilized several national surveys such as the National Comorbidity Surveys (NCS, NCS-R), Epidemiologic Catchment Area Surveys (ECA), National Ambulatory Medical Care Survey (NAMCS), Midlife Development in the United States (MIDUS), and, of course, the Medical Expenditure Panel Surveys (MEPS) [68, 98, 157-159] due to their extensive assessment of treatment utilization. This study uses the MEPS to describe mental health treatment patterns among individuals in same-sex couples (SS individuals) and different-sex couples (DS individuals).

Because the main goal for this study was to examine the impact of sexual minority status on mental health care treatment utilization, this service utilization was examined within Andersen's Behavior Model for Vulnerable Populations[87]. Andersen's model provides a framework for understanding how and why people utilize health services. By framing the analysis within this model, the impact of sexual minority status on mental health service utilization was isolated to a much greater degree.

The original Andersen Behavior Model was developed over forty years ago as a theoretical framework for understanding how people access and utilize health services[160]. This framework has been used extensively in the literature because it maps how individuals are enabled or impeded in accessing needed health services [161-164]. Because the population of interest, sexual minorities, are at higher risk for mental health and substance abuse (MHSA) disorders, Andersen’s Behavioral Model for Vulnerable Populations, an adaptation of the original model specific for at-risk populations, has been applied to the final analyses (Figure 1) [87].



Figure 3.1. Andersen’s Behavior Model for Vulnerable Populations Adapted for Study #2.

The Andersen model is composed of three core concepts that predict health utilization: predisposing factors, enabling factors, and need factors. Predisposing factors are characteristics that may predispose people to access or utilize health services. Enabling factors are characteristics that could facilitate or impede a person’s utilization of health services. Finally, the need domain includes factors that predict the need for services, such as perceived health need and objective evaluations of health status [87].

Often individuals suffering from mental health and substance abuse (MHSA) conditions do not receive appropriate care. First, many people with MHSA conditions do not initiate any treatment [63, 165]. Among those who do receive treatment, it appears that the majority of

services go to those with high need and only a small proportion goes to those with lower need [68]. These findings suggest that when individuals are seeking services, in general, they are seeking services for more severe or acute MHSA conditions. However, in examining mental health treatment patterns from 1990-2003, Kessler et al. found an overall increase in U.S. mental health treatment use independent of population-level changes in condition severity [98] indicating that not all mental health treatment is based on severity of the disorder.

Sexual minorities, in particular, have been shown to be more at risk for a variety of psychiatric illnesses and substance abuse disorders [4, 17, 166]. The papers to date that have examined MHSA services utilization have focused primarily on whether individuals are receiving any care at all. Across studies of MHSA treatment utilization in sexual minorities, most report a higher rate of use among sexual minorities compared to heterosexuals [10-12, 82] and that sexual minorities are more likely to initiate treatment for a MHSA condition compared to heterosexuals [12, 13, 17, 101]. There is some indication that in absence of a MHSA disorder, sexual minorities are also more likely to use services compared to heterosexuals [10-13].

Hypothesis 1: Individuals in same-sex couples are likely to report receiving psychotherapy or counseling associated with a psychiatric ICD-9 code in the past 12 months compared to individuals in different-sex couples.

Hypothesis 2: Individuals in same-sex couples are more likely to report receiving a psychopharmaceutical prescription associated with a psychiatric ICD-9 code in the past 12 months compared to individuals in different-sex couples.

Hypothesis 3: Individuals in same-sex couples are more likely to have had at least one office-based visit, outpatient visit, or psychopharmaceutical prescription associated with a psychiatric ICD-9 code in the past 12 months compared to individuals in different-sex couples.

Efficacy of mental health treatments is generally evaluated by the extent to which treatments adhere to evidence-based guidelines for treatment type and duration [167-169]. In the literature, the term “adequate care” is used to indicate that a person is receiving the minimally appropriate evidence-based medical treatment for their condition. Several studies suggest that large numbers of people who need mental health care are not receiving adequate care for their mental health disorders [59, 60, 170]. As one example, a study from the NCS suggests that less than 20% of respondents with a serious mental illness receive adequate mental health care and less than 5% of those with non-affective psychotic disorders receive adequate care[60]. In the MIDUS, only 54% of those with at least one mental disorder in the past 12 months received any mental health care and only 14% of those who received care received evidence-based treatment[59]. Lack of adequate treatment has been shown to have a significant economic impact in terms of loss of productivity and disability due to recurrence of symptoms and psychological distress. This lack of adequate treatment has also been associated with a lower quality of life for people who suffer from these illnesses [171, 172].

Studies that examine the associations between sexual orientation and health care utilization find greater dissatisfaction with providers, inaccessibility of services, and unmet need for select preventive services for sexual minorities as compared to heterosexuals [82, 173-175]. Although none of this literature addressed mental health care specifically, this literature suggests that sexual minorities may be less likely to continue mental health care if the patterns of higher levels of dissatisfaction with care are also present in mental health services utilization [61, 176].

Hypothesis 4: Individuals in same-sex couples are less likely to receive minimally adequate health treatment when they have had any office-based visit, outpatient visit, or psychopharmaceutical prescription associated with a psychiatric ICD-9 code in the past 12 months compared to individuals in different-sex couples.

The current study investigated mental health service utilization among individuals in same-sex couples as compared to individuals in different-sex couples. The study drew from Panels 1-13 of the Medical Expenditure Panel Surveys (MEPS) to describe MHSA treatment patterns and determine the prevalence of adequate mental health care by same-sex/different-sex couples' status. The study analyses have been performed in the context of Andersen's Behavior Model for Vulnerable Populations which incorporates predisposing factors, enabling factors, and need to understand how people are using medical services. By examining both patterns of mental health services use and whether a person was receiving adequate care within the framework of the Andersen model, this study explored the impact of sexual minority status on MHSA service use.

3.2 Methods

Data Source

The Medical Expenditure Panel Surveys (MEPS) are a series of surveys comprised of a nationally representative sample of the civilian, non-institutionalized population. These surveys, sponsored by the Agency for Healthcare Research and Quality (AHRQ) and the National Center for Health Statistics (NCHS), provide estimates of health care utilization and expenditures for the U.S. population. For the purposes of this study, I used the public use files (PUF) available as part of the MEPS Household Component survey (MEPS-HC). This study employed data from Panels 1-14 (1996-2010).

Sampling Frame

The sampling frame for the MEPS-HC comes from households interviewed in the previous year's National Health Interview Survey (NHIS). The NHIS sampling frame is a representative sample of the U.S. civilian, non-institutionalized population that reflects an

oversampling of different racial minorities during certain years of the sample (Blacks and Hispanics since 1996; Asian Americans since 2006). Individuals from approximately 35,000 households containing about 87,500 persons complete NHIS interviews each year (http://www.cdc.gov/nchs/nhis/about_nhis.htm#sample_design). Of these 35,000 households, approximately 15,000 households are invited to take part in the MEPS the following year. In addition to racial subgroups that the NHIS oversamples, the MEPS further oversamples additional subgroups such as low-income households.

MEPS Weighting and Design Information

Both NHIS and MEPS use complex probability sampling designs. The MEPS-HC design assigns a single full year person-level weight for each person who responds to the survey for the full period of time that they are in-scope. A person is in-scope whenever he or she is a member of the civilian non-institutionalized U.S. population. The personal-level weight is developed using information pertaining to census region, metropolitan statistical area (MSA), race/ethnicity, sex, age, and poverty status, as well as panel number.

There are currently three sets of MEPS variance strata and PSUs. Before 2002, strata and PSUs were developed year to year. From 2002-2005 the variance strata and PSUs were designed to be compatible with MEPS data associated with NHIS sample design. Due to the 2006 change in NHIS sample design, new variance strata and PSUs have been established for 2006 onwards in MEPS. Because the current study combines data from 1996-2010, the following study used specially created stratum variable (STRA9610) and PSU variable (PSU9610) found in the *MEPS HC-036: MEPS 1996-2010 Pooled Linkage Variance Estimation File* to correctly estimate the variance for study outcomes.

Data Collection

The MEPS-HC collects data in an overlapping panel design. Each household's data are collected over a 2 year period comprised of 5 rounds of data collection. The purpose of this frequent data collection during the two year period is to increase the accuracy of self-reported health services utilization. The average recall in the MEPS is 5 months; however, recall over a period of four months or greater can result in less accurate cost estimates with greater error in recall after 8 months[177]. In order to minimize this recall error, MEPS asks households to keep diaries and calendars of medical events as well as to retrieve medical bills and insurance documents during each interview [178].

Each round of MEPS-HC interviews pertains to a specific reference period. By having 5 rounds over the course of 2 calendar years, MEPS-HC attempts to improve data quality. Each household includes a reference person; usually the person owning or renting the property is chosen as the primary reference person. Computer-assisted personal interviews (CAPI) are done with the household reference person during each round. Due to accessibility or changes in household structure, the reference person may change over the course of the 2 year interview.

All respondents are asked if MEPS can obtain information from their medical providers and pharmacies. A sub-sample of the medical providers is then contacted by MEPS in the Medical Provider Component (MPC). During the MPC assessment, providers are asked to provide more detailed information on diagnosis and procedure codes, dates of visits, payments, and charges associated with any diagnosis and procedure codes. If respondents indicate that they, or someone in the household, are taking any prescription medications then, if permission is obtained, MEPS contacts the pharmacies to collect detailed information on the prescription medications filled there. This is part of the Pharmacy Component (PC) of the MEPS. Both the MPC and PC are not

publicly available data; they are used primarily as an imputation source for expenditure data and their use is discussed in more detail in Study #3.

During each of the five rounds, respondents are asked to supply information such as the name of any prescription medicine that they or someone in the household has received, the name of any health problem that the prescription was provided for, and the number of times the prescription was purchased. This information about prescription drugs is originally collected in the MEPS-HC questionnaire, during which time the respondents are asked to provide written permission to contact the pharmacy where the prescription was filled. Prescription drug information is collected from the household reference person during each of the five rounds. Each prescription drug is classified by its national drug code (NDC). The NDC is a unique numerical code that is available for all prescription, and select over-the-counter, drugs that are in commercial distribution within the United States.

Prescription drug information is corrected during the PC and appropriate edits and imputations are performed. For every prescribed medicine event, the variable RXFLAG indicates how the NDC is imputed (1 for no imputation, 2 for a PC source, 3 a secondary proprietary database).

Study Sample

This study used data from fifteen years of the Medical Expenditure Panel Surveys Household Component (MEPS-HC), 1996-2010. The subjects included in the study were all those who could be identified as being in a couple where one person was both the main referent person for the MEPS-HC and in-scope for at least one round of the survey.

The current study used the following MEPS-HC files: full-year PUF, prescribed medicines PUF, outpatient visits PUF, office-based medical provider visits PUF, and the 1996-

2010 Pooled Estimation File. The full-year files provide household information as well as demographic data. The outpatient and office-based visit files include a marker to indicate if the patient received any psychotherapy or counseling for that visit as well as an ICD-9 code for that visit. This allows medical events in these files to be coded as a mental health event even in the absence of an ICD-9 code. The prescribed medicine files include data on any drug prescriptions filled during the period of interest with the associated ICD-9 3 digit code. Finally the 1996-2010 Pooled Estimation File provides the appropriate sampling structure for studies combining the survey years used in this study.

Study Variables

Exposure

The main exposure of interest is sexual minority status. This is operationalized as residing in a partnered household with either a same-sex or different-sex partner. There were two paths for subjects to be included in this study: 1) the person could either be the main referent person for a household who was in a couple or 2) the person could be a husband/wife/spouse/partner of the main referent person. There were four steps used to identify same-sex and different-sex couples in the MEPS data set. First reference persons were identified through three checks. If a subject was listed as the family reference person (FAMREFPYR)¹ and the subject's person number was the same as the reference person number (REFPERSYR) and finally, if the subject's relationship to the reference person was listed as "self" (RFRELYRX) then the person was considered to be the key reference person. All reference persons were output into a reference person only data set. Second spouses and partners of reference persons were identified in the data sets by the variable RFRELYRX. If the subject's relationship to the

¹ All variables with the letters YR refer to variables that are normally coded with the two digit survey year in the variable. For this study the values that YR takes on are: 96, 97, 98, 99, 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 10.

reference person was labeled as a wife/spouse, husband/spouse, female partner or male partner, they were identified as a spouse or partner. All the spouses or partners were output into a spouse-only data set. Third, these two data sets were merged such that only reference persons with a valid spouse or partner were maintained in the data set. Finally those individuals who were in same-sex couples were labeled as same-sex coupled and those in different-sex couples were labeled as different-sex coupled. This is the same method that AHRQ is using to identify same-sex couples in the MEPS[78]. For this study, all analyses compared persons in same-sex couples to persons in different-sex married couples as cohabiting heterosexual couples are known to differ substantially in their patterns of drug and alcohol use as well as SES from married heterosexual couples[179, 180].

Because of the way the MEPS designs its sampling frame, even though individuals may be participating in the study for 2 years, each year can be analyzed as a separate population[78]. Due to low numbers of individuals in same-sex couples, the study was analyzed by survey year as opposed to panel number. Furthermore, this study was further restricted to people at least 18 years or older and to persons associated with a positive person weight. Because Medicare eligibility changes the way people may use and access services, I restricted my sample to those under the age of 65 for the whole duration of their participation in the study[181]. See Table 3.1 for both the number of individuals in the MEPS identified as being in different-sex or same-sex couples as well as the final study sample which was further restricted to persons ages 18-64 and who had a positive person weight.

Outcomes

The primary purpose of this study was to investigate differences in mental health service utilization in the outpatient setting by sexual minority status. Because the MEPS is a health

services data set, health care visits and prescriptions have associated 3-digit ICD-9 codes when applicable. As is typically done in mental health services research, the main outcomes of interest are dichotomized in the current study to be any psychotherapy/counseling, any psychopharmaceutical use, and any mental health service utilization (either psychotherapy/counseling or psychopharmaceutical prescription or both) [98, 99, 159, 182, 183]. Individuals were identified as having a positive history of psychopharmaceutical treatment if they had filled any prescription that is identified as being associated with a mental health ICD-9 code.

Mental Health Care Utilization By Sexual Minorities

Table 3.1 MEPS Sample by Year, MEPS 1996-2010, unweighted.

Persons	Total	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total Sample (partnered)	188,034	9,472	13,784	9,582	10,348	10,525	14,013	15,744	13,215	13,441	13,261	13,342	12,273	12,767	13,969	12,298
Total DS Married* Individuals	171,125															
Men	85,549	4,380	6,462	4,458	4,830	4,882	6,457	7,248	5,982	6,089	6,043	6,023	5,594	5,642	6,100	5,359
Women	85,576	4,380	6,468	4,459	4,832	4,881	6,459	7,248	5,987	6,092	6,046	6,025	5,597	5,641	6,101	5,360
Total DS Unmarried Individuals	15,911															
Men	7,959	338	411	323	329	357	517	588	589	601	547	599	496	687	832	745
Women	7,952	338	405	322	329	357	518	588	589	601	547	599	496	687	832	744
Total SS Married* Individuals	90															
Men	41	0	3	2	0	2	2	0	4	4	0	0	4	10	8	2
Women	49	0	5	2	4	2	0	2	8	2	6	2	0	4	8	4
Total SS Unmarried Individuals	908															
Men	438	12	14	6	10	18	28	34	24	20	38	52	50	48	42	42
Women	470	24	16	10	14	26	32	36	32	32	34	42	36	48	46	42
Total eligible DS Married* Individuals**	139,983															
Men	67,886	3,538	5,114	3,518	3,842	3,874	5,144	5,786	4,739	4,855	4,812	4,751	4,407	4,481	4,841	4,184
Women	72,097	3,717	5,428	3,722	4,047	4,074	5,468	6,133	5,058	5,149	5,127	5,082	4,687	4,764	5,161	4,480
Total eligible SS Coupled Individuals**	903															
Men	428	11	16	8	10	19		32	23	21	36	46	42	50	45	40
Women	475	22	20	11	17	26	30	35	34	30	36	38	32	51	52	41

*A couple is considered married if the reference person reported being currently married.

**An individual must have had a positive person-level weight for the analyses as well as be ages 18-64.

For treatment events associated with at least one ICD-9 code listed in Appendix 6.2 (either in relation to a visit or in relation to a psychopharmaceutical prescription), I used the Wang et al. definition of adequate care [60] to identify the proportion of individuals in same-sex and different-sex relationships receiving minimally adequate care. Individuals with any mental health ICD-9 code were coded as having minimally adequate care if they received 8 counseling sessions or 4 psychopharmaceutical prescriptions and 4 counseling sessions within one 12 month period of initiating treatment. In the case of psychopharmacotherapy, general recommendations are that most prescriptions require at a minimum four visits for follow-up medication monitoring[184]. For non-medication mental health treatment, research has indicated that psychotherapies for mood disorders such as depression and anxiety disorders require at least eight sessions within a twelve month period[60].

Andersen Behavior Model for Vulnerable Populations

In order to isolate the effect of being a sexual minority on mental health care utilization, while controlling for the numerous factors that affect treatment utilization, two different sets of propensity scores were developed for each individual eligible to be in the study sample using covariates from the Andersen model in the propensity score[185]. The first set of propensity scores was developed for all individuals in the study using the Andersen framework. The second set of propensity scores was developed only for individuals with at least one 3-digit ICD-9 code found in Appendix 6.2.

For this study the components of the Andersen framework were operationalized as follows:

Predisposing Demographic Factors

Age, sex, education, race/ethnicity, and veteran status have all been considered predisposing factors for this model and relevant for examination of mental health services utilization[163]. In addition the main exposure of interest, sexual orientation, was considered as a predisposing factor under the vulnerable population model.

Age

There have been noted disparities in the treatment of depression by age[165]. Furthermore being a young adult has been associated with not receiving any mental health care and not receiving adequate care[60]. In the PUF, MEPS has calculated age from date of birth to 12/31 of the survey year. For this study, I used the age at the end of the first year in the survey. Because Medicare eligibility changes the way people may use and access services, I restricted my sample to those under the age of 65 at the end of the each calendar year[181].

I maintained age in years when calculating the propensity score.

Sex

Some studies have found that women are more likely to use mental health services[186] while other studies have found that men are more likely to seek such services[123]. However among sexual minorities, men and women have been found to be more likely to use mental health services compared to heterosexuals[10, 11]. The NHIS initially measured gender during their survey. The accuracy of the listed gender was then verified during each round of MEPS interview. This variable was dichotomized as male/female.

Veteran Status

Veterans receive diagnoses for mental health disorders at a higher rate than the general population[98, 187]. Veterans are also eligible for free health and mental health care for 2 years after service[187] which may make their service utilization patterns unique compared to non-

veterans. The MEPS-HC year-round file identifies veterans. As the MEPS only samples from the civilian population, no currently serving members of the military are eligible for this study. This variable was dichotomized as veteran/not a veteran.

Predisposing Social Factors

Race/Ethnicity

An individual's race/ethnicity has been shown to influence the likelihood of receiving mental health treatment[165]. In particular, studies have found that Blacks are less likely to initiate needed treatment and receive adequate treatment[60, 165]. Hispanics have been found in some studies to receive more care [60, 188]. The MEPS collected information on race and ethnicity of each respondent during Round 1 of each panel. If the information was not collected during round 1, the interviewer attempted to collect it in a following round.

From 1996-2001 reference persons were asked to identify the race of themselves and their household members using the following categories: American Indian, Aleut/Eskimo, Asian or Pacific Islander, Black, White, and Other. From 2002-2009, reference persons were given a different set of options to identify themselves and their household members: White-no other race reported, Black-no other race reported, American Indian/Alaskan Native-no other race reported, Asian-no other race reported, Native Hawaiian/Pacific Islander-no other race reported, and Multiple race reported. Hispanic ethnicity was ascertained separately during all panels by the variable HISPANX. Because there were two different methods for categorizing race during this period, all respondents in this study have been assigned one of the following categories for race/ethnicity: non-Hispanic White, Hispanic, and non-Hispanic other.

Family Size

Family size has been shown to be related to type of health plan and utilization of services[189]. The MEPS full year file contains the total number of people in the family for each respondent. Based on the distribution of this variable, I top-coded this variable to be 2 persons, 3 persons, 4 or more persons.

Education

Higher levels of education have been associated with receiving any mental health care[190]. The MEPS provides a summary education variable, HIDEG. This variable was created by using information from three different education-related variables: highest grade completed, high school diploma, and highest degree. If the response to highest degree completed was “Refused” or “Don’t know”, the respondent was labeled as having no degree (<1% of respondents) and information from highest grade completed and high school diploma received were used to arrive at a final classification. Using the HIDEG variable, I grouped respondents into one of three education categories to increase the likelihood of matching: H.S. Diploma/GED/Less than H.S. Diploma, Some college, Bachelor’s degree or higher degree.

Enabling Factors

Health insurance, income, region, and metropolitan area were included as enabling factors in the analysis[87, 163]. In addition, receipt of public benefits was also examined as part of the vulnerable domain.

Insurance

Health plans with mental health coverage have been shown to increase access to mental health care and increase quality of that care[111]. In addition, having insurance that covers mental health care has been associated with preventing treatment dropout[176]. Same-sex couples are less likely than different sex couples to have health insurance coverage[72]. For

purposes of this study, insurance was categorized as private, public (such as Medicaid or Medicare), or uninsured.

Income

Lower income has been associated with higher rates of psychiatric disorder and receiving less psychiatric care [191-194]. People in same-sex couples have been shown to have similar or higher rates of poverty than people in different-sex couples with same-sex female couples consistently evidencing higher poverty rates than different-sex couples or male same-sex couples[130]. For this study, I employed a MEPS created variable, **POVCATYR**, as a surrogate for income. This variable was created each year using the Current Population Survey's poverty statistics. The categories used were family income less than 200% of the federal poverty line or 200% or greater of the federal poverty line.

Public Benefits

Receiving public benefits has been associated with mental health morbidity[195]. MEPS provides either a public assistance income amount or a dichotomous variable indicating any income from public assistance across the thirteen panels. A dichotomized variable indicating any income from public assistance/ no income from public assistance was used to assess public benefits.

Need Factors

The need domain in the model includes self-perceptions of health care need[87]. Both perceived physical health and perceived mental health were measured for all fifteen years used in this study.

Perceived Mental Health

Perceived mental health is as an enabling factor in the Andersen Behavioral Model [87, 160, 164]. People who perceive themselves as having poor mental health are more likely to seek treatment for their mental health concerns [62]. Sexual minorities have been found to be more likely to rate their perceived mental health as fair or poor more often than heterosexuals do [17]. In the MEPS, respondents were asked to rate their mental health as excellent, very good, good, fair, or poor. I dichotomized their answers into good mental health (excellent, very good, good responses) and poor mental health (fair, poor responses) [196]. Perceived mental health status was assessed by the MEPS interview during each of the five rounds. Because mental health service utilization was examined over the course of a year and because perceived mental health was assessed as an indicator of need, the earliest completed perceived mental health status was used in this analysis.

Perceived Physical Health

Perceived physical health is also treated as an enabling factor in the Andersen Behavioral Model [87, 160, 164]. Although sexual minorities do not uniformly report worse physical health than their heterosexual counterparts, there does appear to be differences within sexual minority subgroups and heterosexuals. For instance, previous research suggests that bisexual women are more likely to report more days of poor physical health compared to both lesbians and heterosexual women [197], whereas gay and bisexual men are comparatively equal on perceived physical health compared to heterosexuals [145]. Like the perceived mental health measure, the perceived physical health measure in the MEPS asked the respondent to rate their physical health as excellent, very good, good, fair, or poor. This measure was dichotomized into good physical health (excellent, very good, good responses) and poor physical health (fair, poor responses). As

with perceived mental health, the earliest response available to this perceived physical health has been used as the perceived physical health baseline for each individual.

Health Behavior

The outcomes of interest for this study were in this health behavior domain: (1) Evidence of any psychopharmaceutical prescription with a specified mental health ICD-9 code in Appendix 6.2, (2) Any psychotherapy/counseling event, (3) Any encounter assigned a mental health ICD-9 code (office-based visit, outpatient visit, or psychopharmaceutical prescription) in Appendix 6.2, and (4) markers of minimally adequate mental health care.

Missing Covariates from Andersen's Behavioral Model

There are factors that are included in the original Andersen's Behavioral Model for Vulnerable Populations that were not examined in this study[87]. The majority of these factors have not been included because the variables were not collected in either some or all of the panels being used in this study. These variables include levels of social support, childhood history factors (living conditions, victimization, criminal behavior, etc.), community resources (crime rates, social services), and many of the family resources (self-help skills, hunger). One of the downsides to using the MEPS, although an excellent dataset for understanding health care utilization, is that many of these variables may be found in smaller surveys but would not typically be found in a database whose primary purpose is to track treatment utilization and healthcare expenditures in detail.

There are some variables that are found in the MEPS and are part of the Andersen model that were intentionally excluded in the creation of propensity scores. First, some of the MEPS variables concerning access to care have been excluded as they specifically refer to medical care and not mental health care, the focus of this study. Because access to medical care does not

necessarily mean access to mental health services[198] the face validity of these questions are in doubt. Marital status was also excluded from propensity score creation because all individuals in different-sex couples used in the main analyses are married, while the majority of individuals in same-sex couples are not married. Employment was also not included in this analysis because there is no variable in MEPS that may identify if unemployment is voluntary. As this study only examined individuals within couples, it is possible that some of the referent persons or spouses are voluntarily unemployed. Indeed, data from the 2000 Census shows that individuals in same-sex relationships are much more likely to have both spouses working than individuals in different-sex relationships [75, 199]. Furthermore, the propensity score calculation included the family's total income and receipt of public assistance which should account indirectly for distress caused by unemployment and disability. Finally, this propensity score model only used perceived physical health and not both evaluated health and perceived health, because in the context of MEPS the only people who are having their physical health evaluated are those already regularly accessing care. These individuals are more likely to perceive a need for that care[200]. Furthermore perceived physical health has been shown to be a valid indicator of general health status[201, 202].

Other Factors which were included in Propensity Score Creation

In addition to the above covariates, the propensity score also includes variables linked to the probability of being sampled for the MEPS. There has been some debate as to whether the use of propensity scores excludes the possibility of using survey weights or sample design in any analysis[185, 203]. One methods paper finds that studies using propensity scores can and should still use survey weights and sample design in analysis if the intent of the study is to make population-level inferences[203]. However, if no survey weights or sample design information is

used in the analysis, then the interpretation of the propensity score results is limited to discussion of a particular sample instead of making inferences about the larger U.S. adult population.

Because there were empty strata due to both a rare exposure and a rare outcome, for the following study no survey weights or sample design were used when creating estimates that use any of the propensity score methods employed. Age, race/ethnicity, sex, poverty status, MSA, and census region were used in weight creation and were accounted for in the Andersen model. Instead, the propensity score calculation also included a factor that was not included in Andersen's model but was included in weight creation. The only covariate that was part of weight creation and that was not taken into account for in the Andersen model is panel number. Each respondent is part of a panel (1-14). It is important to control for the panel number not only because it was used in the creation of the weights but because it also controls for the year that the survey was administered as well as methods variability. Mental health treatment patterns have changed over the fifteen years of survey data in the study, most notably there has been an increase in psychopharmaceutical medication use to treat mental health disorders[99].

Statistical Analysis

Univariate Analysis

SAS v9.4 (SAS Institute Inc, 2002-2012) was used to prepare data and perform preliminary univariate analyses. As mentioned previously, the NHIS/MEPS are complex surveys. As such, all assigned person-level weights, variance estimation strata, and primary sampling units were used when performing univariate statistical analyses. All univariate analyses reported compare by sexual minority status to describe sample demographics and characteristics. To test for differences at a $p < 0.05$ level between sexual minorities and heterosexuals, I have used

the Rao-Scott Chi-Square test for categorical variables as implemented by PROC SURVEYFREQ (SAS v9.4).

Logistic Regression

For the dichotomous outcome variables (any counseling or psychotherapy visits; any pharmaceutical prescription with a mental health ICD-9 code; or any outpatient visit, office-based visit or pharmaceutical prescription with a mental health ICD-9 code) I used logistic regression methods to calculate odds ratios (ORs) and 95% confidence intervals (95% CI). I executed both crude models and models adjusted for variables specified in the Andersen model.

Propensity Score Creation & Analysis

Due to the large number of covariates in Andersen's model and the small number of individuals in same-sex couples in the study, it is not mathematically desirable to include all these covariates in logistic regression models because of both the decreased power to detect a statistically significant finding and inadequate degrees of freedom to do so [204]. Another statistical method of dealing with large numbers of confounders is matching. Although matching enables one to control for more covariates while giving up less power for smaller sample sizes, matching can also result in a loss of power due to not being able to find matches for all respondents [205, 206]. Alternatively this method can also result in an overestimation of effect size when those successfully matched into the study vary systematically from those not matched into the study on key covariates[185]. This is especially a problem when one or more of the covariates used for the matching process is distributed unevenly between the two groups of interest[185].

Propensity scores were used in this study in order to account for both the factors in the Andersen's model while dealing with rare exposure and rare outcomes. Propensity scores have

often been referred to as balancing scores because, when calculated and applied correctly, the two groups being compared can have the same distribution of the specified covariates [206-208]. Additionally, propensity scores can be especially useful in studies with rare outcomes[209]. In order to overcome power issues, four different propensity score methods were compared as the primary method for controlling covariates in the Andersen model. Specifically, I used propensity scores for covariate control in a logistic regression equation, inverse-probability treatment of weighted (IPTW) propensity scores, propensity score based subclassification (also known as stratification), and propensity score matching.

Two sets of propensity scores have been created for this study. One set of propensity scores was for each of the 140,886 individuals included in this study. The second set was for each of the 12,600 individuals with at least one mental health ICD-9 codes being examined in this study (see Appendix 6.2 for list of mental health ICD-9 codes). These propensity scores have been calculated by estimating an individual logistic regression model for each respondent eligible for this study. This logistic regression model predicted the probability of an individual being in a same-sex or different-sex relationship based on the covariates specified above in the Andersen Model for a Vulnerable Population as well as by panel number [210, 211].

After creation of the propensity score, I assessed the balance of covariates by using the balance diagnostics, recommended by Austin et al., to assess whether the propensity score model has been adequately specified[208]. This included comparing the descriptive statistics of individuals in same-sex relationships compared to individuals in different-sex relationships after either matching or stratifying by propensity scores [208].

Propensity score matching is one way to use a propensity score to distribute the desired covariates equally between two groups. Propensity score matching allows for pseudo-matching

on multiple covariates without the main limitations found in traditional matched analysis and multivariate analysis[205, 211]. In particular, propensity score matching has been shown to be superior to non-matched multivariate analysis and matched analysis when studying small samples. In one methods paper, a small study sample resulted in both the non-matched covariate analysis and matched analysis overestimating the effect size due to bias introduced by uncontrolled confounding and differences between the matched and the unmatched subjects, respectively[185].

Compared to other propensity score methods, propensity score matching has been shown to be more effective at minimizing systematic differences between groups compared to both stratification on the propensity score and covariate adjustment using a propensity score [212-214]. A review of the propensity score literature concluded that, when the exposure groups are balanced, matching might be a preferable method to using the propensity score in a multivariate model[209]. Finally propensity score matching performed slightly better when compared to inverse-probability of treatment weighting in earlier tests [214, 215].

Proportion of Same-sex Versus Different-sex relationships with Both Members of the Couple Using Mental Health Services

Individuals in relationships were the primary unit of analysis. And yet, individuals are located within couples. This suggests that shared variance within couples may have relevance. However, mental health utilization is relatively rare suggesting that the effect of this shared variance should be minimal. The first set of propensity score analyses used all individuals in couples. The second set of analyses used only the referent person in the analyses. By this method, I have empirically evaluated the importance of the possible couple-based effect by observing the robustness of study findings.

Missing Data

Exposure

This study used a validated AHRQ MEPS sample for sexual minority status from 1996-2007[78]. Because this study is using a validated sample from AHRQ, this study assumed there is no missing data for the exposure. In addition, for the years 2008-2010, the same rules used to identify the earlier sample were applied to identify additional individuals in SS and DS couples to the sample.

Outcome

Both the outcomes of any psychotherapy and any psychopharmaceutical treatment rely on identifying at least a single record in the MEPS for either of these treatments. I have not assumed that the lack of a record indicates a possibility that there actually was a positive record that was not recorded. Instead, I assumed that the absence of a record is evidence that such care was not received. As such I have not imputed these two outcomes, nor did I impute the third outcome of combination psychotherapy/psychopharmaceutical treatment.

Covariates used in propensity score creation

In a preliminary examination of the covariates, covariates were missing less than 1% of the time (Table 2). Because covariates were missing so rarely, single imputation was used to impute the missing covariates. This imputation was performed using SAS v9.4 Proc MI.

Table 3.2 Missing data by couple status, MEPS (1996-2010), unweighted. Data only include those eligible for the final study sample.

	Individuals in Same-sex Couples	Individuals in Different-sex Couples
Total Sample	n=903	n=139,983
Missing data		
Sex	0 (0%)	0 (0%)
Receive public benefits	0 (0%)	0 (0%)
Age	0 (0%)	27 (0.02%)
Veteran/Military	0 (0%)	0 (0%)
Income	0 (0%)	0 (0%)
Education	4 (0.42%)	887 (0.6%)
Perceived Physical Health	0 (0%)	2 (0%)
Perceived Mental Health	0 (0%)	2 (0%)
Family Size	0 (0%)	0 (0%)
Race/Ethnicity	0 (0%)	0 (0%)
Payer	0 (0%)	0 (0%)
MSA	0 (0%)	0 (0%)
Region	0 (0%)	0 (0%)

This study been given exemption status from UCLA Office for the Protection of Research Subjects.

3.3 Results

After restricting the sample to those who met the study criteria and who had positive person weights, there were 903 individuals in same-sex couples and 139,983 individuals in different-sex couples. After taking into account complex survey sample design and weights, only 0.79% (95% CI: 0.67%, 0.91%) of the sample were members within same-sex couples.

Characteristics of Sample

Individuals in same-sex couples were different from individuals in different-sex couples on several demographic factors (Table 3.3). In particular, individuals in same-sex couples were more often white, lived in households with only two people in the immediate family, were more highly educated, lived in the west, and lived in a metropolitan statistical area as compared to individuals in different-sex couples (all Rao-Scott Chi-Square p -value \leq 0.001). Individuals in same-sex couples reported similar frequencies of being in fair/poor mental health and in fair/poor physical health as compared to those in different-sex couples (29.3% vs 24.6%, $p=0.06$ and 37.4% and 36.0%, $p=0.57$, respectively). When comparing the referent only sample to the total sample (Table 3.4), these demographic factors and other covariates remained similar across tables for each population (individuals in same-sex couples, individuals in different-sex couples). For differences in utilization by sex, please see more detail in Table 3.5.

Mental Health Care Utilization By Sexual Minorities

Table 3.3 Predisposing demographics, predisposing social factors, enabling factors and need of U.S. adults in same-sex couples or married different-sex couples, age 18 to 64 years, MEPS (1996-2010): Weighted prevalence shown.

Characteristics, %	Same-Sex Couple (n=903)		Different-Sex Couple (n=139,983)		Rao-Scott Chi-Square Test
	%	(SE)	%	(SE)	<i>p-value</i>
Predisposing Demographics					
Age, yrs	42.65	(0.56)	43.81	(0.08)	<0.0001
Veteran	1.20	(0.48)	0.73	(0.04)	0.221
Predisposing Social Factors					
Race/Ethnicity					
Hispanic	10.74	(1.95)	12.14	(0.51)	0.001
White, non-Hispanic	57.03	(3.51)	44.77	(0.69)	
Other, non-Hispanic	32.23	(3.45)	43.09	(0.73)	
Family Size					
2 people	89.04	(2.06)	34.33	(0.33)	<0.0001
3 people	6.56	(1.51)	22.33	(0.26)	
4 or more people	4.40	(1.15)	43.35	(0.35)	
Education					
H.S. Diploma or less	21.39	(2.23)	44.00	(0.46)	<0.0001
Some college	23.50	(2.05)	23.63	(0.26)	
4 year degree or higher	55.10	(2.97)	32.38	(0.45)	
Lives in MSA	93.85	(1.41)	81.30	(0.76)	<0.0001
Census Region					
Northeast	17.18	(2.79)	17.98	(0.77)	0.001
Midwest	15.58	(2.72)	23.32	(0.84)	
South	32.98	(3.94)	36.04	(1.17)	
West	34.26	(4.04)	22.66	(1.09)	
Enabling Factors					
Payer					
Private	85.82	(1.73)	84.50	(0.35)	0.574
Public	3.47	(0.72)	4.43	(0.15)	
Uninsured	10.72	(1.63)	11.07	(0.26)	
Income					
<200% of poverty line	20.90	(1.86)	18.28	(0.36)	0.139
Receives Public Benefits	0.27	(0.17)	0.38	(0.03)	0.595
Need					
Perceived Mental Health					
Fair/Poor	29.27	(2.57)	24.62	(0.26)	0.056
Perceived Physical Health					
Fair/Poor	37.43	(2.52)	36.03	(0.31)	0.573

Mental Health Care Utilization By Sexual Minorities

Table 3.4 Predisposing demographics, predisposing social factors, enabling factors and need of U.S. adults in same-sex couples or married different-sex couples, age 18 to 64 years, **REFERENT ONLY**, MEPS (1996-2010): Weighted prevalence shown.

Characteristics, %	Same-Sex Couple (n=476)		Different-Sex Couple (n=71,868)		Rao-Scott Chi-Square Test
	%	(SE)	%	(SE)	<i>p-value</i>
Predisposing Demographics					
Age, yrs	42.79	(0.62)	43.62	(0.09)	<0.0001
Veteran	0.67	(0.33)	0.85	(0.06)	0.643
Predisposing Social Factors					
Race/Ethnicity					
Hispanic	10.53	(2.19)	11.99	(0.51)	0.001
White, non-Hispanic	57.90	(3.59)	44.99	(0.69)	
Other, non-Hispanic	31.57	(3.46)	43.03	(0.73)	
Family Size					
2 people	88.66	(2.21)	34.70	(0.33)	<0.0001
3 people	6.90	(1.73)	22.47	(0.26)	
4 or more people	4.43	(1.15)	42.83	(0.35)	
Education					
H.S. Diploma or less	18.57	(2.82)	42.82	(0.48)	<0.0001
Some college	22.03	(2.79)	23.37	(0.29)	
4 year degree or higher	59.40	(3.50)	33.81	(0.49)	
Lives in MSA	93.14	(1.56)	81.38	(0.76)	<0.0001
Census Region					
Northeast	16.44	(2.71)	17.86	(0.75)	0.001
Midwest	15.30	(2.61)	23.21	(0.83)	
South	33.65	(3.97)	36.28	(1.19)	
West	34.61	(4.16)	22.66	(1.09)	
Enabling Factors					
Payer					
Private	87.03	(2.14)	84.53	(0.35)	0.490
Public	3.59	(1.01)	4.60	(0.17)	
Uninsured	9.38	(1.85)	10.87	(0.26)	
Income					
<200% of poverty line	18.25	(2.26)	18.46	(0.36)	0.926
Receives Public Benefits	0.27	(0.27)	0.35	(0.03)	0.784
Need					
Perceived Mental Health					
Fair/Poor	30.95	(2.98)	23.99	(0.28)	0.011
Perceived Physical Health					
Fair/Poor	38.79	(3.46)	35.64	(0.33)	0.354

Mental Health Care Utilization By Sexual Minorities

Table 3.5 Predisposing demographics, predisposing social factors, enabling factors and need of U.S. adults in same-sex couples or married different-sex couples, age 18 to 64 years, by sex, MEPS (1996-2010): Weighted prevalence shown.

Characteristics, %	Same-Sex Couple Male		Different-Sex Couple Male		Rao-Scott Chi-Square Test	Same-Sex Couple Female		Different-Sex Couple Female		Rao-Scott Chi-Square Test
	(n=428) % (SE)	(n=67,886) % (SE)	(n=428) % (SE)	(n=67,886) % (SE)	<i>p-value</i>	(n=475) % (SE)	(n=72,097) % (SE)	(n=475) % (SE)	(n=72,097) % (SE)	<i>p-value</i>
Predisposing Demographics										
Age, yrs	43.26	(0.80)	44.54	(0.09)		41.96	(0.82)	43.10	(0.09)	
Veteran	0.55	(0.33)	1.29	(0.07)	0.145	1.93	(0.91)	0.20	(0.02)	<0.0001
Predisposing Social Factors										
Race/Ethnicity										
Hispanic	11.51	(2.73)	12.27	(0.52)		9.87	(2.51)	12.03	(0.51)	
White, non-Hispanic	59.86	(4.78)	44.54	(0.69)	0.003	53.84	(4.39)	44.99	(0.70)	0.119
Other, non-Hispanic	28.64	(4.72)	28.64	(4.72)		36.29	(4.37)	42.98	(0.74)	
Family Size										
2 people	94.75	(2.61)	33.40	(0.34)		82.59	(3.24)	35.21	(0.33)	
3 people	3.30	(1.79)	22.44	(0.27)	<0.0001	10.24	(2.54)	22.21	(0.25)	<0.0001
4 or more people	1.95	(1.23)	44.16	(0.37)		7.17	(1.96)	42.57	(0.34)	
Education										
H.S. Diploma or less	21.76	(3.25)	44.52	(0.50)	<0.0001	20.98	(3.13)	43.49	(0.46)	<0.0001
Some college	18.17	(2.56)	22.23	(0.30)		29.52	(3.35)	24.97	(0.32)	
4 year degree or higher	60.06	(4.20)	33.25	(0.51)		49.50	(4.32)	31.54	(0.45)	
Lives in MSA	95.02	(1.83)	81.38	(0.76)	<0.0001	92.54	(2.20)	81.22	(0.76)	0.001
Census Region										
Northeast	17.47	(3.83)	17.87	(0.78)		16.86	(3.92)	18.07	(0.76)	
Midwest	14.53	(3.58)	23.36	(0.85)	0.024	16.77	(4.10)	23.29	(0.84)	0.085
South	32.92	(5.34)	36.04	(1.19)		33.04	(4.94)	36.04	(1.16)	
West	35.08	(5.36)	22.73	(1.10)		33.33	(5.24)	22.59	(1.08)	
Enabling Factors										
Payer										
Private	84.51	(2.52)	84.59	(0.36)	0.974	87.29	(2.24)	84.41	(0.36)	0.202
Public	4.12	(1.15)	3.85	(0.15)		2.73	(0.73)	4.99	(0.17)	
Uninsured	11.37	(2.36)	11.56	(0.28)		9.98	(2.15)	10.60	(0.26)	
Income										
<200% of poverty line	19.83	(2.55)	18.36	(0.37)	0.357	22.10	(2.60)	18.20	(0.35)	0.108
Receives Public Benefits	0.28	(0.28)	0.00	(0.00)	<0.0001	0.25	(0.19)	0.74	(0.05)	0.135
Need										
Perceived Mental Health										
Fair/Poor	28.89	(3.64)	23.60	(0.28)	0.122	29.69	(3.52)	25.60	(0.29)	0.221
Perceived Physical Health										
Fair/Poor	32.59	(3.32)	35.44	(0.34)	0.405	42.90	(3.61)	36.60	(0.33)	0.071

Description of Mental Health Service Utilization

Individuals in same-sex couples were more likely than those in different-sex couples to report having utilized mental health services over the course of their survey year (Table 3.6). After taking into account survey design and weights, 24% of individuals in same-sex couples (vs. 11% in DS couples) reported receiving any of the mental health care services evaluated (psychotherapy or counseling in the past year, psychopharmaceutical prescription associated with a mental health ICD-9 code, or any office-based or outpatient medical encounter with a mental health ICD-9 code (Rao-Scott Chi-Square for all measures had a p-value <0.0001). These results were very similar when examining only the referent person within each couple (Table 3.7).

Pertaining to the use of mental health services by both sex and sexual minority status, both men in same-sex couples and women in same-sex couples were more likely to have used mental health services compared to individuals of the same sex in different-sex couples (Table 3.8). However, males in same-sex couples did not report statistically significant higher use of psychotherapy or counseling compared to males in different-sex couples.

If an individual reported any medical encounter associated with a specified mental health ICD-9 code, they were then eligible to be included in the adequate care analysis. Individuals in same-sex couples were also more likely to have met the definition of minimally adequate care compared to individuals in different-sex couples (19.3% vs 8.7%, Rao-Scott Chi-Square p-value=0.0008) (Table 3.6). This difference attenuated among males in same-sex couples as compared to males in different-sex couples (10.8% vs 8.2%, Rao-Scott Chi-Square p-value=0.64), but remained among women in same-sex couples compared to women in different-

sex couples (24.7% vs 9.0%, Rao-Scott Chi-Square p-value<0.0001) (Table 3.8).

Mental Health Care Utilization By Sexual Minoriti

Table 3.6 Mental health service utilization among U.S. adults, by sexual minority status, MEPS (1996-2010): Weighted prevalence shown.

	Same-Sex Couple		Different-Sex Couple		Rao-Scott Chi-Square p-value
	%	(SE)	%	(SE)	
Any mental health service utilization					
Received any mental health service* in the past year	23.99	(2.48)	10.72	(0.16)	<0.0001
Has at least one mental health ICD-9 code**	21.52	(2.41)	9.61	(0.15)	<0.0001
Received counseling or psychotherapy in past year	9.59	(1.59)	3.31	(0.09)	<0.0001
Received counseling or psychotherapy as the primary visit reason in the past year	10.26	(1.63)	2.99	(0.09)	<0.0001
Any psychopharmaceutical associated with specified ICD-9 codes**	19.23	(2.23)	8.66	(0.15)	<0.0001
Adequate Care among those with a MH ICD-9 code					
Met definition for adequate care	19.27	(4.25)	8.70	(0.45)	0.001

*A respondent was identified as having received mental health service if they reported having psychotherapy or counseling in the past year, had a psychopharmaceutical prescription associated with a mental health ICD-9 code, or any outpatient or office-based visit with a mental health ICD-9 code.

**For the purposes of this study, mental health ICD-9 codes were ICD-9: '291', '292', '295', '296', '297', '298', '300', '301', '303', '304', '305', '308', '311', 'V11', 'V40'.

Table 3.7 Mental health service utilization among U.S. adults, by sexual minority status, **REFERENT ONLY**, MEPS (1996-2010): Weighted prevalence shown.

	Same-Sex Couple (n=476)		Different-Sex Couple (n=71,868)		Rao-Scott Chi-Square p-value
	%	(SE)	%	(SE)	
Any mental health service utilization					
Received any mental health service* in the past year	22.06	(2.98)	10.33	(0.19)	<0.0001
Has at least one mental health ICD-9 code**	19.67	(2.96)	9.18	(0.18)	<0.0001
Received counseling or psychotherapy in past year	8.74	(1.91)	3.28	(0.10)	<0.0001
Received counseling or psychotherapy as the primary visit reason in the past year	9.79	(1.85)	2.96	(0.10)	<0.0001
Any psychopharmaceutical associated with specified ICD-9 codes**	16.55	(2.72)	8.28	(0.18)	<0.0001
Adequate Care among those with a MH ICD-9 code					
Met definition for adequate care	17.64	(4.63)	9.01	(0.57)	0.016

*A respondent was identified as having received mental health service if they reported having psychotherapy or counseling in the past year, had a psychopharmaceutical prescription associated with a mental health ICD-9 code, or any outpatient or office-based visit with a mental health ICD-9 code.

**For the purposes of this study, mental health ICD-9 codes were ICD-9: '291', '292', '295', '296', '297', '298', '300', '301', '303', '304', '305', '308', '311', 'V11', 'V40'.

Mental Health Care Utilization By Sexual Minorities

Table 3.8 Mental health service utilization among U.S. adults, by sexual minority status and sex, MEPS (1996-2010): Weighted prevalence shown.

	Same-Sex Couple Male		Different-Sex Couple Male		Rao-Scott Chi- Square p-value	Same-Sex Couple Female		Different-Sex Couple Female		Rao-Scott Chi- Square p-value
	%	(SE)	%	(SE)		%	(SE)	%	(SE)	
Any mental health service utilization	(n=428)		(n=67,886)			(n=475)		(n=72,097)		
Received any mental health service* in the past year	17.51	(2.97)	7.40	(0.16)	<0.0001	31.31	(3.58)	13.89	(0.23)	<0.0001
Has at least one mental health ICD-9 code**	15.79	(2.95)	6.42	(0.15)	<0.0001	28.00	(3.50)	12.66	(0.22)	<0.0001
Received counseling or psychotherapy in past year	5.54	(1.49)	2.42	(0.09)	0.002	14.16	(2.83)	4.17	(0.13)	<0.0001
Received counseling or psychotherapy as primary visit reason in past year	6.79	(1.77)	2.15	(0.08)	<0.0001	14.18	(2.80)	3.80	(0.12)	<0.0001
Any psychopharmaceutical associated with specified ICD-9 codes**	14.57	(2.77)	5.72	(0.14)	<0.0001	24.50	(3.37)	11.48	(0.21)	<0.0001
Adequate Care among those with a MH ICD-9 code										
Met definition for adequate care	10.80	(6.30)	8.17	(0.68)	0.640	24.65	(5.60)	8.96	(0.48)	<0.0001

*A respondent was identified as having received mental health service if they reported having psychotherapy or counseling in the past year, had a psychopharmaceutical prescription associated with a mental health ICD-9 code, or any outpatient or office-based visit with a mental health ICD-9 code.

**For the purposes of this study, mental health ICD-9 codes were ICD-9: '291', '292', '295', '296', '297', '298', '300', '301', '303', '304', '305', '308', '311', 'V11', 'V40'.

Individuals in same-sex couples were not only more likely to seek more mental health care services than individuals in different-sex couples, but they also reported using these services more often than individuals in different sex couples (Table 3.9). Individuals in same-sex couples were more likely to have mental health ICD-9 codes associated with some medical event than individuals in different-sex couples. In particular, sexual minorities were more likely to have the following disorders associated with a medical encounter: schizophrenia ($p < 0.003$), episodic mood disorders ($p < 0.0001$), and alcohol dependence syndrome ($p < 0.0001$). However, many of the ICD-9 codes used in this study could not be examined individually because there were often only 1 to 2 respondents listing a specific mental health related ICD-9 code. The most common mental health ICD-9 codes tied to either medical encounters (out-patient and office-based visits) or prescriptions in this study population were '296' (episodic mood disorders), '300' (Anxiety, dissociative, and somatoform disorders), and '311' (depressive disorder not classified elsewhere). The table for referent-person only is not shown due to small numbers.

Mental Health Care Utilization By Sexual Minorities

Table 3.9 Detailed mental health service utilization among U.S. adults, by sexual minority status, MEPS (1996-2010): Weighted prevalence shown.

	Individuals in Same-Sex Couple Total		Individuals in Different-Sex Couple Total		Rao-Scott Chi`
	%	(SE)	%	(SE)	p-value
Number of Visits where Respondent received Counseling or Psychotherapy					
0 visits	90.41	(1.60)	96.69	(0.09)	
1 visit	1.92	(0.60)	0.85	(0.03)	
2-4 visits	1.86	(0.50)	1.03	(0.04)	p<0.0001
5-7 visits	0.80	(0.38)	0.45	(0.03)	
8 or more visits	5.01	(1.17)	0.99	(0.05)	
Number of Visits with Counseling or Psychotherapy as the Primary Reason for the Visit					
0 visits	89.74	(1.64)	97.01	(0.09)	
1 visit	2.60	(0.72)	0.74	(0.03)	
2-4 visits	1.81	(0.45)	0.87	(0.04)	p<0.0001
5-7 visits	0.50	(0.22)	0.43	(0.03)	
8 or more visits	5.35	(1.20)	0.94	(0.51)	
Number of Prescriptions					
0 MH prescriptions	80.76	(2.23)	91.34	(0.15)	
1 MH prescriptions	1.61	(0.50)	1.33	(0.04)	
2,3 MH prescriptions	3.27	(0.72)	1.78	(0.05)	p<0.0001
4-11 prescriptions	8.52	(1.36)	3.73	(0.09)	
12 or more prescriptions in 1 year	5.84	(1.15)	1.83	(0.57)	
ICD-9 Codes (individual may have multiple codes)					
291 Alcohol induced mental disorders	N.A.	N.A.	N.A.	N.A.	N.A.
292 Drug induced mental disorders	N.A.	N.A.	0.00	(0.00)	N.A.
295 Schizophrenic disorders	0.09	(0.09)	0.01	(0.00)	0.0029
296 Episodic mood disorders	0.74	(0.34)	0.12	(0.01)	p<.0001
297 Delusional disorders	N.A.	N.A.	0.00	(0.00)	N.A.
298 Other nonorganic disorders	N.A.	N.A.	0.00	(0.00)	N.A.
300 Anxiety, dissociative, and somatoform disorders	1.55	(0.49)	1.15	(0.04)	0.3355
301 Personality disorders	N.A.	N.A.	0.01	(0.00)	N.A.
303 Alcohol dependence syndrome	0.17	(0.13)	0.01	(0.00)	p<.0001
304 Drug Dependence	N.A.	N.A.	0.01	(0.00)	N.A.
305 Nondependent abuse of drugs	0.15	(0.11)	0.11	(0.01)	0.618
308 Acute reaction to stress	0.68	(0.36)	0.42	(0.02)	0.356
311 Depressive disorder not elsewhere classified	2.34	(0.70)	1.37	(0.04)	0.072
V11 Personal history of mental disorder	N.A.	N.A.	N.A.	N.A.	N.A.
V40 Mental and behavioral problems	0.08	(0.08)	0.02	(0.00)	0.085

Note: Not Applicable (N.A.) indicate that there were 0 observations in those cells so an estimate could not be calculated, nor could Rao-Scott Chi-Square tests be computed.

Propensity Score Calculation

Propensity scores were calculated using logistic regression procedures while incorporating explanatory variables from Andersen's model on health service utilization for vulnerable populations and additional factors that were used in creation of survey weights. As shown in Table 3.3, individuals in same-sex couples were different on several of these variables from individuals in different-sex couples. Because the model for propensity score creation had been specified from a theoretical model (as opposed to statistical testing), I proceeded with the propensity score analyses despite the clear imbalance that remained between the two groups (individuals in same-sex couples, individuals in different-sex couples). Figure 3.2 contains two box plots to summarize the lack of propensity score balance. With this lack of balance, several propensity score methodology papers suggest not going forward with propensity score analyses [212, 214, 216]. In particular, any propensity score matching or stratification with imbalanced scores will analyze subsamples that are not representative of the study population [203].

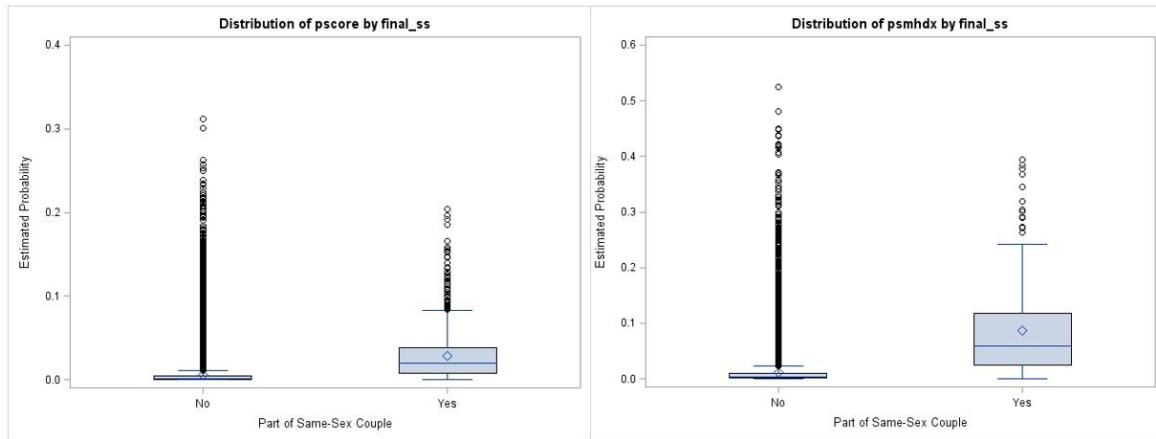


Figure 3.2 Results of logistic model predicting that individuals were in same-sex couples using sex, race/ethnicity, age, veteran status, % <200% below federal poverty line, insurance status, receipt of public assistance, perceived mental health status, perceived physical health status, family size, living in a metropolitan statistical area, region of the country, and MEPS survey panel (MEPS, 1996-2010).

Comparison of Logistic Regression & Propensity Score Analyses

The main analyses for this study required examining how different statistical techniques resulted in different estimates of the odds ratio. The first analyses were logistic regressions that accounted for the complex sampling design and weights as well as adjusting for the covariates used in the creation of the propensity score on the four main outcomes of interest (Table 3.10 total sample, Table 3.11 referent-only sample). Despite the rare exposure (being an individual in a same-sex couple) and rare outcome (received any counseling, any prescription associated with a mental health ICD-9 code, any visit associated with an ICD-9 code, met definition of adequate care), these four models successfully converged in SAS v9.4 using PROC SURVEYLOGISTIC even with all the covariates included in the model. All three outcomes related to mental health service utilization indicated that individuals in same-sex couples have approximately two times the odds of any of these outcomes compared to individuals in different-sex couples even after

adjusting for factors in Andersen's model. When examining differences in minimally adequate care, individuals in same-sex couples were not more or less likely to receive adequate care than individuals in different-sex couples (OR: 1.51 95% CI: 0.87, 2.64).

When the analyses were expanded to examine the impact of the propensity score on investigating these outcomes, similar results were found for most outcomes across most statistical techniques. These analyses did not account for the complex sampling design, so although they can be interpreted as average treatment effects within the study population, the results are not representative of the U.S. cohabitating or married population [203]. As mentioned earlier, due to the overwhelming differences at baseline, these propensity scores were

Mental Health Care Utilization By Sexual Minorities

Table 3.10 Comparison of logistic regression and four propensity score methods on estimating mental health service utilization by sexual minority status, MEPS (1996-2010).

	Logistic Regression Using Survey Weights		Propensity Score as covariate	Inverse Probability of Treatment Weighted	Propensity Score Stratification	Propensity Score Matched Analysis
	Unadjusted	Adjusted*	No survey weights	No survey weights	No survey weights	No survey weights
<i>Mental Health Service Utilization</i>	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Any Counseling	3.1 (2.14, 4.47)	2.16 (1.52, 3.07)	2.44 (1.95, 3.05)	2.62 (2.49, 2.76)	2.67 (2.15, 3.32)	2.67^ (1.80, 3.96)
Any Mental Health Prescription	2.51 (1.91, 3.31)	2.29 (1.77, 2.96)	2.19 (1.85, 2.59)	1.92 (1.85, 1.99)	2.20 (1.87, 2.60)	2.09^ (1.60, 2.74)
Any Visit Associated with an ICD-9 code	2.63 (2.02, 3.43)	2.32 (1.82, 2.96)	2.23 (1.91, 2.61)	3.00 (2.91, 3.10)	2.30 (1.97, 2.68)	2.05^ (1.06, 2.62)
Met definition for adequate care	2.16 (1.15, 4.08)	1.51 (0.87, 2.64)	1.72 (1.18, 2.52)	0.91 (0.80, 1.04)	4.16 (3.07, 5.63)	1.65^^ (0.94, 2.92)

*adjusted for same covariates used in propensity score creation: sex, race/ethnicity, age, veteran status, % <200% below federal poverty line, insurance status, receipt of public assistance, perceived mental health status, perceived physical health status, family size, living in a metropolitan statistical area, region of the country, and MEPS survey panel.

**N.A.: Not applicable due to lack of variance calculations. Variances could not be calculated due to lack of entries within stratum.

^Final matched sample included 903 individuals in SS couples and 853 individuals in DS couples. 25 individuals in DS couples were sampled twice for analysis.

^^Final matched sample included 202 individuals in SS couples and 174 individuals in DS couples. 14 individuals in DS couples were sampled twice for analysis.

Mental Health Care Utilization By Sexual Minorities

Table 3.11 Comparison of logistic regression and four propensity score methods on estimating mental health service utilization by sexual minority status REFERENTS ONLY, MEPS (1996-2010).

	Logistic Regression Using Survey Weights		Propensity Score as covariate	Inverse Probability of Treatment Weighted	Propensity Score Stratification	Propensity Score Matched Analysis
	Unadjusted	Adjusted*	No survey weights	No survey weights	No survey weights	No survey weights
<i>Mental Health Service Utilization</i>	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Any Counseling	2.82 (1.76, 4.52)	1.74 (1.10, 2.76)	1.97 (1.42, 2.73)	3.04 (2.84, 3.27)	2.23 (1.63, 3.06)	1.4 [^] (0.87, 2.24)
Any Mental Health Prescription	2.2 (1.51, 3.21)	1.65 (1.15, 2.38)	1.67 (1.31, 2.14)	1.18 (1.12, 1.25)	1.76 (1.39, 2.24)	1.49 [^] (1.03, 2.13)
Any Visit Associated with an ICD-9 code	2.46 (1.76, 3.44)	1.85 (1.34, 2.56)	1.86 (1.49, 2.33)	2.75 (2.64, 2.87)	1.98 (1.59, 2.45)	1.79 ^{^^} (1.28, 2.51)
Met definition for adequate care	2.16 (1.15, 4.08)	1.16 (0.60, 2.25)	1.26 (0.70, 2.28)	0.76 (0.63, 0.91)	3.04 (1.92, 4.84)	1.67 ^{^^} (.69, 4.00)

*adjusted for same covariates used in propensity score creation: sex, race/ethnicity, age, veteran status, % <200% below federal poverty line, insurance status, receipt of public assistance, perceived mental health status, perceived physical health status, family size, living in a metropolitan statistical area, region of the country, and MEPS survey panel.

**N.A.: Not applicable due to lack of variance calculations. Variances could not be calculated due to lack of entries within stratum.

[^]Final matched sample included 476 individuals in SS couples and 460 individuals in DS couples. 8 individuals in DS couples were sampled twice for analysis.

^{^^}Final matched sample included 96 individuals in SS couples and 84 individuals in DS couples. 4 individuals in DS couples were sampled multiple times (2 sampled twice, 1 sample 3 times, 1 sample 5 times).

not balanced. Because they were not balanced after propensity score creation, these propensity score methods are not the most appropriate ways to examine the relationship of between sexual minority status and mental health service utilization in this population. Due to the imbalance in propensity scores, the most appropriate propensity scores to interpret are the methods that use propensity score covariate adjustment and inverse probability weighted propensity scores[217]. Although several propensity score matching algorithms were attempted (including 1:2, 1:5 with replacement), the results shown in Tables 3.10 and 3.11 are the result of using the PSMATCH2 package in STATA with one to one nearest neighbor matching with replacement. Trying to match more than 1:1 resulted in loss of unique individuals from the sample who were eligible for inclusion in the analysis. For propensity score stratification, I used five quintiles as recommend in the literature [212, 213].

Across the four propensity scores methods (covariate, IPTW, stratification, & matching), there was no one method that consistently produced more conservative results. The inverse probability of treatment weighted (IPTW) method produced the tightest confidence intervals. As mentioned previously, all propensity score methods produced odds ratios that indicated that individuals in same-sex couples had 2.44 (95% CI: 2.0, 3.0) to 2.67 (95% CI: 1.8, 3.96) odds of receiving any counseling or psychotherapy in the past year compared to individuals in different-sex couples, 1.92 (95% CI: 1.9, 2.0) to 2.20 (95% CI: 1.9, 2.6) odds of having any prescription associated with a mental health ICD-9 code, and 2.05 (95% CI: 1.1, 2.6) to 3.00 (95% CI: 2.9, 3.1) odds of having any visit associated with an ICD-9 code. Only one measure, receipt of adequate care, had very different results across propensity score methods. The IPTW result indicated that individuals in same-sex couples had 0.91 (95% CI: 0.8, 1.04) odds of receiving adequate care compared to individuals in different-sex couples. The propensity score matching

result for adequate care had a point estimate above 1, but crossed the null (OR: 1.65, 95% CI: 0.94, 2.92). Finally, both propensity score stratification and the propensity score as a covariate suggested that individuals in same-sex couples have higher odds of receiving adequate care compared to individuals in different-sex couples.

In this sample, propensity score stratification was particularly problematic because the propensity scores across the two groups were imbalanced. The first four strata accounted for 80.4% of the individuals in different-sex couples, but only 22.2% of the individuals in same-sex couples.

In the case of the referent only sample, the same general trends of higher odds of utilization among individuals in same-sex couples than individuals in different-sex couples hold for almost all the measures. The main exception to this is the outcome for adequate care where again the results varied greatly across methods (Table 3.11).

3.4 Discussion

Sexual minorities appear to utilize mental health services at higher rates than heterosexuals in the current study. The same was true in my initial study. These findings support the limited research that has been done to date [22-25]. The current results, drawn from a representative nationwide sample of the non-institutionalized U.S. population, allowed a more in-depth investigation into how mental health care utilization differs by sexual minority status. Indeed, the MEPS dataset represents one of the most-respected health services data sets available to conduct these analyses. The current study expands our level of knowledge beyond the first study in three substantial ways: (1) the current study frames sexual minority mental health care utilization using a well-respected model for health care access and utilization, Andersen's Behavioral Model for Vulnerable populations, (2) prescriptions are affiliated with an ICD-9 code

in the MEPS which allows for analysis by indication and not just by drug type and (3) the MEPS comprehensive measurement of services utilization permits investigation of patterns of minimally adequate mental health care thus allowing the quantification of service use (i.e., number of visits and number of prescriptions filled).

The analyses for the four major outcomes in this study all examined mental health care utilization in the context of Andersen's Behavioral Model for Vulnerable populations[160]. Using this framework enabled these analyses to isolate the impact of sexual minority status on mental health care utilization while accounting for covariates that could impede or enable access to mental health care. The Andersen model is a well-respected framework for examining health care utilization in the health services literature [161-164].

Because the MEPS uses ICD-9 coding for the prescriptions, the current study also investigated only prescriptions that have an associated mental health ICD-9 code. In study 1, sexual minorities reported taking a psychopharmaceutical prescription, classified by the prescription's Multum Therapeutic Classification, in the past 30 days more often than did exclusive heterosexuals (20.5% vs 12.8%, Rao-Scott Chi-Square $p < 0.0001$). Subgroup analyses revealed lesbian and bisexual women had 2.5 times the odds of having taken a psychopharmaceutical prescription in the past 30 days than heterosexual women after adjusting for potential confounders. In the current study, individuals in same-sex couples also had higher odds of obtaining at least one prescription associated with a mental health ICD-9 code than individuals in different-sex couples (aOR from logistic regression with weights: 1.7; 95% CI: 1.2, 2.4). Although the current study looked at this within the time frame of a year (as opposed to past 30 days) and only captured individuals in same-sex couples (as opposed to identifying sexual minorities by both identity and behavior), the consistency in the results across these two

studies indicates that sexual minorities are likely receiving psychopharmaceutical prescriptions more often than their heterosexual counterparts. In addition, the present study indicates that this excess use is associated with treatment of mental health diagnoses.

The current study also expands on Study #1 by allowing a more in-depth examination of mental health service utilization. Although Study #1 indicated that sexual minorities had higher odds of receiving any type of mental health service compared to exclusive heterosexuals, the NHANES does not capture information on frequency of utilization. If sexual minorities are seeking mental health services because they are in greater need of these services, then understanding the extent to which sexual minorities are receiving adequate care should capture if they are receiving the minimal evidence-based medical treatment for their conditions. The current paper supports prior work indicating that many people do not receive adequate mental health care [59, 60, 170]. Only 8.7% of individuals in different-sex couples and 19.3% of individuals in same-sex couples with at least one mental health ICD-9 code had mental health-focused treatment that met the definition of adequate care. After adjusting for covariates found in Andersen's Behavioral Model for Vulnerable Populations, individuals in same-sex couples were not found to have increased odds of evidencing adequate care patterns than individuals in different-sex couples in three out of the five models examined.

Although this study found that individuals in same-sex couples were not more or less likely to have met the definition for adequate care compared to individuals in different-sex couples, this definition fails to differentiate reasons for not receiving adequate health care. For example, it cannot be ascertained whether the lack of adequate care is due to problems in access to care, discontinuance of treatment due to a medical provider's orders, or early termination of care. Treatment drop-out for mental health care is quite common (estimated in one study at 22%

with 70% of these drop-outs occurring after the first or second visit) [176]. If, as seen in paper 1, sexual minorities are accessing mental health care even with no indication of need, then adequate care may not be an appropriate measure of mental health care utilization. Nevertheless, this definition allows a first look into sexual orientation differences in adequate care rates.

In addition to strengthening several of Study #1's findings, I employed multiple statistical analyses in the current paper to examine if the findings remained consistent across analyses. For this paper, I employed logistic regressions using survey weights and examined four different propensity score techniques to investigate the differences in estimation results across methods. As presented earlier, these techniques did not result in divergent findings except for results pertaining to the adequate care analyses in which the point estimates fell below the null for the IPTW analysis. Out of the five analytic techniques, the logistic regression with survey weights is likely to be the most appropriate model for two reasons. First, this was the only analysis that employed survey design variables and weights, so any results should be representative of individuals in same-sex or married different-sex couples within the U.S. non-institutionalized civilian population. Second, because the propensity scores were greatly imbalanced across groups, propensity score methods are not ideal for these analyses. In particular, the imbalance of propensity scores led to several statistical problems when it came to using propensity score matching.

Although this study expanded upon Study #1 and used multiple analytic methods to examine the results, there were several important limitations to be considered in contextualizing my findings. The main limitation to this study is in the assessment of sexual orientation status. Because neither MEPS, nor the NHIS ascertained sexual identity or sexual behavior, I was only able to assign sexual minority status by examining the sex of the person's partner. This means

that bisexuals and homosexually-experienced heterosexuals may be classified among those in different-sex couples within the study. Also because this is the only way to ascertain sexual minority status within this data set, I am only able to generalize my results to those who are in same-sex or married different-sex couples and not to the entire population. In a California-based survey, 37%-46% of gay men and 51%-62% of lesbians were partnered as compared to 62% of the heterosexual population[218]. Individuals in same-sex couples were also more likely to be older, white, and more highly educated than non-partnered lesbians and gay men[218]. Although these results may not be generalizable to all sexual minorities in the U.S. because I am likely missing some sexual minority subgroups (e.g., bisexuals), the finding of any mental health care utilization in the past year is consistent with both paper 1 and the prior literature.

In addition to limitations in the identification of the main exposure variable, there are additional concerns with several of the covariates used (or that were absent from) Andersen's model. For both perceived mental health status and perceived physical health status, I examined the earliest response provided. For the spouse or partner, the response to perceived health statuses could come from either the referent (proxy response) or the spouse themselves. This may have introduced bias into the results and the direction of the bias could go either towards the null or away from the null. I believe that allowing the earliest response introduces less bias into the study than either imputing an initial response or requiring that all responses come from the respondent and not a proxy. A proxy response may be related to the spouse's current mental health condition (those who are in worse mental health may not be available to answer). By uniformly taking the first time point with available data, I hoped to avoid introducing this additional bias. There were also several variables that were found in Andersen's model, but were not available in the MEPS consistently across survey cycles. Notably, the MEPS does not

consistently ascertain immigrant status or contain information on country of birth. Nativity is a known correlate of sexual orientation [4].

Another limitation is that use of mental health services has significantly changed over the twelve year period of this study. Time trends indicate that comfort with seeking mental health care is increasing, so the results may be biased if there are different proportions of same-sex or different-sex couples over the twelve year period of the proposed study [219]. There has also been an increase in reports of same-sex behavior over this time period [220]. However, because panel number was accounted for in the logistic regression and propensity score creation, bias toward the null is the likely effect of these concerns. Finally, there may be unknown confounders biasing the results. Although propensity score methods, if implemented correctly, should yield a balance of known confounders between sexual minorities and heterosexuals, the unknown confounders still have not been accounted for in any of these statistical models.

Despite these limitations, this study has several strengths including a focus on mental health services regardless of a given DSM diagnosis. This is a strength because several studies and reports indicate that there are large discrepancies between diagnosis and actual need for treatment[109, 221]. Furthermore, the MEPS data set is a highly regarded resource for examining health services utilization in the United States due to its population-based sampling and its thoroughness in both data collection and editing. This study contained a detailed examination of mental health services utilization in a vulnerable population, which from prior studies, appears to heavily utilize mental health services. Results from this study could have an important impact on understanding mental health service utilization for both the mental health services field and the sexual minority health field.

3.5 Conclusion

Currently there is a shortage of national data sets that contain data on both sexual identity and comprehensive health care utilization. Despite this limitation in the MEPS data arising from the failure to measure sexual orientation identity, by identifying probable sexual minorities through individuals self-reporting that they had a same-sex spouse or partner, I used the MEPS data to demonstrate that individuals in same-sex couples utilize mental health services (both counseling and psychopharmaceutical prescriptions) more often than individuals in different-sex couples. There is also some indication that when individuals in same-sex couples access mental health services they may be using more of these services than individuals in different-sex couples who utilize any mental health service. Understanding how different populations are accessing mental health services is essential in ensuring that there is adequate mental health care coverage both in terms of service providers as well as payer coverage. With the increase in integrated care patterns, non-mental health specialists are currently the first line of treatment for mental health needs. In that regard, there needs to be an increased emphasis on training providers to care for the needs of LGB individuals.

Chapter 4: The Cost of Mental Health Care Services for Individuals in Same-Sex Couples (Study #3)

4.1 Introduction

The overall aim of this final study was to estimate the costs associated with the increased use of mental health care services among sexual minorities. Recently published work indicates that sexual minorities are using mental health services at a higher rate than heterosexuals [10-13]. Using detailed expenditure information from the Medical Expenditure Panel Surveys, this study estimates the increased cost of this utilization for individuals in same-sex couples as compared to individuals in different-sex couples. This study also examined both out-of-pocket mental health care costs and total mental health care costs.

In 2007, total costs for mental health and substance abuse related expenses were estimated at \$36.5 billion[222]. As of 2005, mental health conditions accounted for the most spending of any set of health conditions [223]. Grabe et al. found that high psychiatric distress predicted increased overall health care utilization [224]. In particular, patients with depression end up accruing medical costs similar to or higher than those with other chronic medical disorders [225].

In addition to being an expensive component of the U.S. healthcare system in general, mental health care visits and non-generic psychopharmaceutical medications are more likely to have higher copayments than many other medical expenses[171]. Research has shown that individuals with higher copayments are more likely to forgo initial treatment visits or to not obtain prescribed medication[226, 227]. Because mental health services require higher copayments on average, examining out-of-pocket costs are essential to understanding use of mental health services.

Cost analysis is an important method for informing our understanding of the distribution of limited healthcare resources. Results from cost analysis research have been used to inform reimbursement amounts for Medicare/Medicaid, to influence insurance policy coverage for treatments, and to shape public policy [228]. Until 2010, U.S. healthcare costs had been increasing at a rate faster than the gross domestic product (GDP) for over a decade [229, 230], . In particular, mental healthcare has been an important part of this increase, rising at a rate higher than inflation [231]. Although mental healthcare costs have been growing since the early seventies, there is a common perception that much of mental healthcare spending is not necessary [232]. When the IOM recommended that AHRQ use the MEPS to identify priority conditions by frequency of the condition, health burden, and resource use, mental disorder-related expenditures merited mental disorders a place among these priority conditions [233].

Due to the Patient Protection and Affordable Care Act (PPACA) and the Mental Health Parity Act, previously uninsured people with mental health and substance abuse (MHSA) conditions are gaining unprecedented access to MHSA services. Estimating the costs of these services is essential to understanding future costs[228]. Given that sexual minorities, particularly women, have historically had less access to health insurance, they may be more likely to gain coverage through these policy changes[82]. But to date, little research has been done on patterns of mental healthcare utilization and associated expenditures among sexual minorities.

The first two studies in this dissertation as well as some previously published literature have shown that sexual minorities are more likely to use mental health services compared to heterosexuals[10, 11]. Because inpatient and emergency department utilization are large healthcare cost drivers for individuals [234, 235], this study examines not only office-based and outpatient visits, but also emergency department visits and hospitalizations associated with

mental health ICD-9 codes (Appendix 6.2). In addition, because psychopharmaceutical prescriptions have grown steadily over the past decade as a first line treatment intervention [158, 228, 236], this study also highlights prescription drug use. Any prescription associated with a mental health ICD-9 code is also an indication of a mental health-related service and expenditure.

Hypothesis 1: Individuals in same-sex couples are more likely to have a medical encounter or pharmaceutical prescription associated with a mental health ICD-9 code than individuals in different-sex couples within the twelve-month survey period.

Although the existing literature provides evidence of higher use of mental health services among sexual minorities compared to heterosexuals, no research has been conducted to date on the cost of this increased usage of services. Using data from the MIDUS, Cochran et al. found that sexual minorities are more likely to use multiple treatment methods for when accessing MHSA services [17] suggesting that sexual minorities may also be accruing more out-of-pocket expenses as copayments for mental health-related treatments are often higher than co-payments for other medical care [171]. The purpose of this final study is to compare both total and out-of-pocket costs of mental health services among individuals in same-sex couples with individuals in different-sex couples. This is accomplished using information available in the 1996-2010 MEPS public use files. The mental health care expenditures (both overall and out-of-pocket) have been collected in detail by the MEPS. Both in-patient psychiatric care and day-care services are, in

particular, extremely costly[171, 237]. My second and third hypotheses are directed at out-of-pocket mental health care expenditures and total mental health care expenditures, respectively. These reflect the expectation that there is greater intensity of services use among sexual minorities.

Hypothesis 2: Individuals in same-sex couples are more likely to have greater total out-of-pocket expenditures associated with mental health ICD-9 codes than individuals in different-sex couples within the twelve-month survey period.

Hypothesis 3: Individuals in same-sex couples are more likely to have greater total expenditures related to mental health ICD-9 codes than individuals in different-sex couples within the twelve-month survey period.

This study estimates the difference in mental health care expenditures for individuals in same-sex couples within the United States compared to individuals in different-sex couples based on their sexual orientation status. Prior research suggests that sexual minorities use mental health services at higher rates than heterosexuals[10, 11], but the economic burden of this increased service utilization remains unknown. This study investigates whether individuals in same-sex couples, on average, spend more on mental health care than individuals in different-sex couples. It does so by examining both out-of-pocket (OOP) mental health care expenditures as well as overall mental health care expenditures.

4.2 Methods

Data Source

To describe the costs associated with increased mental health utilization, including psychopharmaceutical prescriptions, among individuals in same-sex couples compared to individuals in different-sex couples, this study used publicly available data from the MEPS Household Component (MEPS-HC) from 1996-2010. Details on survey administration (including sampling frame) and data collection can be found in the Study #2 methods section.

MEPS-HC Data Files

Specifically this study combined information from the following data files: full year public use files (PUFs), office-based medical provider visits PUFs, outpatient visits PUFs, emergency room visits PUFs, hospital inpatient stays PUFs, prescribed medicines PUFs, and the 1996-2010 Pooled Estimation File. The full year, office-based medical provider, outpatient visits, prescribed medicine, and 1996-2010 Pooled Estimation Files have been described in Study #2. The current study also uses the hospital inpatient stays and emergency room visit PUF files. The emergency room file visit has a visit category indicator in which a respondent could indicate if the primary purpose of the visit was psychotherapy/mental health counseling. There is no such indicator for the inpatient hospitalization file. For this final study, a medical encounter was classified as a mental health medical encounter if there was an associated MH ICD-9 code. This was done for two reasons. First, ICD-9 codes were attached to every medical event or prescription in the MEPS, but other indicators such as visit category or an indicator for receiving counseling were not available across all files used in this study. Second, by restricting classification only to MH ICD-9 codes as an indicator of mental health services, this study

should produce a more conservative estimate of MH services utilization than incorporating the other indicators used in the previous study.

Expenditures

Within the MEPS, expenditures refer to the amount paid for health care services. The total expenditures for an individual medical event (office-based visit, hospital inpatient stay, ER visit, outpatient visit) or filled prescription is the sum of payments for care received for that medical event or that filled prescription. This total expenditure is comprised of payments made out-of-pocket, by private insurance, by Medicare, or by any other source of payment.

Expenditure data in all event files have been rounded the nearest penny, whereas expenditure data in the full year file (Total Medical Expenditures and Total Prescription Expenditures) have been rounded to the nearest dollar.

As for the expenditure variables, the MEPS uses both the medical provider component (MPC) and pharmaceutical component (PC) to edit and impute all expenditure data before being released in a PUF. For non-prescription drug expenditures, the MEPS used logical edits to resolve any inconsistencies with the MEPS-HC and MPC reported data. These edits address outliers as well as misattributed payments such as reimbursed amounts that were initially reported as out-of-pocket.

MEPS also uses a weighted sequential hot-deck procedure to impute any missing individual expenditures as well as for the total charge variable. These are performed separately for the different categories of medical provider care. In addition, MEPS provides imputed household-reported insurance payments. These are imputed because respondents are often unaware that their insurer paid a discounted amount to their provider. For the final editing and imputing, if an MPC event had complete data, MEPS uses the data from the MPC-reported event

and discards data obtained from the HC. If both the MPC and HC have incomplete data on an event, final values are derived by the imputation process described above.

In addition to the above edits and imputations, the MEPS conducts a separate imputation procedure for expenditures that were capitated (paid on a per-month per-person basis). This imputation procedure was performed to allow expenditure completion for events when the respondent was in a managed care plan. These capitated events were then imputed to each event.

For prescription cost estimates, MEPS used information from both the MEPS-HC and the PC prescription data to impute prescription drug costs. However, beginning with the 2007 dataset, new rules were used to identify price outliers for prescription medications. The new thresholds vary by patent status; this has resulted in an overall improvement in data quality. Of consequence, there is more variation in estimates for generic prescription prices, lower mean prices for generics, higher mean prices for brand name drugs, greater differences between generic and brand name drugs, and a lower out-of-pocket cost for families[238].

As multiple years of data were combined for the current study, all expenditures used in the analyses were adjusted so they are comparable across survey years. Because this pooling is specific to health care expenses, the MEPS recommends use of PHCE over other price indices because it is specific to health care services. Health care prices change at a rate faster than overall price inflation; the PCHE accounts for these health care price changes when pooling datasets across panels[239]. Prior to analyzing the data, I inflated all the expenditure data as indicated by the PCHE to 2010 dollars, the most recent year included in the survey.

Study Sample

As with Study #2, the data sample includes all individuals in couples surveyed during the MEPS where at least one partner/spouse is considered the reference person. Also as in Study #2,

I restricted the analysis to individuals who were 18-64 years old at the end of the first survey year.

Study Variables

Exposure

The main exposure of interest in this study is sexual minority status. As in study 2, this was operationalized by an individual in a household reporting that he or she resided in a household with someone whom the respondent indicated is a husband, wife, or partner. Individuals were included in the study sample if they were married to someone of a different-sex (DS) or if they were either married or living in a partner-like relationship with someone of the same-sex (SS). More detail on how these individuals were identified can be found in the methods description for study 2. There were a total of 140,886 individuals eligible for the study. As in study 2, all analyses were completed twice. Once with both individuals of the couple and a second time with only the referent persons included.

Outcomes

This study investigates mental health care-related expenditures, including costs associated with inpatient hospitalization stays and emergency department visits. As previously mentioned, a mental health care related event was considered to have occurred for any medical encounter where any of up to the three ICD-9 codes associated with the visit, inpatient stay, or prescription were a mental health ICD-9 code listed in the Appendix 6.2.

Mental Health Care Event

All individuals were assigned a yes/no value for this outcome, any mental health care event. Although mental health care events in study #2 are restricted in the analysis to outpatient visits, office-based visits, year-round, and prescribed medicine PUFs, this current study expands the analysis to include inpatient stays and emergency room visits PUFs.

Any individual in the study with at least one of the following events while in-scope was assigned a positive history of having a mental health care event: an ER visit with an ICD-9 code from the Appendix 6.2, an inpatient hospital stay with an ICD-9 code from the Appendix 6.2, an office-based visit with an ICD-9 code from the Appendix 6.2, an outpatient visit with an ICD-9 code from the Appendix 6.2, or receiving any psychopharmaceutical prescription associated with a ICD-9 code listed in the Appendix 6.2. The remaining individuals without evidence of a mental health care event were assigned a value of “no” to any mental health care event.

Mental Health Care Expenditures

Among individuals with a positive mental health care event, their mental health expenditures were summed to form two variables: out-of-pocket mental health care expenditures and total mental health care expenditures.

Out-of-pocket mental health care expenditures

Out-of-pocket mental health care expenditures were defined as any payments directly made by the respondent’s household in relation to a mental health care event while he or she was in-scope of the study. As mentioned previously, insurance systems often have higher copays for both mental health patient visits and psychopharmaceutical prescriptions [171]. Because these higher copays have been shown to influence treatment utilization[226, 227], understanding the amount of out-of-pocket expenses incurred during mental health treatment is an important aspect of understanding mental health treatment utilization.

Total mental health care expenditures

Total mental health care expenditures were estimated by the summation of expenditures from any inpatient stays, emergency department visits, outpatient visits, office-based visits, and prescription drugs for the MH ICD-9 codes found in Appendix 6.2.

Table 4.1 MEPS Eligible Sample by Year, MEPS 1996-2010, unweighted.

Persons	Total	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total Sample for Study 3*	140,886	7,288	10,578	7,259	7,916	7,993	10,671	11,986	9,854	10,055	10,011	9,917	9,168	9,346	10,099	8,745
Total DS Married Individuals**																
Men	67,886	3,538	5,114	3,518	3,842	3,874	5,144	5,786	4,739	4,855	4,812	4,751	4,407	4,481	4,841	4,184
Women	72,097	3,717	5,428	3,722	4,047	4,074	5,468	6,133	5,058	5,149	5,127	5,082	4,687	4,764	5,161	4,480
Total SS Coupled Individuals***																
Men	428	11	16	8	10	19	29	32	23	21	36	46	42	50	45	40
Women	475	22	20	11	17	26	30	35	34	30	36	38	32	51	52	41

*An individual must have had a positive person-level weight for the analyses as well as be ages 18-64.

**A person is considered married if the reference person reported being married.

***Individuals in same-sex couples who were either married or living together were use in this analyses.

Zero expenditures

There were two types of zero expenditures related to mental health services utilization that I encountered in the MEPS data files. There were individuals in SS or DS couples who had no mental health related medical encounters over the course of the survey year. The second situation arose in individuals in SS or DS couples who did have a medical encounter that was associated with a mental health ICD-9 code, but had no record of any payment in relation to this service.

After examining the raw counts (unweighted data), among those who had any associated MH ICD-9 code, 854 individuals had no out of pocket expenditures and 75 had zero expenditures associated with the service. Among those with a mental health ICD-9 procedure code, individuals in SS couples and individuals and DS couples had similar frequencies of not paying an out of pocket cost (3.73% (SE=1.72) and 5.43% (SE=0.29), respectively). Likewise for total costs for a medical encounter, 2.35% of the SS individuals with an ICD-9 mental health code had \$0 costs associated with that code, compared to 0.44% of DS individuals (standard errors 1.58 and 0.07, respectively).

Possible Confounders

Covariates captured in the MEPS data consistently for the whole study period that have been found to be associated with both the exposure and outcomes of interest are included in the analyses. Descriptions of these variables, evidence for inclusion in any statistical models, and how they are operationalized in the current study is included below.

Age

Older age has been associated with increased mental health services use [98, 112]. Sexual minorities tend to be younger compared to heterosexuals in population-based surveys [19, 21, 50]. Age was treated as a potential confounder in this analysis. As in Study#2, age was restricted to those who were 18 years or older, but less than 65. The age of each respondent at the end of the first year of the two year survey determined eligibility for the study and for subsequent analyses. MEPS calculated age from date of birth to 12/31 of the first year complete year of the survey panel. Age was used as a categorical variable in this study in order to maintain adequate power in analyses (18-24, 25-34, 35-44, 45-64).

Sex

The relation of sex to mental health services use is mixed, some studies indicate that males are more likely to seek such services [123], while others find that females are more likely to use services[122]. Sexual minorities have been found to utilize mental health services more often than their heterosexual counterparts [10-13]. Sex was initially determined from the NHIS cycle used to select respondents into the MEPS. This variable was verified during each MEPS interview. It was corrected if necessary. Respondents were categorized as male or female.

Race/Ethnicity

Race/Ethnicity has been shown to be associated with both mental health care utilization and sexual orientation[131, 165]. Due to MEPS data collection changes and small sample sizes, race/ethnicity has been categorized into: non-Hispanic white, Hispanic, and non-Hispanic other. For further discussion, please refer to the discussion of Race/Ethnicity in Study #2.

Education

Higher education has been associated with mental health services use[98] and with sexual minority status[10]. As in Study #2, the variable HIDEG which contained information on highest

degree obtained was used to group respondents into the following education categories: H.S. Diploma/GED/Less than H.S. Diploma, Some college, Bachelor's degree or higher degree.

Insurance

Insurance status is related to receiving both any health care services[240] and mental health care services[83]. The type of insurance also influences out-of-pocket expenses[134]. Sexual minorities have been shown to have less access to health insurance compared to heterosexuals [56, 197]. For this study, insurance was categorized as any private insurance, public, and uninsured.

Census Region

For this analysis, census region was treated as a confounder as it has been found to be associated both sexual orientation[241] and MHSA services use[98]. Census regions were categorized as Northeast, Midwest, South, and West.

Family size

Family size was considered a confounder in this study. Same-sex couples are more likely to have smaller households on average than different-sex couples because they are less likely to be raising children[242]. Additionally, household size has been related to health plans and utilization of health services [189]. Family size was a categorical variable in this analysis. Family size was operationalized as 2 family members, 3 family members, or four or more family members in the household.

Household Poverty Level

Household poverty level was treated as a confounder as it is associated with both sexual orientation and health services use[98, 242]. The categories used were poor/near poor/low

income (less than 200% of poverty line) or middle/high income (200% or greater of poverty line). More discussion on this variable can be found in Study #2.

Metropolitan Statistical Area

MSA was treated as a confounder for these analyses. MSA has been shown to be associated with MHSA services utilization[98]. Living in a MSA is also associated with sexual orientation[93, 243]. MSA status was dichotomized into MSA and non-MSA.

Perceived Physical Health Status

Poor perceived physical health has been related to seeking professional help and greater perceived need for mental health services[62]. Poor physical health has also been associated with increased use of mental health care[59]. As for the relation of sexual minority status to perceived physical health, sexual minorities, as a whole, do not report worse physical health. However, certain subgroups of sexual minorities, specifically bisexual women, do perceive themselves as having worse physical health [145, 197]. Even though perceived physical health was ascertained at all five time points during the study, as in Study #2, only the first time point was used. Again, as in Study #2, perceived health was dichotomized into good health (“excellent,” “very good,” “good” responses) and poor health (“fair,” “poor” responses). For more information on the perceived health variable and limitations of this variable, please refer to Study #2.

Statistical Analysis

Either STATA v12 (StataCorp, 2011) or SAS v9.4 (SAS Institute Inc, 2002-2013) was used for all data preparation and analyses. All statistical analyses in this study accounted for the NHIS/MEPS complex sampling design. Person-level weights, variance estimation strata, and primary sampling units for all analyses came from the 1996-2010 Pooled Estimation file.

Univariate Analyses

For the first set of analyses, I conducted univariate analyses on all variables to describe sample demographics and characteristics. I used these analyses to investigate the distribution of each variable and, in the case of the expenditure variables, inform decisions about additional analyses based on these distributions. My expenditures were highly skewed and right-tail heavy. This is consistent with many prior studies on medical expenditures, including those using the MEPS data[244]. For my categorical variables, I calculated both the Rao-Scott Chi-Square test available in the PROC SURVEYFREQ (SAS v.9.4). For my continuous variables (expenditures), I calculated t-test statistics in PROC SURVEYMEANS (SAS v9.4).

Cost Analyses

Instrumental Variable

To assess the impact of sexual orientation on mental health services utilization, ideally these models would employ an instrumental variable. The use of an instrumental variable could account for any potential unmeasured or unknown confounding between the exposure (sexual minority status) and the outcome (mental health service/expenditure). The use of instrumental variables is regarded as good practice when examining patterns of service utilization and cost[245].

Unfortunately, there is no variable in the MEPS that would meet the criteria of an instrumental variable for the exposures and outcomes I examined in the current study. In reviewing the literature for possible instruments, there were very few studies that employed an instrumental variable where sexual minority status was either the primary exposure or outcome [246, 247]. At the time of this study, I had not found any published studies that have identified a

variable that could be related to sexual minority status but not to mental health that was contained in the MEPS.

Because there were no appropriate instruments in the current data, the results and discussion section do not suggest causal inferences for this paper.

Two-part models

As has become common in cost-analyses[163, 235], I used a two-part model to examine mental health care expenditures. The first part of the model assesses the probability of having a mental health care event. The second part of the model investigates different cost outcomes among those who report a positive history of a mental health care event. This two-part model is appropriate for estimating mental health care expenditures, in particular, as a large proportion of respondents are likely to have no mental health care expenditures[235].

All of these models take into account the complex sampling design of the MEPS. I also use appropriate weights for all analyses. The following analysis was performed in STATA v12 using survey regression procedures (SVY command). These analyses use the STATA command TPM for the estimation of all two-part expenditure models[248].

As mentioned previously, some respondents in the study sample had one or more mental health encounters but zero expenditures (out-of-pocket or total). Because TPM requires the same dependent variable for both the probit model and the expenditure model, I recoded out-of-pocket and total expenditures from \$0 to \$0.001 for all of these respondents so that the probit part of the model would accurately estimate the probability of any use of mental health care.

Part 1: Probit Model

The first model evaluated is a probit model predicting the probability of any use of mental health care during the period of study.

Part 2: Expenditure Models

These models predicted expenditures conditional on non-zero expenditures. Only those individuals with at least one mental health care event were included for the following expenditure models. Because health expenditure data rarely conform to normal distributions and are often highly skewed, the appropriate model and any necessary outcome-related transformations would normally be chosen based on the specific distribution of each outcome[249, 250]. For this paper, I examined fit statistics to identify the best model for these data.

Based on the recommendations of Manning et. al., I initiated the analysis by examining the performance of a general linear model (GLM) [249]. The advantage to using a GLM approach in cost analysis is that the outcome (expenditure) may remain untransformed. This means that the results also can be directly interpreted without retransforming results[235]. Manning suggests examining both the original scale and log-scale residuals from the GLM. Since the log-scale residuals were heavy-tailed with a kurtosis > 3 , GLM was not the recommended model. When the log-scale residuals are heavy-tailed with a kurtosis > 3 , the literature suggests an ordinary least square models (OLS-based models) [251].

This process of model selection was repeated with both out-of-pocket mental health care expenditures and total mental health care expenditures. Tests for both outcomes suggested that the OLS model had the best model fit.

Combining Part 1 and Part 2 of the Two-Part Model

After both parts of the two part model were created, these parts were combined to obtain the predicted expenditures of individuals by same-sex or different-sex couple status by this equation:

Expenditure = Probability of Any Use of MH Services * MH Expenditures Given Any MH Services Use[154]

For the second part of my model that uses a log-transformed expenditure outcome, I used a smear factor to retransform any estimates obtained[250].

All of my expenditure analyses have been conducted within the TPM STATA command which has the capability to use complex survey design weights and sampling frames as well as estimate the marginal effects for variables of interest (e.g., individuals in SS vs DS couples) [248].

Proportion of Same-sex Versus Different-sex relationships with Both Members of the Couple Using Mental Health Services

As with Study #2, individuals in relationships are the primary unit of analysis. Shared variance within couples may still be relevant to the analyses, especially when considering the many covariates that are identical for two members of a couple (family size, MSA, household income). I conducted two sets of analyses. In my first set of analyses, all individuals in couples were included. In my second set of analyses, I used only the referent.

Missing Data

Exposure

As in Study #2, this study employed a validated AHRQ MEPS sample for sexual minority status from 1996-2007[78]. Because I used a sample validated by AHRQ, there were no data missing for my exposure. In addition, I also used the survey years 2008-2010. The same

logic provided by AHRQ to identify individuals in couples from 1996-2007 was used for the years 2008-2010.

Outcome

Notably, there were concerns about missing expenditure data or misclassification of relevant expenditures either because of the sensitivity of mental health conditions or because the MEPS relies on self-reporting and proxy reporting of mental health events. Both in-patient psychiatric care and day-care services are, in particular, extremely costly[171, 237]. Prior research both in Europe and in the U.S. have shown a high concordance between reported mental health care expenditures and actual expenditures [88, 252]. The outcome “any mental health care event” relies on identifying at least a single record in MEPS for one of the following events: mental health ICD-9 code for inpatient stay, emergency room visit, outpatient visit, office-based visit, or prescription drug. As with Study #2, absence of a record was treated as evidence that no mental health care was received. For my expenditure-dependent outcomes, all expenditure variables have gone through an editing and imputation process documented earlier in Study 2. There is no missing expenditure data for any medical event in the MEPS PUF.

Missing Data Analysis

Examinations of the covariates indicated that there is less than 1% missing data (please see study #2 for a more detailed breakdown of the missing data). Because covariates were missing so rarely, single imputation was used to impute the missing covariates. SAS v9.4 Proc MI was used to impute the missing variables.

This study has been given exemption status from UCLA Office for the Protection of Research Subjects.

4.3 Results

This study has the same study sample as Study #2. When the sample was restricted to those who met the study criteria and who had positive person weights, there were 903 individuals in same-sex couples and 139,983 individuals in different-sex couples. Using the survey sample design and weights, 0.79% (95% CI: 0.67%, 0.91%) of the final sample were members of same-sex couples.

Characteristics of Sample

Tables 4.2 and 4.3 provide demographic characteristics of the sample as well as several covariates related to sexual orientation and mental health service utilization. For the total sample (both individuals in the couple included in the sample), individuals in same-sex couples were more likely to be older, white non-Hispanic, have more education, smaller family sizes, live in a MSA, and live in the western part of the United States compared to individuals in different-sex couples. In the referent only sample, many of these attribute differences remained. In the referent-only sample, referents in a same-sex couple were more likely to be female and more likely to report fair or poor mental health than referents in different-sex couples.

Mental Health Care Utilization By Sexual Minorities

Table 4.2. Demographics and descriptive characteristics of U.S. adults in same-sex couples or married different-sex couples, age 18 to 64 years, MEPS (1996-2010): Weighted prevalence shown.

Characteristics, %	Same-Sex Couple (n=903)		Different-Sex Couple (n=139,983)		Rao- Scott Chi- Square Test
	%	(SE)	%	(SE)	<i>p-value</i>
Gender, Female	47.0	(3.6)	51.1	(0.1)	0.247
Age					
18-24	0.7	(0.3)	2.9	(0.1)	<.0001
25-34	21.8	(2.3)	20.4	(0.3)	
35-44	37.1	(2.4)	29.0	(0.2)	
45-64	40.5	(2.7)	47.7	(0.3)	
Race/Ethnicity					
Hispanic	10.7	(2.0)	12.1	(0.5)	0.001
White, non-Hispanic	57.0	(3.5)	44.8	(0.7)	
Other, non-Hispanic	32.2	(3.5)	43.1	(0.7)	
Education					
H.S. Diploma or less	21.4	(2.2)	44.0	(0.5)	<.0001
Some College	23.5	(2.1)	23.6	(0.3)	
4 year degree or higher	55.1	(3.0)	32.4	(0.5)	
Family Size					
2 people	89.0	(2.1)	34.3	(0.3)	<.0001
3 people	6.6	(1.5)	22.3	(0.3)	
4 or more people	4.4	(1.2)	43.4	(0.4)	
Lives in MSA	93.9	(1.4)	81.3	(0.8)	<.0001
Census Region					
Northeast	17.2	(2.8)	18.0	(0.8)	0.002
Midwest	15.6	(2.7)	23.3	(0.8)	
South	33.0	(3.9)	36.0	(1.2)	
West	34.3	(4.0)	22.7	(1.1)	
Payer					
Private	85.8	(1.7)	84.5	(0.4)	0.574
Public	3.5	(0.7)	4.4	(0.2)	
Uninsured	10.7	(1.6)	11.1	(0.3)	
Family income <200% of federal poverty level	20.9	(1.9)	18.3	(0.4)	0.139
Perceived Mental Health					
Fair/Poor	29.3	(2.6)	24.6	(0.3)	0.056
Perceived Physical Health					
Fair/Poor	37.4	(2.5)	36.0	(0.3)	0.573

Mental Health Care Utilization By Sexual Minorities

Table 4.3. Demographics and descriptive characteristics of U.S. adults in same-sex couples or married different-sex couples **REFERENT ONLY**, age 18 to 64 years, MEPS (1996-2010): Weighted prevalence shown.

Characteristics, %	Same-Sex Couple (n=476)		Different-Sex Couple (n=71,868)		Rao-Scott Chi- Square Test
	%	(SE)	%	(SE)	<i>p-value</i>
Gender, Female	48.7	(3.5)	39.3	(0.4)	0.007
Age					
18-24	0.6	(0.4)	3.4	(0.1)	0.018
25-34	24.0	(3.0)	20.7	(0.3)	
35-44	32.2	(3.0)	28.7	(0.3)	
45-64	43.3	(3.0)	47.2	(0.3)	
Race/Ethnicity					
Hispanic	10.5	(2.2)	12.0	(0.5)	0.001
White, non-Hispanic	57.9	(3.6)	45.0	(0.7)	
Other, non-Hispanic	31.6	(3.5)	43.0	(0.7)	
Education					
H.S. Diploma or less	18.6	(2.8)	42.8	(0.5)	<.0001
Some College	22.0	(2.8)	23.4	(0.3)	
4 year degree or higher	59.4	(3.5)	33.8	(0.5)	
Family Size					
2 people	88.7	(2.2)	34.7	(0.3)	<.0001
3 people	6.9	(1.7)	22.5	(0.3)	
4 or more people	4.4	(1.2)	42.8	(0.4)	
Lives in MSA	93.1	(1.6)	81.4	(0.8)	<.0001
Census Region					
Northeast	16.4	(2.7)	17.9	(0.8)	0.001
Midwest	15.3	(2.6)	23.2	(0.8)	
South	33.7	(4.0)	36.3	(1.2)	
West	34.6	(4.2)	22.7	(1.1)	
Payer					
Private	87.0	(2.1)	84.5	(0.4)	0.49
Public	3.6	(1.0)	4.6	(0.2)	
Uninsured	9.4	(1.9)	10.9	(0.3)	
Family income <200% of federal poverty level line	18.3	(2.3)	18.5	(0.4)	0.926
Perceived Mental Health					
Fair/Poor	31.0	(3.0)	24.0	(0.3)	0.011
Perceived Physical Health					

Fair/Poor	38.8	(3.5)	35.6	(0.3)	0.926
-----------	------	-------	------	-------	-------

Mental Health Care Utilization

As reported in Study #2, individuals in same-sex couples as compared to individuals in different-sex couples were more likely to report a mental health care event (21.6% versus 9.7%, respectively with a Rao-Scott Chi-Square p-value of <0.0001), where a mental health care event was defined as any medical event or prescription with a mental health ICD-9 code. When defining mental health encounters in this manner, individuals in same-sex couples did not appear very different in their utilization of outpatient, inpatient, or emergency department mental health care as compared to individuals in different-sex couples (Table 4.4). The main difference in mental health service utilization between individuals in same-sex couples and different-sex couples were found in office-based visits and psychopharmaceutical prescriptions. Prevalence of reported mental health encounters remained similar across the total study sample and the referent only study sample (Table 4.5).

Table 4.4 Mental health (MH) service utilization among U.S. adults in same-sex relationships or married different-sex relationships, by sexual minority status, MEPS (1996-2010): Weighted prevalence shown.

	Same-Sex Couple		Different-Sex Couple		Rao-Scott Chi-Square p-value
	%	(SE)	%	(SE)	
Any medical encounter with a MH ICD-9 code*	21.61	(2.41)	9.66	(0.15)	<.0001
Office-based visit	12.77	(1.90)	4.75	(0.10)	<.0001
Outpatient visit	0.40	(0.24)	0.21	(0.02)	0.275
Emergency Department	0.26	(0.15)	0.24	(0.02)	0.881
Inpatient Stay	0.20	(0.13)	0.17	(0.01)	0.794
Any prescription with a MH ICD-9 code*	19.24	(2.23)	8.66	(0.15)	<.0001

* ICD-9 codes included: 291, 292, 295, 296, 297, 298, 300, 301, 303, 304, 305, 308, 311, v11, v40.

Table 4.5 Mental health (MH) service utilization among U.S. adults in same-sex relationships or married different-sex relationships, **REFERENT ONLY**, by sexual minority status, MEPS (1996-2010): Weighted prevalence shown.

	Same-Sex Couple		Different-Sex Couple		Rao-Scott Chi-Square p-value
	%	(SE)	%	(SE)	
Any medical encounter with a MH ICD-9 code*	19.67	(2.96)	9.22	(0.19)	<.0001
Office-based visit	12.31	(2.47)	4.57	(0.12)	<.0001
Outpatient visit	0.49	(0.37)	0.21	(0.02)	0.236
Emergency Department	0.24	(0.20)	0.25	(0.02)	0.955
Inpatient Stay	0.05	(0.05)	0.17	(0.02)	0.152
Any prescription with a MH ICD-9 code*	16.55	(2.72)	8.28	(0.18)	<.0001

* ICD-9 codes included: 291, 292, 295, 296, 297, 298, 300, 301, 303, 304, 305, 308, 311, v11, v40.

Mental Health Care Expenditures

Among those who had any mental health care utilization, individuals in same-sex couples had higher mean expenditures for out-of-pocket expenditures. For total healthcare expenditures, the confidence intervals overlapped between individuals in same-sex couples and different-sex couples (Table 4.6). Among the smaller sample of referents only, there appeared to be little difference between the mean expenditures of individuals in same-sex couples and different-sex couples (Table 4.7). Due to small numbers, especially for inpatient stays and emergency department visits, several of these estimates had wide confidence intervals or could not be calculated.

Modeling Mental Health Expenditure

Mental Health Care Utilization By Sexual Minorities

Both the out-of-pocket mental health care expenditures and the total expenditures are skewed (Figures 4.1 & 4.2).

Table 4.6 Mental health service expenditures among U.S. adults in same-sex relationships or married different-sex relationships who received mental health care services, by sexual minority status, MEPS (1996-2010): Weighted means shown.

	Same-Sex Couple		Different-Sex Couple	
	Mean (\$)	95% CI	Mean (\$)	95% CI
MH-related Out-of-Pocket Expenditures*				
Office-based visits	467.19	(200.94, 733.43)	218.08	(184.84, 251.31)
Outpatient visits	9.33	(5.24, 13.42)	129.85	(75.91, 183.78)
Emergency Department visits	159.52	(71.96, 247.08)	128.97	(95.60, 162.35)
Inpatient Stays	366.84	(61.72, 571.97)	544.49	(339.21, 749.77)
Prescriptions	308.87	(239.86, 377.88)	231.87	(221.58, 242.16)
Total out-of-pocket expenditures	556.48	(383.90, 729.06)	330.47	(308.84, 352.11)
Total MH-related Expenditures*				
Office-based visits	1,212.64	(705.24, 1,720.03)	705.64	(653.20, 758.08)
Outpatient visits	97.55	(35.74, 159.35)	1,376.40	(993.81, 1,758.98)
Emergency Department visits	2,803.75	(688.52, 4,918.98)	875.96	(720.81, 1,031.11)
Inpatient Stays	64,428.00	(14,489, 114,367)	11,826.00	(8,730.00, 14,922)
Prescriptions	1,164.58	(846.24, 1,482.93)	737.32	(711.30, 763.34)
Total Expenditures	2,378.08	(1,330.46, 3,425.70)	1,261.74	(1,181.05, 1,342.43)

*All expenditures converted to 2010 dollars using the Personal Health Care Expenditure Price Index.

Table 4.7 Mental health service expenditures among U.S. adults in same-sex relationships or married different-sex relationships, **REFERENTS ONLY**, who received mental health care services, by sexual minority status, MEPS (1996-2010): Weighted means shown.

	Same-Sex Couple		Different-Sex Couple	
	Mean (\$)	95% CI	Mean (\$)	95% CI
MH-related Out-of-Pocket Expenditures*				
Office-based visits	407.06	(147.87, 666.24)	216.38	(174.20, 258.56)
Outpatient visits	8.41	(2.40, 14.42)	138.14	(49.35, 226.93)
Emergency Department visits	119.31	(15.54, 223.08)	147.13	(100.70, 193.55)
Inpatient Stays	N.A. **	N.A. **	534.20	(251.66, 816.75)
Prescriptions	732.15	(696.91, 767.39)	233.15	(218.87, 247.43)
Total out-of-pocket expenditures	452.40	(270.57, 634.24)	333.89	(306.16, 361.61)
Total MH-related Expenditures*				
Office-based visits	894.04	(606.79, 1,181.28)	720.41	(650.71, 790.10)
Outpatient visits	135.69	(107.88, 163.50)	1,173.71	(879.38, 1,468.04)
Emergency Department visits	4,275.35	(2,497.99, 6,052.72)	968.39	(735.10, 1,201.69)
Inpatient Stays	N.A. **	N.A. **	8,423.26	(6,687.87, 10,159.00)
Prescriptions	992.13	(727.12, 1,257.14)	230.18	(167.94, 292.41)
Total Expenditures	1,451.49	(1,092.04, 1,810.93)	1,226.86	(1,152.48, 1,301.24)

*All expenditures converted to 2010 dollars using the Personal Health Care Expenditure Price Index.

Mental Health Care Utilization By Sexual Minorities

**Only 1 respondent in a same-sex couple had a positive cost for inpatient stay, so mean and 95% CI could not be calculated.

As discussed in the methods, after testing the GLM for both out-of-pocket mental health expenditure and total expenditure, I examined estimates of kurtosis in the distribution. Both models had residuals with kurtosis > 3 (kurtosis=13 for out-of-pocket and kurtosis=23 for the total mental health expenditure). This result indicated that an OLS model would likely have a better fit. The following results are based off a two part model employing logit model for the first part and then an OLS regression model with a logged dependent variable for the second part.

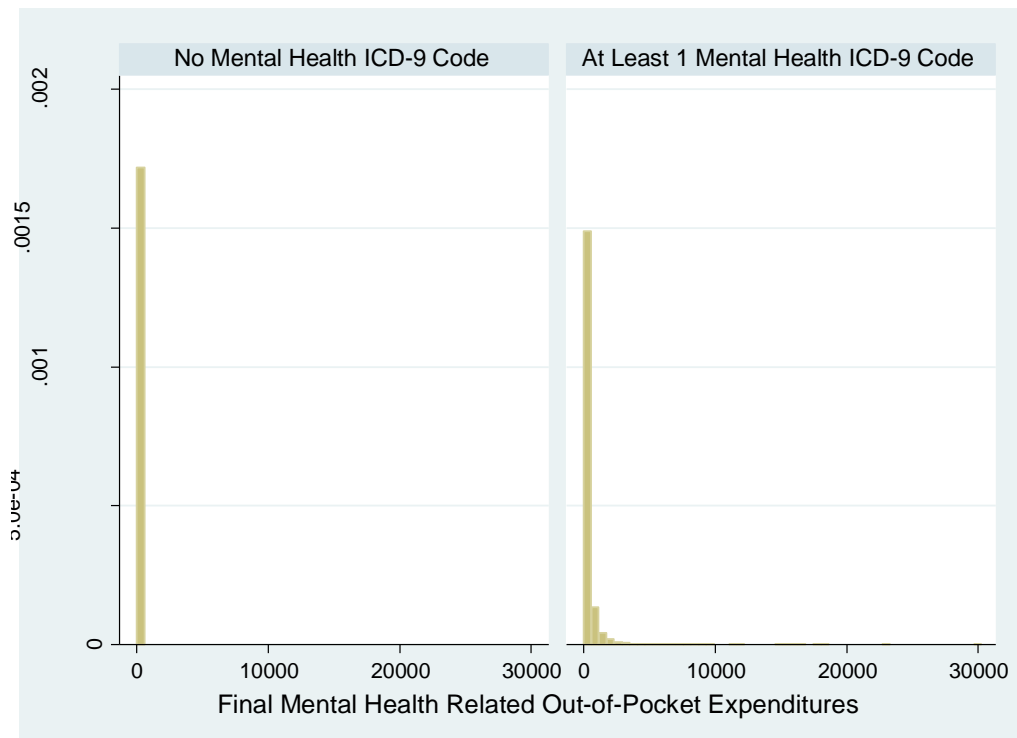


Figure 4.1 Unweighted Out-of-Pocket Mental Health Related Expenditures by Presence of Mental Health ICD-9 Code

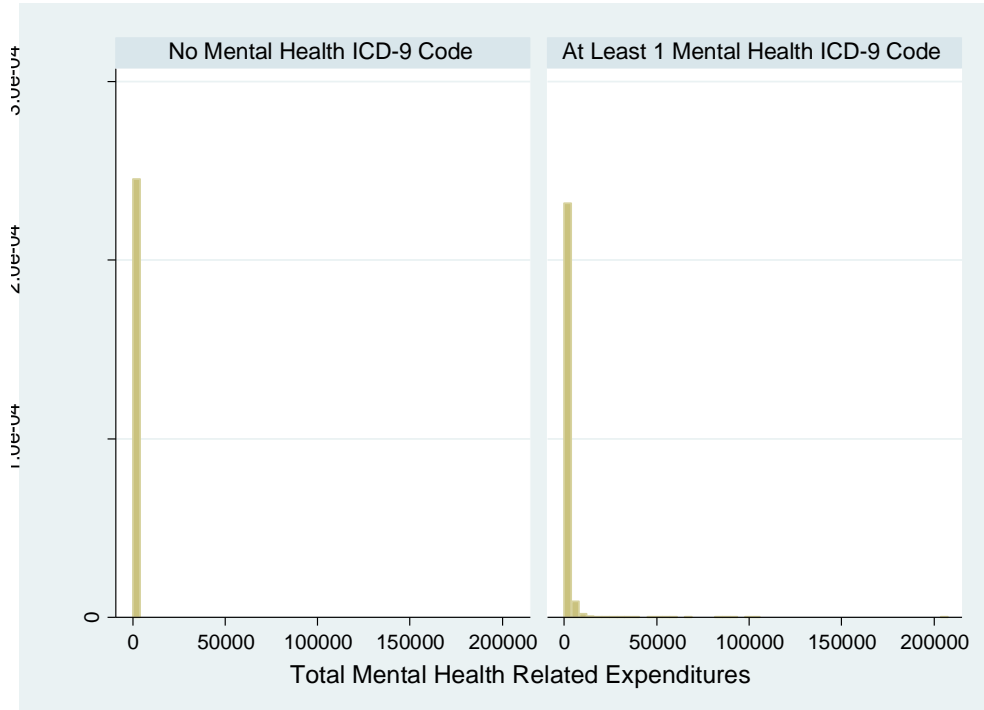


Figure 4.2 Unweighted Total Mental Health Related Expenditures by Presence of Mental Health ICD-9 Code

Two Part Model: Logit Model & Regression with Logged Mental Health Expenditures

The following is a description of the OLS models on the expenditure outcomes of interest.

Out-of-Pocket Mental Health Expenditures using a Logit and Regression with a Log Transformed Expenditure Variable

Results shown in Tables 4.8 and 4.9 pertain to out-of-pocket mental health expenditures for the total population while results shown in Tables 4.10 and 4.11 pertain to out-of-pocket mental health expenditures for referents only. For the analyses that included both individuals in the couple, sexual orientation was independently significant in both the logit and the regression models (p-value for the parameter < 0.0001 and p=0.04, respectively). Sexual orientation was also found jointly significant (Adjusted Wald test p<0.0001). The incremental out-of-pocket

expenditure related to being an individual in a same-sex couple was higher than being an individual in a different-sex couple (\$136.65 95% CI: \$63.20, \$210.10).

In the referent only analyses, sexual orientation was found jointly significant. However the incremental expenditure for an individual in a same-sex couple vs in a different sex couple crossed \$0 (\$65.53, 95% CI: \$ -46.30, \$177.37).

Mental Health Care Utilization By Sexual Minorities

Table 4.8. Results of Weighted Logit Model Predicting Mental Health Service Utilization among U.S. adults in same-sex relationships or married different-sex relationships, MEPS (1996-2010).

Parameter	Parameter Estimate	SE	p-value
Individual in SS couple	0.84	(0.14)	<0.001
Age Category, years			
18-24	0.53	(0.10)	<0.001
25-34	0.81	(0.10)	<0.001
35-44	0.89	(0.10)	<0.001
45-64			
Female	0.78	(0.03)	<0.001
Education			
H.S. Diploma or less			
Some College			
4 year degree or higher	0.11	(0.04)	0.005
Race/Ethnicity			
White, non-Hispanic	-0.01	(0.04)	0.832
Hispanic	-0.95	(0.05)	<0.001
Other, non-Hispanic	-0.69	(0.04)	<0.001
Lives in MSA	0.03	(0.04)	0.562
Census Region			
Northeast			
Midwest	0.08	(0.05)	0.166
South	0.07	(0.05)	0.154
West	0.03	(0.06)	0.587
Perceived Fair/Poor Physical Health	0.92	(0.03)	<0.001
Family Size			
Two people			
Three people	-0.09	(0.04)	0.024
Four or more people	-0.25	(0.03)	<0.001
Insurance Status			
Private Insurance			
Public Insurance	0.66	(0.06)	<0.001
Uninsured	-0.54	(0.05)	<0.001
Income is less than 200% of Poverty Line	-0.08	(0.04)	0.033

Mental Health Care Utilization By Sexual Minorities

Table 4.9 Results of Weighted Regression Analysis with Log Transformation Estimating Out-of-Pocket Mental Health Related Medical Expenditures among U.S. adults in same-sex relationships or married different-sex relationships with at least one mental health event, MEPS (1996-2010).

Parameter	Parameter Estimate	SE	p-value
Individual in SS couple	0.65	(0.32)	0.041
Age Category, years			
18-24	0.42	(0.33)	0.202
25-34	0.80	(0.32)	0.015
35-44	0.75	(0.31)	0.017
45-64			
Female	0.40	(0.08)	<0.001
Education			
H.S. Diploma or less			
Some College	0.18	(0.11)	0.092
4 year degree or higher	0.39	(0.10)	<0.001
Race/Ethnicity			
White, non-Hispanic			
Hispanic	-0.54	(0.14)	<0.001
Other, non-Hispanic	-0.29	(0.10)	0.003
Lives in MSA	0.14	(0.11)	0.229
Census Region			
Northeast			
Midwest	-0.09	(0.12)	0.46
South	0.21	(0.11)	0.05
West	-0.39	(0.15)	0.01
Perceived Fair/Poor Physical Health	0.24	(0.08)	0.003
Family Size			
Two people			
Three people	0.02	(0.10)	0.823
Four or more people	-0.11	(0.10)	0.284
Insurance Status			
Private Insurance			
Public Insurance	-2.27	(0.23)	<0.001
Uninsured	0.31	(0.18)	0.096
Income is less than 200% of Poverty Line	0.56	(0.13)	<0.001

Mental Health Care Utilization By Sexual Minorities

Table 4.10 Results of Weighted Logit Model Predicting Mental Health Service Utilization among U.S. adults in same-sex relationships or married different-sex relationships **REFERENT ONLY**, MEPS (1996-2010).

Parameter	Parameter		
	Estimate	SE	p-value
Individual in SS couple	0.63	(0.18)	0.001
Age Category, years			
18-24	0.50	(0.13)	<0.001
25-34	0.79	(0.13)	<0.001
35-44	0.87	(0.12)	<0.001
45-64			
Female	0.87	(0.04)	<0.001
Education			
H.S. Diploma or less			
Some College	0.10	(0.05)	0.061
4 year degree or higher	0.03	(0.06)	0.632
Race/Ethnicity			
White, non-Hispanic			
Hispanic	-1.01	(0.07)	<0.001
Other, non-Hispanic	-0.68	(0.05)	<0.001
Lives in MSA	0.00	(0.05)	0.942
Census Region			
Northeast			
Midwest	0.08	(0.07)	0.264
South	0.06	(0.07)	0.383
West	0.02	(0.08)	0.771
Perceived Fair/Poor Physical Health	0.95	(0.04)	<0.001
Family Size			
Two people			
Three people	-0.10	(0.05)	0.062
Four or more people	-0.29	(0.04)	<0.001
Insurance Status			
Private Insurance			
Public Insurance	0.74	(0.07)	<0.001
Uninsured	-0.45	(0.07)	<0.001
Income is less than 200% of Poverty Line	-0.10	(0.05)	0.046

Mental Health Care Utilization By Sexual Minorities

Table 4.11 Results of Weighted Regression Analysis with Log Transformation Estimating Out-of-Pocket Mental Health Related Medical Expenditures among U.S. adults in same-sex relationships or married different-sex relationships with at least one mental health event **REFERENT ONLY**, MEPS (1996-2010).

Parameter	Parameter Estimate	SE	p-value
Individual in SS couple	0.15	(0.54)	0.784
Age Category, years			
18-24	0.07	(0.47)	0.876
25-34	0.60	(0.43)	0.166
35-44	0.58	(0.41)	0.16
45-64			
Female	0.32	(0.12)	0.008
Education			
H.S. Diploma or less			
Some College	0.25	(0.14)	0.082
4 year degree or higher	0.42	(0.15)	0.005
Race/Ethnicity			
White, non-Hispanic			
Hispanic	-0.61	(0.21)	0.004
Other, non-Hispanic	-0.32	(0.12)	0.01
Lives in MSA	0.16	(0.15)	0.269
Census Region			
Northeast			
Midwest	-0.10	(0.18)	0.571
South	0.30	(0.16)	0.071
West	-0.27	(0.19)	0.15
Perceived Fair/Poor Physical Health	0.19	(0.11)	0.1
Family Size			
Two people			
Three people	0.07	(0.15)	0.662
Four or more people	0.01	(0.14)	0.97
Insurance Status			
Private Insurance			
Public Insurance	-2.35	(0.30)	<0.001
Uninsured	0.29	(0.25)	0.244
Income is less than 200% of Poverty Line	0.35	(0.17)	0.034

Total Mental Health Expenditures using a Logit and Regression with a Log Transformed Expenditure Variable

Tables 4.12 and 4.13 provide partial results of the investigation of total mental health expenditures for the total sample. Tables 4.14 and 4.15 examine total mental health expenditures for referents only. Again results for both models indicate that sexual minority status was jointly significant for predicting total mental health expenditures. For the total study sample, being an individual in a same-sex couple resulted in an incremental increase in total mental health care expenditures of \$107.28 (95% CI: \$21.14, 193.42) compared to being an individual in a different-sex couple. For the referent only population, being an individual in a same-sex couple resulted in an incremental increase in total mental health care expenditures of \$19.13 (95% CI: \$-113.80, \$152.06) compared to being an individual in a different-sex couple.

Mental Health Care Utilization By Sexual Minorities

Table 4.12 Results of Weighted Logit Model Predicting Mental Health Service Utilization among U.S. adults in same-sex relationships or married different-sex relationships, MEPS (1996-2010).

Parameter	Parameter Estimate	SE	p-value
Individual in SS couple	0.84	(0.14)	<0.001
Age Category, years			
18-24	0.53	(0.10)	<0.001
25-34	0.81	(0.10)	<0.001
35-44	0.89	(0.10)	<0.001
45-64			
Female	0.78	(0.03)	<0.001
Education			
H.S. Diploma or less			
Some College			
4 year degree or higher	0.11	(0.04)	0.005
Race/Ethnicity			
White, non-Hispanic	-0.01	(0.04)	0.832
Hispanic	-0.95	(0.05)	<0.001
Other, non-Hispanic	-0.69	(0.04)	<0.001
Lives in MSA	0.03	(0.04)	0.562
Census Region			
Northeast			
Midwest	0.08	(0.05)	0.166
South	0.07	(0.05)	0.154
West	0.03	(0.06)	0.587
Perceived Fair/Poor Physical Health	0.92	(0.03)	<0.001
Family Size			
Two people			
Three people	-0.09	(0.04)	0.024
Four or more people	-0.25	(0.03)	<0.001
Insurance Status			
Private Insurance			
Public Insurance	0.66	(0.06)	<0.001
Uninsured	-0.54	(0.05)	<0.001
Income is less than 200% of Poverty Line	-0.08	(0.04)	0.033

Mental Health Care Utilization By Sexual Minorities

Table 4.13 Results of Weighted Regression Analysis with Log Transformation Estimating Out-of-Pocket Mental Health Related Medical Expenditures among U.S. adults in same-sex relationships or married different-sex relationships with at least one mental health event, MEPS (1996-2010).

Parameter	Parameter Estimate	SE	p-value
Individual in SS couple	0.14	(0.31)	0.636
Age Category, years			
18-24			
25-34	0.38	(0.23)	0.109
35-44	0.52	(0.22)	0.02
45-64	0.40	(0.22)	0.066
Female	0.07	(0.05)	0.136
Education			
H.S. Diploma or less			
Some College	0.12	(0.06)	0.036
4 year degree or higher	0.20	(0.06)	0.001
Race/Ethnicity			
White, non-Hispanic			
Hispanic	-0.31	(0.07)	<0.001
Other, non-Hispanic	0.00	(0.05)	0.967
Lives in MSA	0.14	(0.06)	0.021
Census Region			
Northeast			
Midwest	0.01	(0.08)	0.887
South	0.00	(0.07)	0.993
West	-0.05	(0.08)	0.471
Perceived Fair/Poor Physical Health	0.26	(0.04)	<0.001
Family Size			
Two people			
Three people	-0.04	(0.05)	0.508
Four or more people	-0.06	(0.05)	0.213
Insurance Status			
Private Insurance			
Public Insurance	0.54	(0.09)	<0.001
Uninsured	-0.46	(0.11)	<0.001
Income is less than 200% of Poverty Line	0.13	(0.06)	0.04

Mental Health Care Utilization By Sexual Minorities

Table 4.14 Results of Weighted Logit Model Predicting Mental Health Service Utilization among U.S. adults in same-sex relationships or married different-sex relationships **REFERENT ONLY**, MEPS (1996-2010).

Parameter	Parameter Estimate	SE	p-value
Individual in SS couple	0.63	(0.18)	0.001
Age Category, years			
18-24	0.50	(0.13)	<0.001
25-34	0.79	(0.13)	<0.001
35-44	0.87	(0.12)	<0.001
45-64			
Female	0.87	(0.04)	<0.001
Education			
H.S. Diploma or less			
Some College	0.10	(0.05)	0.061
4 year degree or higher	0.03	(0.06)	0.632
Race/Ethnicity			
White, non-Hispanic			
Hispanic	-1.01	(0.07)	<0.001
Other, non-Hispanic	-0.68	(0.05)	<0.001
Lives in MSA	0.00	(0.05)	0.942
Census Region			
Northeast			
Midwest	0.08	(0.07)	0.264
South	0.06	(0.07)	0.383
West	0.02	(0.08)	0.771
Perceived Fair/Poor Physical Health	0.95	(0.04)	<0.001
Family Size			
Two people			
Three people	-0.10	(0.05)	0.062
Four or more people	-0.29	(0.04)	<0.001
Insurance Status			
Private Insurance			
Public Insurance	0.74	(0.07)	<0.001
Uninsured	-0.45	(0.07)	<0.001
Income is less than 200% of Poverty Line	-0.10	(0.05)	0.046

Mental Health Care Utilization By Sexual Minorities

Table 4.15 Results of Weighted Regression Analysis with Log Transformation Estimating Total Mental Health Related Medical Expenditures among U.S. adults in same-sex relationships or married different-sex relationships with at least one mental health event **REFERENT ONLY**, MEPS (1996-2010).

Parameter	Parameter Estimate	SE	p-value
Individual in SS couple	-0.36	(0.53)	0.496
Age Category, years			
18-24	0.31	(0.24)	0.201
25-34	0.42	(0.24)	0.085
35-44	0.38	(0.22)	0.092
45-64			
Female	0.13	(0.06)	0.037
Education			
H.S. Diploma or less			
Some College	0.11	(0.08)	0.183
4 year degree or higher	0.22	(0.09)	0.014
Race/Ethnicity			
White, non-Hispanic			
Hispanic	-0.39	(0.11)	<0.001
Other, non-Hispanic	-0.05	(0.07)	0.452
Lives in MSA	0.04	(0.07)	0.605
Census Region			
Northeast			
Midwest	-0.01	(0.10)	0.923
South	0.05	(0.09)	0.579
West	0.01	(0.10)	0.891
Perceived Fair/Poor Physical Health	0.20	(0.06)	0.001
Family Size			
Two people			
Three people	-0.07	(0.08)	0.343
Four or more people	-0.06	(0.07)	0.353
Insurance Status			
Private Insurance			
Public Insurance	0.60	(0.11)	<0.001
Uninsured	-0.39	(0.12)	0.001
Income is less than 200% of Poverty Line	0.07	(0.09)	0.393

Mental Health Care Utilization By Sexual Minorities

Table 4.16 Summary of two part model expenditures for both out-of-pocket mental health care expenditures and total mental health care expenditures among U.S. adults in same-sex relationships or married different-sex relationships, by sexual minority status, MEPS 1996-2010.

	Incremental Increase in Expenditure Attributable to being in a SS Couple (compared to DS Couple)**	95% CI**
Out-of-Pocket MH Expenditures[^]		
OLS results with log transformation of expenditures	\$136.65	(\$63.20, \$210.10)
Total MH Expenditures[^]		
OLS results with log transformation of expenditures	\$107.28	(\$21.14, \$193.42)

*All models weighted according to MEPS instructions and adjusted for age, sex, education, race/ethnicity, living in MSA, census region, perceived physical health, insurance, and income.

**In 2010 dollars.

[^] A positive parameter estimate indicates more spending among individuals in SS relationships compared to individuals in DS relationships.

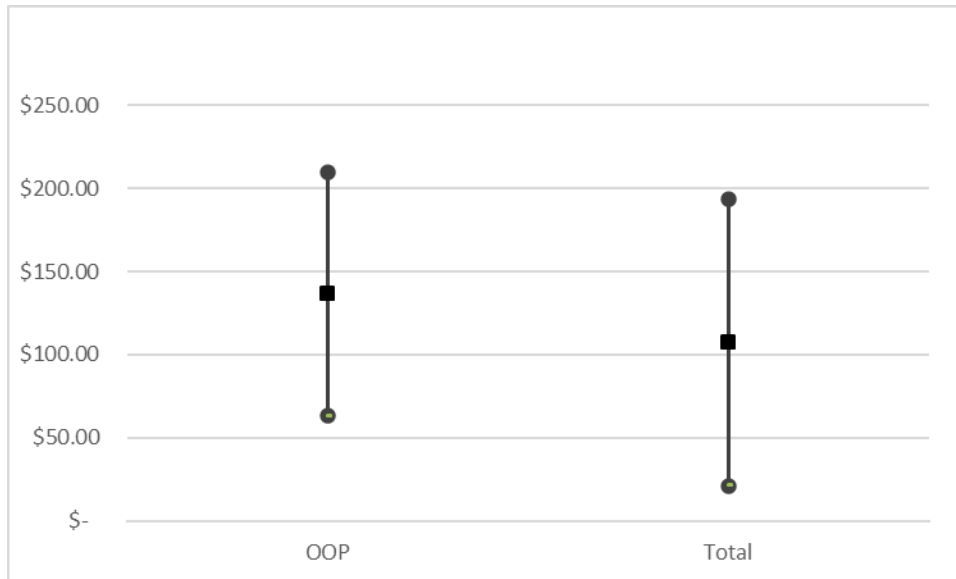


Figure 4.3 Incremental Mental Health Care Expenditure Increase for Individuals in SS Couples compared to Individuals in DS Couples for Out-of-Pocket (OOP) and Total MH Expenditures (Total)

4.4 Discussion

The current study expands upon the prior studies in this dissertation by estimating the cost of mental health care for individuals in same-sex couples compared to individuals in different-sex couples. Prior literature [10, 12, 50] and the first two studies in this dissertation

indicate that sexual minorities are more likely to access mental health care than heterosexuals.

The present study finds that not only do sexual minorities use more mental health services, they have higher out-of-pocket and total mental health expenditures than individuals in different-sex relationships do.

The two part model results indicate that individuals in same-sex couples spend more on mental health care services than individuals in different-sex couples. Despite the higher expenditures, sexual minorities did not appear to have more inpatient stays, emergency department visits, or outpatient visits than individuals in different-sex couples. However, an inability to detect a difference in utilization may be due to how rarely those three settings are utilized by anyone for mental health care. The increased use in services, primarily office-based visits and psychopharmaceutical prescriptions, by sexual minorities does translate into a greater financial burden for this stigmatized population. The expenditure analysis which examined out-of-pocket expenditures indicate that sexual minorities may bear disproportionate amount of their mental health care spending as out-of-pocket expenses. This model estimates that on average, an individual in a same-sex couple spends \$136 more on mental health care related out-of-pocket expenses than an individual in a different-sex couple. This is more of an incremental increase than for what an individual in same-sex couples spent on total mental health care expenditure compared to an individual in a different-sex couple (\$107).

Many of the same limitations found in study #2 apply to this study as well. Again, the way sexual minority status was assessed can result in misclassification. This misclassification is most likely placing sexual minorities into the heterosexually classified group (individuals in different-sex couples). Because there are more individuals in different-sex couples and the percentage of adults who partner with both sexes so low, this misclassification is not likely to

change my estimates very much. In fact, it should bias the results towards the null as these “hidden” sexual minorities among the different-sex couples would presumably share the increased risk of mental health care events and increased expenditures for individuals in same-sex relationships. As I discussed in study #2, a smaller proportion of the adult sexual minority population is in a cohabitating or married relationship compared to the proportion of adult heterosexuals who are married [218]. Again, the results of this paper most likely do not represent all sexual minorities because I was only able to examine those sexual minorities who are married or are in a cohabitating relationship.

In terms of my outcomes, several studies associate increasing frequency of services use with underreporting of this service use [177, 253, 254]. This could have biased my result toward the null if those in same-sex couples were using more services but were also more likely to underreport those services. However as part of the MEPS-MPC, a large portion of this underreporting may have been captured when MEPS went directly to the medical providers and pharmacies to check self-reported events and expenditures. Additionally, some mental health services, such as self-help groups, are not provided through the medical system[98]. The MEPS is designed to capture medical-based services. Because of this, I may have underestimated the proportion of individuals using any mental health services. The MEPS only collects information on non-institutionalized individuals. Both prisoner and homeless populations have higher rates of mental illness than the civilian non-institutionalized population and are not included in the current study[255, 256].

Foreign-birth status could not be ascertained for all data years of this study, so I could not incorporate foreign-birth status in my analyses despite it being a known confounder [4, 257, 258]. Immigrants use less medical services than non-immigrants[257, 258]. This may be due, in

part, to the healthy immigrant effect (only healthier people in a population have the resources to immigrate)[259]. Sexual minorities are also less likely to be foreign-born[4]. However I have included several correlates of foreign birth status in my analyses which may have removed some of the uncontrolled confounding. Specifically, I controlled for race/ethnicity, education, poverty level, and U.S. region in my analyses; these variables are all significantly correlated with foreign birth [257].

Perhaps the greatest limitation to this study was that there was no proper instrument for instrumental variable analyses contained within MEPS. Instrumental methods are often used in studies examining health care service utilization to eliminate bias caused by an endogenous covariate or to eliminate bias due to unknown/unmeasured confounders between the exposure and the outcome[245].

Despite these limitations, this study has several strengths. First, the MEPS is considered the most comprehensive source of cost and health care utilization data in the United States. For this study I was able to examine a wide variety of mental health services (office-based visits, outpatient visits, emergency department visits, inpatient stays, and prescriptions) to create a comprehensive picture of mental health service utilization. In addition to using a well-regarded data set with validated survey methodology, the sexual minority sample used in this study has been validated by researchers at AHRQ [78]. Furthermore, because the primary goal of the MEPS is to estimate national U.S. medical expenditures, all expenditure variables have been thoroughly edited and, when applicable, imputed. In addition, my two-part model analyses produced robust results indicating that sexual minorities spent more than non-sexual minorities on both out-of-pocket mental health care expenditures and total mental health care expenditures.

This study comes at a time of emerging changes in U.S. health policy. Under the Patient Protection and Affordable Care Act (PPACA), there should be many more opportunities for people to access mental health care in the U.S. One study estimates that with expansion of insurance coverage there will be an additional of 1.15 million people who will be accessing mental health care with the adoption of coverage [260]. In addition, current mental health care users may start accessing more care with better coverage. Without understanding how different populations are using mental health care services, it is hard to estimate the impact of these policy changes on both utilization and health care work force needs [261]. Although there has been a slowdown in health care spending and the rate of health care spending growth was lower than the GDP for 2010-2012[230, 262], there is no suitable data source to investigate if this same decrease in spending growth is occurring for the sexual minority population.

4.5 Conclusion

Individuals in same-sex couples were more likely to have used a mental health service in the past year compared to individuals in different-sex couples. They also spent more on out-of-pocket costs and total mental health care expenditures than individuals in different-sex couples. Under PPACA and the Mental Healthy Parity Act, it is important to quantify this disproportionate health care utilization by sexual minority status to identify the economic burden (both on the patients and on the system) as well as predict future costs.

Chapter 5: Summary of findings & conclusions

5.1 Summary of findings

Sexual minorities both in and not in committed relationships utilize mental health services at higher rates than heterosexually married persons. In particular, sexual minorities seem to be primarily accessing this care in office-based visits and through psychopharmaceutical prescriptions, this increased use of mental health care does not appear to be in more urgent treatment settings such as inpatient hospitalizations stays or emergency department visits.

Sexual Minority Use of Mental Health Care Services in a Nationally Representative Survey

The first paper of this dissertation hints that subgroups of sexual minorities are utilizing mental health services at higher rates than exclusive heterosexuals. For this dissertation, NHANES was used to conduct a high-level examination of mental health service utilization by sexual minorities. The NHANES has not only captured sexual orientation and sexual behavior, but has captured this information for 5 survey cycles available at the time of this study. Because of this, I was able to examine differences in mental health care utilization across sexual minority subgroups. Overall sexual minorities were more likely to have received either mental health specialty care in the past year or taken a psychopharmaceutical prescription in the past 30 days compared to exclusive heterosexuals or both, but these differences were not uniform across subgroups. Among men, bisexual men had 1.8 times higher odds of having utilized mental health care (either mental health specialty visit in past year or prescription drug in past 30 days) compared to exclusively heterosexual men. Among women, all three sexual minority sub-groups examined (lesbian, bisexual, and homosexually-experienced heterosexuals) had higher odds of having utilized mental health care compared to exclusively heterosexual women.

In addition to investigating sexual orientation-related differences in service utilization, I also examined evidence for both unmet need for mental health services and non-indicated use of mental health services. In this regard, I observed that sexual minority women had lower odds of having unmet need for mental health care compared to exclusively heterosexual women. Sexual minority women also had higher odds of seeking mental health services in the absence of any indicated need. Although receiving mental health services without an indication of need is not unique to sexual minorities [98], sexual minority women appear to be using these services more often without screening positive for traditional markers of need. There are several different reasons that these sexual minority women may be using these services. First, the traditional markers of need may fail to capture the stress of every day discrimination. Non-gender conforming women are especially at high risk of experiencing more day-to-day stress than their gender-conforming counterparts [263]. Second, there may be a positive social norm around seeking mental health care among sexual minority women. Sexual minority women may be more likely to seek such care, perhaps even preventively, because so many other sexual minority women also receive some form of mental health care treatment and because traditionally homosexuality has been linked to mental illness. Overall this study found that sexual minorities seem to be accessing more mental health care than heterosexuals.

Describing Mental Health Treatment Patterns Among Individuals in Same-Sex Couples in a National Sample

Based on the results of the first paper, I wanted to understand how these services were actually being utilized in the population. I incorporated Andersen's Model for Vulnerable Populations into my work in order to understand how certain groups were accessing care. By examining utilization within the framework of Andersen's model, I attempted to isolate the

impact of being a sexual minority on mental health service utilization. Across 14 MEPS panels, I identified 903 individuals in same-sex couples with validated AHRQ methodology[78]. Almost 24% of individuals in same-sex couples received some mental health care service in the past year compared to only 11% of individuals in different-sex couples. This difference seemed to be primarily driven by relatively high percentage of individuals with at least one prescription associated with a mental health ICD-9 code (19.2% individuals in SS couples, 8.7% individuals in DS couples).

For my analyses, I employed logistic regression and 4 propensity score methods to examine the relationship between mental health service utilization and sexual minority status. Although the results varied slightly across methods, individuals in same-sex relationships had higher odds of having had at least one mental health medical encounter or prescription in the past year compared to individuals in different-sex relationships. However, it did not appear that individuals in same-sex couples had higher odds for receiving adequate treatment after initiating any mental health service than individuals in different-sex couples. Despite the methodological weaknesses of the current study, this study finds that sexual minorities are receiving more mental health care, specifically in the form of office-based visits and psychopharmaceutical prescriptions. There does not seem to be any difference in the quality of care for individuals in same-sex couples compared to individuals in different-sex couples, but the higher utilization of psychopharmaceutical prescriptions could be a problem given the elevated rates of substance abuse among sexual minorities, especially women [264].

The Cost of Mental Health Care Services for Individuals in Same-Sex Couples

The first two studies show that sexual minorities are using these services at an increased rate, but at what cost to the health care system or to the individual consumer? The third study

quantifies the cost of these mental health services for individuals in same-sex couples. Using the MEPS, again, this study expanded on the second study by including both inpatient stays and emergency department visits which are health care cost drivers. Although individuals in same-sex couples did not appear to utilize emergency departments or have inpatient stays more than individuals in different-sex couples, the cost analyses indicated that individuals in same-sex couples spent more than individuals in different-sex couples on mental health services. In particular, individuals in same-sex couples spent \$136 more on out-of-pocket costs for mental health services than individuals in different-sex couples did on average. Being in a same-sex couple resulted in an incremental increase in total mental health care costs of \$107 annually compared to being an individual in a different-couple. This study shows tentative evidence that the behavioral differences previously identified result in real differences in cost burdens for the population.

5.2 Overall Strengths & Limitations

Several of the limitations for these studies vary primarily by the data set used in the study and have been discussed in the prior chapters. However, there are two overarching limitations in this dissertation. First, because this dissertation is focused on a small subpopulation (sexual minorities), it was a challenge to obtain enough survey data to conduct these studies. For the first study, I combined 5 cycles of the NHANES that ascertained sexual orientation. This resulted in a total population of 15,361 eligible subjects, which only included 1,021 sexual minority subjects. For the second and third studies, I used fifteen years of the MEPS (1996-2010). I only identified 903 individuals in same-sex couples, out of my total sample of 140,886 individuals in same-sex relationships or different-sex marriages. The second limitation is that information on sexual orientation has only been tracked in data sets for about the last fifteen years. It will be difficult to

confirm any of these results in other national data sets or to see if this increased utilization has changed over time.

Nevertheless there are many strengths to this dissertation including that these studies build on each other to support the main hypothesis of this dissertation. From this body of work I can clearly draw the conclusion that sexual minorities are using more mental health services than heterosexuals. In the first study, I was able to use the NHANES to examine differences within sexual minority classification by gender and revealed that although sexual minorities overall are more likely to use mental health services, this increased utilization does not appear uniform across sexual minority subgroups. In the second and third studies, I used the MEPS. Because the MEPS captures ICD-9 codes associated with all visits, inpatient stays, and psychopharmaceutical prescriptions, I was able to classify mental health prescriptions with more certainty than in the first study. In addition, the MEPS employs extensive validation and imputation processes to ensure that their expenditure variables are as accurate as possible. MEPS is considered to be the most complete source of national health care expenditure data.

It is also clear that sexual minorities are not accessing these services in the same way as heterosexuals. These studies indicate that although sexual minorities are accessing care at higher rates than heterosexuals, they do not seem to be receiving better care. In addition, they may be seeking care when there is no indicated need for this mental health care. Sexual minorities and the health care system may be paying more for this care when these individuals are not necessarily receiving better care for this increase in spending.

5.3 Public Health Implications & Future Research

This dissertation also has important implications for both policy and future research. A Kaiser Family Foundation Brief released January 2014 highlights the changing health care

landscape that should enable sexual minorities to access health care at unprecedented levels. The Patient Protection and Affordable Care Act (PPACA) as well as the Supreme Court dismissal of the Defense of Marriage Act (DOMA) both support increases in insurance coverage for sexual minorities and individuals in same-sex marriages. However, as highlighted in the introduction of this dissertation, there has been little research in this field. In order to understand the policy impact of PPACA and DOMA on sexual minority mental health care utilization, there needs to be more research elucidating patterns of us among sexual minorities.

Although a better understanding of the impact of both PPACA and DOMA on sexual minority health services utilization requires more research, lack of sufficient data on sexual minorities will make it difficult to conduct future health services research and policy analyses. Currently sexual minority status is rarely captured in electronic medical records[265], it is not part of an insurance claim, and it has not been uniformly captured in national data sets that examine health service utilization. I was able to identify some sexual minorities by restricting my analyses to individuals within same-sex couples, but there were many sexual minorities that were not accounted for in my MEPS analyses. Starting in the 2013 wave, the NHIS is asking a question on sexual orientation in their adult respondent survey. Due to the low numbers of sexual minorities sampled in population-based surveys and the even smaller portion of sexual minorities that will be re-sampled from the NHIS for inclusion in the MEPS, these data sets are still years away from being able to accurately portray sexual minority health care utilization. Next steps for this research include identifying other health services data systems that capture an aspect of sexual minority identity or encouraging their inclusion in electronic medical records or claims databases. Their inclusion in these databases would not only aid in better patient care, but also help inform public health interventions as well as policy development.

6. Appendices

Appendix 6.1 Multum Lexicon Therapeutic Classifications Used in Study #1

2nd Level ID	2nd Level Category Name
67	Anxiolytics, sedatives, and hypnotics
64	Anticonvulsants
249	Antidepressants
251	Antipsychotics

Appendix 6.2 3-digit ICD-9-CM Codes Mental Health Codes Used in Study #2 and #3

291	Alcohol induced mental disorders
292	Drug induced mental disorders
295	Schizophrenic disorders
296	Episodic mood disorders
297	Delusional disorders
298	Other nonorganic psychoses
300	Anxiety dissociative and somatoform disorders
301	Personality disorders
303	Alcohol dependence syndrome
304	Drug dependence
305	Nondependent abuse of drugs
308	Acute reaction to stress
311	Depressive disorder not elsewhere classified
V11	Personal history of mental disorder
V40	Mental and behavioral problems

7. References

1. Gilman, S.E., et al., *Risk of psychiatric disorders among individuals reporting same-sex sexual partners in the National Comorbidity Survey*. American journal of public health, 2001. **91**(6): p. 933.
2. Cochran, S.D. and V.M. Mays, *Relation between psychiatric syndromes and behaviorally defined sexual orientation in a sample of the US population*. American Journal of Epidemiology, 2000. **151**(5): p. 516.
3. Cochran, S.D., et al., *Estimates of alcohol use and clinical treatment needs among homosexually active men and women in the U.S. population*. J Consult Clin Psychol, 2000. **68**(6): p. 1062-71.
4. Cochran, S.D. and V.M. Mays, *Burden of psychiatric morbidity among lesbian, gay, and bisexual individuals in the California Quality of Life Survey*. Journal of abnormal psychology, 2009. **118**(3): p. 647.
5. Burgess, D., et al., *Effects of perceived discrimination on mental health and mental health services utilization among gay, lesbian, bisexual and transgender persons*. Journal of LGBT Health Research, 2008. **3**(4): p. 1-14.
6. Trocki, K.F., L. Drabble, and L. Midanik, *Use of heavier drinking contexts among heterosexuals, homosexuals and bisexuals: results from a National Household Probability Survey*. J Stud Alcohol, 2005. **66**(1): p. 105-10.
7. Mills, T.C., et al., *Distress and depression in men who have sex with men: the Urban Men's Health Study*. Am J Psychiatry, 2004. **161**(2): p. 278-85.
8. Hughes, T.L., *Lesbians' drinking patterns: beyond the data*. Subst Use Misuse, 2003. **38**(11-13): p. 1739-58.
9. Skinner, W.F., *The prevalence and demographic predictors of illicit and licit drug use among lesbians and gay men*. Am J Public Health, 1994. **84**(8): p. 1307-10.
10. Grella, C.E., et al., *Effects of Sexual Orientation and Gender on Perceived Need for Treatment by Persons With and Without Mental Disorders*. Psychiatric Services, 2011. **62**(4): p. 404.
11. Grella, C., et al., *Influence of gender, sexual orientation, and need on treatment utilization for substance use and mental disorders: Findings from the California Quality of Life Survey*. BMC Psychiatry, 2009. **9**(1): p. 52.
12. Tjepkema, M., *Health care use among gay, lesbian, and bisexual Canadians*. HealthReports, 2008. **19**(1): p. 53.
13. Bakker, F.C., et al., *Do homosexual persons use health care services more frequently than heterosexual persons: Findings from a Dutch population survey*. Social science & medicine, 2006. **63**(8): p. 2022-2030.
14. Gates, G.J., *How many people are lesbian, gay, bisexual, and transgender?* Los Angeles: The Williams Institute, UCLA School of Law, 2011.
15. People, H.
16. Lesbian, C.o., et al., *The Health of Lesbian, Gay, Bisexual, and Transgender People: Building a Foundation for Better Understanding*. 2011: Natl Academy Pr.
17. Cochran, S.D., J.G. Sullivan, and V.M. Mays, *Prevalence of mental disorders, psychological distress, and mental health services use among lesbian, gay, and bisexual*

- adults in the United States*. Journal of Consulting and Clinical Psychology, 2003. **71**(1): p. 53-61.
18. Cochran, S.D., *Emerging issues in research on lesbians' and gay men's mental health: Does sexual orientation really matter?* American psychologist, 2001. **56**(11): p. 931.
 19. Mays, V.M. and S.D. Cochran, *Mental health correlates of perceived discrimination among lesbian, gay, and bisexual adults in the United States*. Am J Public Health, 2001. **91**(11): p. 1869-76.
 20. Gilman, S.E., et al., *Risk of psychiatric disorders among individuals reporting same-sex sexual partners in the National Comorbidity Survey*. Am J Public Health, 2001. **91**(6): p. 933-9.
 21. Cochran, S.D. and V.M. Mays, *Relation between psychiatric syndromes and behaviorally defined sexual orientation in a sample of the US population*. Am J Epidemiol, 2000. **151**(5): p. 516-23.
 22. Kuyper, L. and T. Fokkema, *Minority stress and mental health among Dutch LGBS: Examination of differences between sex and sexual orientation*. Journal of counseling psychology, 2011.
 23. Kuyper, L. and T. Fokkema, *Minority stress and mental health among Dutch LGBs: Examination of differences between sex and sexual orientation*. J Couns Psychol, 2011. **58**(2): p. 222-33.
 24. Matthews, A.K., et al., *Prediction of Depressive Distress in a Community Sample of Women: The Role of Sexual Orientation*. Am J Public Health, 2002. **92**(7): p. 1131-1139.
 25. Silenzio, V.M., et al., *Sexual orientation and risk factors for suicidal ideation and suicide attempts among adolescents and young adults*. Am J Public Health, 2007. **97**(11): p. 2017-9.
 26. Ploderl, M. and R. Fartacek, *Suicidality and associated risk factors among lesbian, gay, and bisexual compared to heterosexual Austrian adults*. Suicide Life Threat Behav, 2005. **35**(6): p. 661-70.
 27. Paul, J.P., et al., *Suicide attempts among gay and bisexual men: lifetime prevalence and antecedents*. Am J Public Health, 2002. **92**(8): p. 1338-45.
 28. Cochran, S.D. and V.M. Mays, *Lifetime prevalence of suicide symptoms and affective disorders among men reporting same-sex sexual partners: results from NHANES III*. Am J Public Health, 2000. **90**(4): p. 573-8.
 29. King, S. and H. Dabelko-Schoeny, *"Quite Frankly, I Have Doubts About Remaining": Aging-In-Place and Health Care Access for Rural Midlife and Older Lesbian, Gay, and Bisexual Individuals*. Journal of LGBT Health Research, 2009. **5**(1): p. 10 - 21.
 30. Brady, K.T. and C.L. Randall, *Gender differences in substance use disorders*. Psychiatric Clinics of North America, 1999. **22**(2): p. 241-252.
 31. Kessler, R.C., et al., *US prevalence and treatment of mental disorders: 1990–2003*. The New England journal of medicine, 2005. **352**(24): p. 2515.
 32. Cochran, B.N., K.M. Peavy, and A.F. Santa, *Differentiating LGBT Individuals in Substance Abuse Treatment: Analyses Based on Sexuality and Drug Preference*. Journal of LGBT Health Research, 2008. **3**(2): p. 63 - 75.
 33. Wilsnack, S.C., et al., *Drinking and drinking-related problems among heterosexual and sexual minority women*. J Stud Alcohol Drugs, 2008. **69**(1): p. 129-39.
 34. Stall, R., et al., *Alcohol use, drug use and alcohol-related problems among men who have sex with men: the Urban Men's Health Study*. Addiction, 2001. **96**(11): p. 1589-1601.

35. Koh, A.S. and L.K. Ross, *Mental health issues: A comparison of lesbian, bisexual and heterosexual women*. Journal of Homosexuality, 2006. **51**(1): p. 33-57.
36. Eisenberg, M.E. and M.D. Resnick, *Suicidality among gay, lesbian and bisexual youth: the role of protective factors*. J Adolesc Health, 2006. **39**(5): p. 662-8.
37. Sandfort, T.G., et al., *Same-sex sexual behavior and psychiatric disorders: findings from the Netherlands Mental Health Survey and Incidence Study (NEMESIS)*. Arch Gen Psychiatry, 2001. **58**(1): p. 85-91.
38. Jorm, A.F., et al., *Sexual orientation and mental health: results from a community survey of young and middle-aged adults*. Br J Psychiatry, 2002. **180**: p. 423-7.
39. Friedman, M.S., et al., *Gay-related development, early abuse and adult health outcomes among gay males*. AIDS Behav, 2008. **12**(6): p. 891-902.
40. McKirnan, D.J. and P.L. Peterson, *Alcohol and drug use among homosexual men and women: epidemiology and population characteristics*. Addict Behav, 1989. **14**(5): p. 545-53.
41. Hamilton, C.J. and J.R. Mahalik, *Minority stress, masculinity, and social norms predicting gay men's health risk behaviors*. Journal of counseling psychology, 2009. **56**(1): p. 132.
42. McKirnan, D.J. and P.L. Peterson, *Psychosocial and cultural factors in alcohol and drug abuse: an analysis of a homosexual community*. Addict Behav, 1989. **14**(5): p. 555-63.
43. Bell, A.P. and M.S. Weinberg, *Homosexualities: A study of diversity among men and women*. 1978.
44. Morgan, K.S., *Caucasian lesbians' use of psychotherapy: A matter of attitude?* Psychology of Women Quarterly, 1992. **16**(1): p. 127.
45. Liddle, B.J., *Gay and lesbian clients' selection of therapists and utilization of therapy*. Psychotherapy: Theory, research, practice, training, 1997. **34**(1): p. 11.
46. Hughes, T.L., et al., *Comparing Lesbians' and Heterosexual Women's Mental Health: A Multi-Site Survey*. Journal of Gay & Lesbian Social Services, 2000. **11**(1): p. 57 - 76.
47. Burgess, D., et al., *Effects of perceived discrimination on mental health and mental health services utilization among gay, lesbian, bisexual and transgender persons*. J LGBT Health Res, 2007. **3**(4): p. 1-14.
48. Bradford, J., C. Ryan, and E.D. Rothblum, *National Lesbian Health Care Survey: implications for mental health care*. J Consult Clin Psychol, 1994. **62**(2): p. 228-42.
49. Jones, M.A. and M.A. Gabriel, *Utilization of psychotherapy by lesbians, gay men, and bisexuals: Findings from a nationwide survey*. American Journal of Orthopsychiatry, 1999. **69**(2): p. 209-219.
50. Grella, C.E., et al., *Influence of gender, sexual orientation, and need on treatment utilization for substance use and mental disorders: Findings from the California Quality of Life Survey*. BMC psychiatry, 2009. **9**(1): p. 52.
51. Drabble, L., L.T. Midanik, and K. Trocki, *Reports of Alcohol Consumption and Alcohol-Related Problems among Homosexual, Bisexual and Heterosexual Respondents: Results from the 2000 National Alcohol Survey**. Journal of Studies on Alcohol, 2005. **66**(1): p. 111-121.
52. Eisenberg, D., et al., *Stigma and Help Seeking for Mental Health Among College Students*. Medical Care Research and Review, 2009. **66**(5): p. 522-541.
53. Hogan, M.F., *The President's New Freedom Commission: recommendations to transform mental health care in America*. Psychiatric Services, 2003.

54. Corrigan, P., *How stigma interferes with mental health care*. American psychologist, 2004. **59**(7): p. 614.
55. Garnets, L., et al., *Issues in psychotherapy with lesbians and gay men: A survey of psychologists*. American psychologist, 1991. **46**(9): p. 964.
56. Ponce, N.A., et al., *The Effects Of Unequal Access To Health Insurance For Same-Sex Couples In California*. Health Affairs, 2010.
57. Ramos, C., M. Badgett, and B. Sears, *Evidence of Employment Discrimination on the Basis of Sexual Orientation and Gender Identity: Complaints Filed with State Enforcement Agencies 1999-2007*. 2008.
58. Diamant, A.L., M.A. Schuster, and J. Lever, *Receipt of preventive health care services by lesbians*. American Journal of Preventive Medicine, 2000. **19**(3): p. 141-148.
59. Wang, P.S., P. Berglund, and R.C. Kessler, *Recent care of common mental disorders in the United States*. Journal of General Internal Medicine, 2000. **15**(5): p. 284-292.
60. Wang, P.S., O. Demler, and R.C. Kessler, *Adequacy of treatment for serious mental illness in the United States*. American journal of public health, 2002. **92**(1): p. 92.
61. Edlund, M.J., et al., *Dropping out of mental health treatment: patterns and predictors among epidemiological survey respondents in the United States and Ontario*. American Journal of Psychiatry, 2002. **159**(5): p. 845.
62. Mojtabai, R., M. Olfson, and D. Mechanic, *Perceived Need and Help-Seeking in Adults With Mood, Anxiety, or Substance Use Disorders*. Arch Gen Psychiatry, 2002. **59**(1): p. 77-84.
63. Wang, P.S., et al., *Twelve-month use of mental health services in the United States: results from the National Comorbidity Survey Replication*. Arch Gen Psychiatry, 2005. **62**(6): p. 629-40.
64. Grella, C.E., et al., *Perceptions of need and help received for substance dependence in a national probability survey*. Psychiatr Serv, 2009. **60**(8): p. 1068-74.
65. Hatzenbuehler, M.L., et al., *Racial/ethnic disparities in service utilization for individuals with co-occurring mental health and substance use disorders in the general population: results from the national epidemiologic survey on alcohol and related conditions*. J Clin Psychiatry, 2008. **69**(7): p. 1112-21.
66. Hasin, D.S., et al., *Prevalence, correlates, disability, and comorbidity of DSM-IV alcohol abuse and dependence in the United States: results from the National Epidemiologic Survey on Alcohol and Related Conditions*. Arch Gen Psychiatry, 2007. **64**(7): p. 830-42.
67. Wu, L.T., C.L. Ringwalt, and C.E. Williams, *Use of substance abuse treatment services by persons with mental health and substance use problems*. Psychiatr Serv, 2003. **54**(3): p. 363-9.
68. Druss, B.G., et al., *Understanding mental health treatment in persons without mental diagnoses: results from the National Comorbidity Survey Replication*. Arch Gen Psychiatry, 2007. **64**(10): p. 1196-203.
69. Sell, R.L., *Defining and measuring sexual orientation: A review*. Archives of Sexual Behavior, 1997. **26**(6): p. 643-658.
70. MA, Y.B.C. and M.K. EdM, *Assessment of sexual orientation in lesbian/gay/bisexual studies*. Journal of Homosexuality, 1996. **30**(4): p. 49-62.
71. Austin, S.B., et al., *Making Sense of Sexual Orientation Measures: Findings from a Cognitive Processing Study with Adolescents on Health Survey Questions*. Journal of LGBT Health Research, 2007. **3**(1): p. 55 - 65.

72. Badgett, M., *Best Practices for Asking Questions about Sexual Orientation on Surveys*. 2009.
73. Xu, F., M.R. Sternberg, and L.E. Markowitz, *Men who have sex with men in the United States: Demographic and behavioral characteristics and prevalence of HIV and HSV-2 infection: results from National Health and Nutrition Examination Survey 2001-2006*. Sexually transmitted diseases, 2010. **37**(6): p. 399.
74. Calzo, J.P., et al., *Retrospective recall of sexual orientation identity development among gay, lesbian, and bisexual adults*. 2011.
75. Black, D., et al., *The measurement of same-sex unmarried partner couples in the 2000 US Census*. 2007.
76. Heck, J.E. and J.S. Jacobson, *Asthma diagnosis among individuals in same-sex relationships*. Journal of Asthma, 2006. **43**(8): p. 579-584.
77. Heck, J.E., R.L. Sell, and S. Sheinfeld Gorin, *Health care access among individuals involved in same-sex relationships*. American Journal of Public Health, 2006: p. AJPH. 2005.062661 v1.
78. Clift, J.a.K., J., *Access to and Use of Medical Care Among Individuals in Same-Sex Couples: Findings from the Medical Expenditure Panel Survey (MEPS)*. 2010, AHRQ.
79. Nisbet, P.A., *Protective factors for suicidal black females*. Suicide and Life-Threatening Behavior, 1996. **26**(4): p. 325-341.
80. Greenfield, E.A. and N.F. Marks, *Formal volunteering as a protective factor for older adults' psychological well-being*. The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 2004. **59**(5): p. S258.
81. Hawton, K., *Sex and suicide*. The British Journal of Psychiatry, 2000. **177**(6): p. 484-485.
82. Buchmueller, T. and C.S. Carpenter, *Disparities in Health Insurance Coverage, Access, and Outcomes for Individuals in Same-Sex Versus Different-Sex Relationships, 2000-2007*. American journal of public health, 2010. **100**(3): p. 489.
83. McAlpine, D.D. and D. Mechanic, *Utilization of specialty mental health care among persons with severe mental illness: the roles of demographics, need, insurance, and risk*. Health Services Research, 2000. **35**(1 Pt 2): p. 277.
84. Currie, J. and J. Gruber, *Health insurance eligibility, utilization of medical care, and child health*. The Quarterly Journal of Economics, 1996. **111**(2): p. 431.
85. Alegria, M., et al., *Inequalities in use of specialty mental health services among Latinos, African Americans, and non-Latino whites*. Psychiatr Serv, 2002. **53**(12): p. 1547-55.
86. People, C.o.L.H.I.f.H. and I.o. Medicine, *Leading Health Indicators for Healthy People 2020: Letter Report*. 2011: Natl Academy Pr.
87. Gelberg, L., R.M. Andersen, and B.D. Leake, *The Behavioral Model for Vulnerable Populations: application to medical care use and outcomes for homeless people*. Health Services Research, 2000. **34**(6): p. 1273.
88. Zuvekas, S.H. and G.L. Olin, *Accuracy of Medicare expenditures in the medical expenditure panel survey*. Inquiry, 2009. **46**(1): p. 92-108.
89. Meyer, I.H., *Minority stress and mental health in gay men*. Journal of health and Social Behavior, 1995: p. 38-56.
90. Meyer, I.H., *Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: conceptual issues and research evidence*. Psychol Bull, 2003. **129**(5): p. 674-97.

91. Hershberger, S.L. and A.R. D'Augelli, *The impact of victimization on the mental health and suicidality of lesbian, gay, and bisexual youths*. *Developmental psychology*, 1995. **31**(1): p. 65.
92. McLaughlin, K.A., et al., *Disproportionate exposure to early-life adversity and sexual orientation disparities in psychiatric morbidity*. *Child Abuse & Neglect*, 2012. **36**(9): p. 645-655.
93. Bostwick, W.B., et al., *Dimensions of Sexual Orientation and the Prevalence of Mood and Anxiety Disorders in the United States*. *American journal of public health*, 2010. **100**(3): p. 468.
94. Gilman, S.E., et al., *Risk of psychiatric disorders among individuals reporting same-sex sexual partners in the National Comorbidity Survey*. *American Journal of Public Health*, 2001. **91**(6): p. 933-939.
95. Suarez, T., et al., *Selective serotonin reuptake inhibitors as a treatment for sexual compulsivity*. *Beyond Condoms*, 2002: p. 199-220.
96. Horberg, M.A., et al., *Effects of depression and selective serotonin reuptake inhibitor use on adherence to highly active antiretroviral therapy and on clinical outcomes in HIV-infected patients*. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, 2008. **47**(3): p. 384.
97. Himelhoch, S. and D.R. Medoff, *Efficacy of antidepressant medication among HIV-positive individuals with depression: A systematic review and meta-analysis*. *AIDS Patient Care & STDs*, 2005. **19**(12): p. 813-822.
98. Wang, P.S., et al., *Twelve-month use of mental health services in the United States: results from the National Comorbidity Survey Replication*. *Archives of general psychiatry*, 2005. **62**(6): p. 629.
99. Zuvekas, S.H., *Prescription Drugs And The Changing Patterns Of Treatment For Mental Disorders, 1996–2001*. *Health Affairs*, 2005. **24**(1): p. 195-205.
100. Mojtabai, R. and M. Olfson, *Proportion of antidepressants prescribed without a psychiatric diagnosis is growing*. *Health Affairs*, 2011. **30**(8): p. 1434-1442.
101. Grella, C.E., et al., *Influence of gender, sexual orientation, and need on treatment utilization for substance use and mental disorders: findings from the California Quality of Life Survey*. *BMC Psychiatry*, 2009. **9**: p. 52.
102. Demyttenaere, K., et al., *Prevalence, severity, and unmet need for treatment of mental disorders in the World Health Organization World Mental Health Surveys*. *JAMA: the journal of the American Medical Association*, 2004. **291**(21): p. 2581.
103. Piette, J.D., et al., *Perceived needs and unmet needs for formal services among people with HIV disease*. *Journal of Community Health*, 1993. **18**(1): p. 11-23.
104. Wells, K., et al., *Ethnic disparities in unmet need for alcoholism, drug abuse, and mental health care*. *Am J Psychiatry*, 2001. **158**(12): p. 2027-32.
105. Bijl, R.V. and A. Ravelli, *Psychiatric morbidity, service use, and need for care in the general population: results of The Netherlands Mental Health Survey and Incidence Study*. *American journal of public health*, 2000. **90**(4): p. 602.
106. Craske, M.G. and B.G. Zucker, *Consideration of the apa practice guideline for the treatment of patients with panic disorder: strengths and limitations for behavior therapy*. *Behavior Therapy*, 2001. **32**(2): p. 259-281.
107. Shapiro, S., et al., *Measuring need for mental health services in a general population*. *Medical Care*, 1985: p. 1033-1043.

108. Kessler, R.C., et al., *Prevalence and treatment of mental disorders, 1990 to 2003*. New England Journal of Medicine, 2005. **352**(24): p. 2515-2523.
109. Regier, D.A., et al., *Limitations of diagnostic criteria and assessment instruments for mental disorders: implications for research and policy*. Archives of general psychiatry, 1998. **55**(2): p. 109.
110. Kessler, R.C., et al., *Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States: results from the National Comorbidity Survey*. Archives of General Psychiatry, 1994. **51**(1): p. 8.
111. Druss, B.G., et al., *Mental health care quality under managed care in the United States: a view from the Health Employer Data and Information Set (HEDIS)*. American Journal of Psychiatry, 2002. **159**(5): p. 860.
112. Padgett, D.K., et al., *Ethnicity and the use of outpatient mental health services in a national insured population*. American journal of public health, 1994. **84**(2): p. 222.
113. Centers for Disease Control and Prevention (CDC). National Center for Health Statistics (NCHS). National Health and Nutrition Examination Survey Data. Hyattsville, M.U.S.D.o.H.
114. Faulkner, A.H. and K. Cranston, *Correlates of same-sex sexual behavior in a random sample of Massachusetts high school students*. American Journal of Public Health, 1998. **88**(2): p. 262-266.
115. Moriarty, D.G., M.M. Zack, and R. Kobau, *The Centers for Disease Control and Prevention's Healthy Days Measures—Population tracking of perceived physical and mental health over time*. Health and quality of life outcomes, 2003. **1**(1): p. 37.
116. Taylor, V.R., et al., *Measuring Healthy Days: Population Assessment of Health-related Quality of Life*. 2000, US Dept. of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Division of Adult and Community Health.
117. Strine, T.W., et al., *Risk behaviors and healthcare coverage among adults by frequent mental distress status, 2001*. American journal of preventive medicine, 2004. **26**(3): p. 213-216.
118. Centers for Disease Control and Prevention. *Measuring Healthy Days*. Atlanta, Georgia: CDC, November 2000.
119. Kimerling, R. and N. Baumrind, *Access to Mental Health Services Among California Women*. Women's Health: Findings from the California Women's Health Survey, 1997-2003.
120. Mumford, L., *Multum Lexicon Database*. 2008, Cerner Multum. Available at: <http://www.multum.com/Lexicon.htm> (accessed July 25, 2008).
121. PubMed Health, *Drugs and Supplements* http://www.ncbi.nlm.nih.gov/pubmedhealth/s/drugs_and_supplements/a/ (accessed July 25, 2008).
122. Drapeau, A., R. Boyer, and A. Lesage, *The influence of social anchorage on the gender difference in the use of mental health services*. The Journal of Behavioral Health Services and Research, 2009. **36**(3): p. 372-384.
123. Albizu-Garcia, C.E., et al., *Gender and health services use for a mental health problem*. Social science & medicine, 2001. **53**(7): p. 865-878.

124. Mays, V.M. and S.D. Cochran, *Mental health correlates of perceived discrimination among lesbian, gay, and bisexual adults in the United States*. American Journal of Public Health, 2001. **91**(11): p. 1869-1876.
125. DuBard, C.A. and Z. Gizlice, *Language spoken and differences in health status, access to care, and receipt of preventive services among US Hispanics*. American journal of public health, 2008. **98**(11): p. 2021.
126. Carrasquillo, O., A.I. Carrasquillo, and S. Shea, *Health insurance coverage of immigrants living in the United States: differences by citizenship status and country of origin*. American journal of public health, 2000. **90**(6): p. 917.
127. Larsen, L.J., *The Foreign-born Population in the United States, 2003*. 2004: US Dept. of Commerce, Economics and Statistics Administration, US Census Bureau.
128. Rostosky, S.S., et al., *Lesbian, gay, and bisexual individuals' psychological reactions to amendments denying access to civil marriage*. American Journal of Orthopsychiatry, 2010. **80**(3): p. 302-310.
129. Han, E. and G.G. Liu, *Racial disparities in prescription drug use for mental illness among population in US*. J Ment Health Policy Econ, 2005. **8**(3): p. 131-43.
130. Albelda, R., et al., *Poverty in the lesbian, gay, and bisexual community*. 2009.
131. Parks, C.A., T.L. Hughes, and A.K. Matthews, *Race/Ethnicity and Sexual Orientation: Intersecting Identities*. Cultural Diversity and Ethnic Minority Psychology, 2004. **10**(3): p. 241.
132. Williams, D.R., *The concept of race in Health Services Research: 1966 to 1990*. Health Services Research, 1994. **29**(3): p. 261.
133. Andersen, R.M., *National health surveys and the behavioral model of health services use*. Med Care, 2008. **46**(7): p. 647-53.
134. Hwang, W., et al., *Out-of-pocket medical spending for care of chronic conditions*. Health Affairs, 2001. **20**(6): p. 267.
135. Lurie, I.Z., L.M. Manheim, and D.D. Dunlop, *Differences in medical care expenditures for adults with depression compared to adults with major chronic conditions*. The journal of mental health policy and economics, 2009. **12**(2): p. 87.
136. Fredriksen-Goldsen, K.I., et al., *Health Disparities Among Lesbian, Gay, and Bisexual Older Adults: Results From a Population-Based Study*. American journal of public health, 2013(0): p. e1-e8.
137. D'Hoore, W., A. Bouckaert, and C. Tilquin, *Practical considerations on the use of the Charlson comorbidity index with administrative data bases*. Journal of Clinical Epidemiology, 1996. **49**(12): p. 1429-1433.
138. Deyo, R.A., D.C. Cherkin, and M.A. Ciol, *Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases*. Journal of Clinical Epidemiology, 1992. **45**(6): p. 613-619.
139. Valderas, J.M., et al., *Defining comorbidity: implications for understanding health and health services*. The Annals of Family Medicine, 2009. **7**(4): p. 357-363.
140. Fleming, P., et al. *HIV prevalence in the United States, 2000*. in *9th conference on Retroviruses and Opportunistic Infections*. 2002.
141. Campsmith, M.L., et al., *Undiagnosed HIV prevalence among adults and adolescents in the United States at the end of 2006*. JAIDS Journal of Acquired Immune Deficiency Syndromes, 2010. **53**(5): p. 619-624.
142. Allison, P.D. *Imputation of categorical variables with PROC MI*. 2005.

143. Little, R.J.A. and D.B. Rubin, *Statistical analysis with missing data*. 1987.
144. Royston, P., *Multiple imputation of missing values: update of ice*. Stata Journal, 2005. **5**(4): p. 527.
145. Cochran, S.D. and V.M. Mays, *Physical health complaints among lesbians, gay men, and bisexual and homosexually experienced heterosexual individuals: results from the California Quality of Life Survey*. Am J Public Health, 2007. **97**(11): p. 2048-55.
146. McIntyre, J., et al., *Systems-level Barriers in Accessing Supportive Mental Health Services for Sexual and Gender Minorities: Insights from the Provider's Perspective*. Canadian Journal of Community Mental Health (Revue canadienne de santé mentale communautaire), 2011. **30**(2): p. 173-186.
147. Lingley-Pottie, P., P.J. McGrath, and P. Andreou, *Barriers to Mental Health Care: Perceived Delivery System Differences*. Advances in Nursing Science, 2013. **36**(1): p. 51-61.
148. Thomas, K., et al., *County-level estimates of mental health professional shortage in the United States*. Psychiatric Services, 2009. **60**(10): p. 1323-1328.
149. Alegría, M., et al., *Mental health care for Latinos: Inequalities in use of specialty mental health services among Latinos, African Americans, and non-Latino Whites*. Psychiatric Services, 2002. **53**(12): p. 1547-1555.
150. Harris, K.M., M.J. Edlund, and S. Larson, *Racial and ethnic differences in the mental health problems and use of mental health care*. Medical care, 2005. **43**(8): p. 775-784.
151. Andrews, G., S. Henderson, and W. Hall, *Prevalence, comorbidity, disability and service utilisation: overview of the Australian National Mental Health Survey*. The British Journal of Psychiatry, 2001. **178**(2): p. 145.
152. Druss, B.G., et al., *Primary care, public health, and mental health*. Preventing chronic disease, 2010. **7**(1).
153. Turner, B.J., et al., *Relationship of Gender, Depression, and Health Care Delivery With Antiretroviral Adherence in HIV infected Drug Users*. Journal of General Internal Medicine, 2003. **18**(4): p. 248-257.
154. Chen, R.Y., et al., *Distribution of health care expenditures for HIV-infected patients*. Clinical Infectious Diseases, 2006. **42**(7): p. 1003.
155. Burnam, M.A., et al., *Use of mental health and substance abuse treatment services among adults with HIV in the United States*. Archives of general psychiatry, 2001. **58**(8): p. 729.
156. Sorensen, L. and S.J. Roberts, *Lesbian uses of and satisfaction with mental health services: Results from Boston Lesbian Health Project*. Journal of homosexuality, 1997.
157. Landerman, L.R., et al., *The relationship between insurance coverage and psychiatric disorder in predicting use of mental health services*. American Journal of Psychiatry, 1994. **151**(12): p. 1785.
158. Olfson, M., et al., *National trends in the outpatient treatment of children and adolescents with antipsychotic drugs*. Archives of general psychiatry, 2006. **63**(6): p. 679.
159. Olfson, M., et al., *National trends in the outpatient treatment of depression*. JAMA: the journal of the American Medical Association, 2002. **287**(2): p. 203.
160. Andersen, R.M., *Revisiting the behavioral model and access to medical care: does it matter?* J Health Soc Behav, 1995. **36**(1): p. 1-10.

161. Phillips, K.A., et al., *Understanding the context of healthcare utilization: assessing environmental and provider-related variables in the behavioral model of utilization*. Health Services Research, 1998. **33**(3 Pt 1): p. 571.
162. Branch, L., et al., *Toward understanding elders' health service utilization*. Journal of Community Health, 1981. **7**(2): p. 80-92.
163. Dhingra, S.S., et al., *Determining Prevalence and Correlates of Psychiatric Treatment With Andersen's Behavioral Model of Health Services Use*. Psychiatric Services, 2010. **61**(5): p. 524.
164. Andersen, R. and J.F. Newman, *Societal and individual determinants of medical care utilization in the United States*. Milbank Quarterly, 2005. **83**(4): p. Online only-Online only.
165. Harman, J.S., M.J. Edlund, and J.C. Fortney, *Disparities in the adequacy of depression treatment in the United States*. Psychiatric Services, 2004. **55**(12): p. 1379.
166. Cochran, S.D., et al., *Mental health and substance use disorders among Latino and Asian American lesbian, gay, and bisexual adults*. J Consult Clin Psychol, 2007. **75**(5): p. 785-94.
167. Torrey, W.C., et al., *Implementing evidence-based practices for persons with severe mental illnesses*. Psychiatric Services, 2001. **52**(1): p. 45.
168. Drake, R.E., et al., *Implementing evidence-based practices in routine mental health service settings*. Psychiatric Services, 2001. **52**(2): p. 179.
169. Mellman, T.A., et al., *Evidence-based pharmacologic treatment for people with severe mental illness: a focus on guidelines and algorithms*. Psychiatric Services, 2001. **52**(5): p. 619.
170. McGlynn, E.A., et al., *The quality of health care delivered to adults in the United States*. New England Journal of Medicine, 2003. **348**(26): p. 2635-2645.
171. Saxena, S., et al., *World Health Organization's Mental Health Atlas 2005: implications for policy development*. World Psychiatry, 2006. **5**(3): p. 179.
172. Saxena, S., et al., *Resources for mental health: scarcity, inequity, and inefficiency*. The Lancet, 2007. **370**(9590): p. 878-889.
173. Williams, K.A. and M.V. Chapman, *Comparing Health and Mental Health Needs, Service Use, and Barriers to Services among Sexual Minority Youths and Their Peers*. Health and Social Work, 2011. **36**(3): p. 197-206.
174. Addis, S., et al., *The health, social care and housing needs of lesbian, gay, bisexual and transgender older people: A review of the literature*. Health & social care in the community, 2009. **17**(6): p. 647-658.
175. McNair, R., L.A. Szalacha, and T.L. Hughes, *Health Status, Health Service Use, and Satisfaction According to Sexual Identity of Young Australian Women*. Women's Health Issues, 2011. **21**(1): p. 40-47.
176. Olfson, M., et al., *Dropout from outpatient mental health care in the United States*. Psychiatric Services, 2009. **60**(7): p. 898.
177. Petrou, S., et al., *The accuracy of self-reported healthcare resource utilization in health economic studies*. International journal of technology assessment in health care, 2002. **18**(3): p. 705-710.
178. Zuvekas, S.H. and G.L. Olin, *Validating household reports of health care use in the medical expenditure panel survey*. Health Serv Res, 2009. **44**(5 Pt 1): p. 1679-700.
179. Waite, L.J., *Does marriage matter?* Demography, 1995. **32**(4): p. 483-507.

180. Kalmijn, M., A. Loeve, and D. Manting, *Income dynamics in couples and the dissolution of marriage and cohabitation*. Demography, 2007. **44**(1): p. 159-179.
181. Medicare, Medicare Payment Advisory Commission. Report to the Congress: Selected Medicare Issues (June 1999). Washington DC: MedPAC.
182. Bender, D.S., et al., *Treatment utilization by patients with personality disorders*. American Journal of Psychiatry, 2001. **158**(2): p. 295.
183. Busch, S.H., *Specialty Health Care, Treatment Patterns, and Quality: The Impact of a Mental Health Carve Out on Care for Depression*. Health Services Research, 2002. **37**(6): p. 1583-1601.
184. Schulberg, H.C., et al., *Treating major depression in primary care practice: an update of the Agency for Health Care Policy and Research Practice Guidelines*. Archives of general psychiatry, 1998. **55**(12): p. 1121.
185. Blackford, J.U., *Propensity scores: Method for matching on multiple variables in down syndrome research*. Journal Information, 2009. **47**(5).
186. Koopmans, G.T. and L.M. Lamers, *Gender and health care utilization: The role of mental distress and help-seeking propensity*. Social science & medicine, 2007. **64**(6): p. 1216-1230.
187. Seal, K.H., et al., *Bringing the war back home: Mental health disorders among 103 788 US veterans returning from Iraq and Afghanistan seen at Department of Veterans Affairs Facilities*. Archives of Internal Medicine, 2007. **167**(5): p. 476.
188. Cheung, F.K. and L.R. Snowden, *Community mental health and ethnic minority populations*. Community Mental Health Journal, 1990. **26**(3): p. 277-291.
189. Dowd, B., et al., *Health plan choice and the utilization of health care services*. The review of Economics and Statistics, 1991: p. 85-93.
190. Katz, S.J., et al., *Medication management of depression in the United States and Ontario*. Journal of General Internal Medicine, 1998. **13**(2): p. 77-85.
191. Cook, B.L., T. McGuire, and J. Miranda, *Measuring trends in mental health care disparities, 2000 2004*. Psychiatric Services, 2007. **58**(12): p. 1533.
192. Cook, J.A., *Employment barriers for persons with psychiatric disabilities: Update of a report for the President's Commission*. Psychiatric Services, 2006. **57**(10): p. 1391.
193. Kessler, R.C., et al., *Individual and Societal Effects of Mental Disorders on Earnings in the United States: Results From the National Comorbidity Survey Replication*. Am J Psychiatry, 2008. **165**(6): p. 703-711.
194. Burkhauser, R.V., A.J. Houtenville, and L. Rovba, *Accounting for the declining fortunes of working-age people with disabilities*. Ithaca, NY: Cornell University, Rehabilitation Research and Training Center on Employment, 2007.
195. Judd, L.L. and H.S. Akiskal, *The prevalence and disability of bipolar spectrum disorders in the US population: re-analysis of the ECA database taking into account subthreshold cases*. Journal of Affective Disorders, 2003. **73**(1-2): p. 123-131.
196. Katz, S.J., et al., *The use of outpatient mental health services in the United States and Ontario: the impact of mental morbidity and perceived need for care*. American journal of public health, 1997. **87**(7): p. 1136.
197. Diamant, A.L., et al., *Health behaviors, health status, and access to and use of health care: a population-based study of lesbian, bisexual, and heterosexual women*. Arch Fam Med, 2000. **9**(10): p. 1043-51.

198. Cunningham, P.J., *Beyond parity: primary care physicians' perspectives on access to mental health care*. Health Affairs, 2009. **28**(3): p. w490-w501.
199. Austin, P.C., *Type I error rates, coverage of confidence intervals, and variance estimation in propensity-score matched analyses*. The International Journal of Biostatistics, 2009. **5**(1): p. 13.
200. Connelly, J.E., et al., *Health perceptions of primary care patients and the influence on health care utilization*. Medical care, 1989: p. 99-109.
201. Miilunpalo, S., et al., *Self-rated health status as a health measure: the predictive value of self-reported health status on the use of physician services and on mortality in the working-age population*. Journal of Clinical Epidemiology, 1997. **50**(5): p. 517-528.
202. Kaplan, G.A. and T. Camacho, *Perceived health and mortality: a nine-year follow-up of the human population laboratory cohort*. American Journal of Epidemiology, 1983. **117**(3): p. 292.
203. DuGoff, E.H., M. Schuler, and E.A. Stuart, *Generalizing Observational Study Results: Applying Propensity Score Methods to Complex Surveys*. Health services research, 2013.
204. Rothman, K.J., S. Greenland, and T.L. Lash, *Modern epidemiology*. 2008: Lippincott Williams & Wilkins.
205. Rosenbaum, P.R. and D.B. Rubin, *The central role of the propensity score in observational studies for causal effects*. Biometrika, 1983. **70**(1): p. 41.
206. Joffe, M.M. and P.R. Rosenbaum, *Propensity scores*. American Journal of Epidemiology, 1999. **150**(4): p. 327-333.
207. Ho, D.E., et al., *Matching as nonparametric preprocessing for reducing model dependence in parametric causal inference*. Political Analysis, 2007. **15**(3): p. 199.
208. Austin, P.C., *Balance diagnostics for comparing the distribution of baseline covariates between treatment groups in propensity-score matched samples*. Statistics in Medicine, 2009. **28**: p. 3083-3107.
209. Shah, B.R., et al., *Propensity score methods gave similar results to traditional regression modeling in observational studies: a systematic review*. Journal of Clinical Epidemiology, 2005. **58**(6): p. 550-559.
210. Dehejia, R., *Practical propensity score matching: a reply to Smith and Todd*. Journal of Econometrics, 2005. **125**(1-2): p. 355-364.
211. Dehejia, R.H. and S. Wahba, *Propensity score-matching methods for nonexperimental causal studies*. Review of Economics and statistics, 2002. **84**(1): p. 151-161.
212. Austin, P.C., P. Grootendorst, and G.M. Anderson, *A comparison of the ability of different propensity score models to balance measured variables between treated and untreated subjects: a Monte Carlo study*. Statistics in Medicine, 2007. **26**(4): p. 734-753.
213. Austin, P.C. and M.M. Mamdani, *A comparison of propensity score methods: a case study estimating the effectiveness of post AMI statin use*. Statistics in Medicine, 2006. **25**(12): p. 2084-2106.
214. Austin, P.C., *The relative ability of different propensity score methods to balance measured covariates between treated and untreated subjects in observational studies*. Medical Decision Making, 2009. **29**(6): p. 661.
215. Austin, P.C., *The performance of different propensity-score methods for estimating differences in proportions (risk differences or absolute risk reductions) in observational studies*. Statistics in Medicine, 2010. **29**: p. 2137-2148.

216. Austin, P.C., *An Introduction to Propensity Score Methods for Reducing the Effects of Confounding in Observational Studies*. Multivariate Behavioral Research, 2011. **46**(3): p. 399-424.
217. Caliendo, M. and S. Kopeinig, *Some practical guidance for the implementation of propensity score matching*. Journal of economic surveys, 2008. **22**(1): p. 31-72.
218. Carpenter, C. and G.J. Gates, *Gay and lesbian partnership: evidence from California*. Demography, 2008. **45**(3): p. 573-590.
219. Wang, P.S., et al., *Failure and delay in initial treatment contact after first onset of mental disorders in the National Comorbidity Survey Replication*. Archives of general psychiatry, 2005. **62**(6): p. 603.
220. Turner, C.F., et al., *Same-Gender Sex Among US Adults Trends Across the Twentieth Century and During the 1990s*. Public opinion quarterly, 2005. **69**(3): p. 439-462.
221. Spitzer, R.L., *Diagnosis and need for treatment are not the same*. Archives of general psychiatry, 1998. **55**(2): p. 120.
222. Brown Jr, E., *STATISTICAL BRIEF# 319*. Health Care, 2011.
223. Roehrig, C., et al., *National health spending by medical condition, 1996–2005*. Health Affairs, 2009. **28**(2): p. w358.
224. Grabe, H.J., et al., *Association of mental distress with health care utilization and costs: a 5-year observation in a general population*. Social Psychiatry and Psychiatric Epidemiology, 2009. **44**(10): p. 835-844.
225. Hamre, H.J., et al., *Health costs in patients treated for depression, in patients with depressive symptoms treated for another chronic disorder, and in non-depressed patients: a two-year prospective cohort study in anthroposophic outpatient settings*. The European Journal of Health Economics, 2010. **11**(1): p. 77-94.
226. Simon, G.E., et al., *Impact of visit copayments on outpatient mental health utilization by members of a health maintenance organization*. American Journal of Psychiatry, 1996. **153**(3): p. 331.
227. Simon, G.E., M. VonKorff, and M.L. Durham, *Predictors of outpatient mental health utilization by primary care patients in a health maintenance organization*. American Journal of Psychiatry, 1994. **151**(6): p. 908.
228. Mark, T.L., et al., *Changes In US Spending On Mental Health And Substance Abuse Treatment, 1986–2005, And Implications For Policy*. Health Affairs, 2011. **30**(2): p. 284-292.
229. Chernew, M.E., R.A. Hirth, and D.M. Cutler, *Increased spending on health care: long-term implications for the nation*. Health Affairs, 2009. **28**(5): p. 1253-1255.
230. Martin, A.B., et al., *National Health Spending In 2012: Rate Of Health Spending Growth Remained Low For The Fourth Consecutive Year*. Health Affairs, 2014. **33**(1): p. 67-77.
231. Druss, B.G., *Rising Mental Health Costs: What Are We Getting For Our Money?* Health Affairs, 2006. **25**(3): p. 614-622.
232. Frank, R.G., H.H. Goldman, and T.G. McGuire, *Trends In Mental Health Cost Growth: An Expanded Role For Management?* Health Affairs, 2009. **28**(3): p. 649-659.
233. Institute of Medicine, *Crossing the Quality Chasm: A New Health System for the Twenty-first Century* (Washington: National Academy Press, 2001).
234. Gonzalez, J.M., *National Health Care Expenses in the U.S. Civilian Noninstitutionalized Population, 2011*. Statistical Brief #425.

235. Buntin, M.B. and A.M. Zaslavsky, *Too much ado about two-part models and transformation?:: Comparing methods of modeling Medicare expenditures*. Journal of health economics, 2004. **23**(3): p. 525-542.
236. Olfson, M., et al., *National Trends in the Mental Health Care of Children, Adolescents, and Adults by Office-Based Physicians*. JAMA psychiatry (Chicago, Ill.), 2013.
237. Heider, D., et al., *Direct medical mental health care costs of schizophrenia in France, Germany and the United Kingdom-findings from the European Schizophrenia Cohort (EuroSC)*. European Psychiatry, 2009. **24**(4): p. 216-224.
238. MEPS, 2008 Rx Drug. 2013 [cited 2013 11/19/2013]; Available from: http://www.meps.ahrq.gov/mepsweb/data_stats/download_data_files_detail.jsp?cboPufNumber=HC-118A.
239. MEPS. *USING APPROPRIATE PRICE INDICES FOR ANALYSES OF HEALTH CARE EXPENDITURES OR INCOME ACROSS MULTIPLE YEARS*. 2013 [cited 2013 11/19/2013]; Available from: http://meps.ahrq.gov/about_meps/Price_Index.shtml.
240. Asch, S.M., et al., *Who is at greatest risk for receiving poor-quality health care?* New England Journal of Medicine, 2006. **354**(11): p. 1147-1156.
241. Berg, N. and D. Lien, *Measuring the effect of sexual orientation on income: evidence of discrimination?* Contemporary Economic Policy, 2002. **20**(4): p. 394-414.
242. Conron, K.J., M.J. Mimiaga, and S.J. Landers, *A population-based study of sexual orientation identity and gender differences in adult health*. American journal of public health, 2010: p. AJPH. 2009.174169 v2.
243. Jepsen, C. and L.K. Jepsen, *Does home ownership vary by sexual orientation?* Regional Science and Urban Economics, 2009. **39**(3): p. 307-315.
244. Yu, Yu WW, Machlin S. Examination of Skewed Health Expenditure Data from the Medical Expenditure Panel Survey (MEPS). Agency for Healthcare Research and Quality Working Paper No. 04002, October 2004, <http://www.ahrq.gov>.
245. Dowd, B. and R.J. Town, *Does X Really Cause Y?* 2002: Citeseer.
246. Roberts, A.L., M.M. Glymour, and K.C. Koenen, *Does maltreatment in childhood affect sexual orientation in adulthood?* Archives of sexual behavior, 2013. **42**(2): p. 161-171.
247. Antecol, H. and M.D. Steinberger, *Female labor supply differences by sexual orientation: a semi-parametric decomposition approach*. 2009, IZA discussion papers.
248. Belotti, F. and P. Deb, *TPM: Stata module to estimate two-part cross-sectional models*. Statistical Software Components, 2013.
249. Manning, W.G. and J. Mullahy, *Estimating log models: to transform or not to transform?* I*. Journal of health economics, 2001. **20**(4): p. 461-494.
250. Manning, W.G., *The logged dependent variable, heteroscedasticity, and the retransformation problem*. Journal of health economics, 1998. **17**(3): p. 283.
251. Park, R.E., *Estimation with heteroscedastic error terms*. Econometrica, 1966. **34**(4): p. 888.
252. Heinrich, S., et al., *Accuracy of self-reports of mental health care utilization and calculated costs compared to hospital records*. Psychiatry research, 2011. **185**(1-2): p. 261-268.
253. Roberts, R.O., et al., *Comparison of self-reported and medical record health care utilization measures* I*. Journal of Clinical Epidemiology, 1996. **49**(9): p. 989-995.
254. Ritter, P.L., et al., *Self-reports of health care utilization compared to provider records*. Journal of Clinical Epidemiology, 2001. **54**(2): p. 136-141.

255. Rosenheck, R.A. and G.A. Greenberg, *Mental Health Correlates of Past Homelessness in the National Comorbidity Study Replication*. Journal of Health Care for the Poor and Underserved, 2010. **21**(4): p. 1234-1249.
256. James, D.J., L.E. Glaze, and U.S.B.o.J. Statistics, *Mental health problems of prison and jail inmates*. 2006: US Dept. of Justice, Office of Justice Programs, Bureau of Justice Statistics.
257. Ku, L., *Health insurance coverage and medical expenditures of immigrants and native-born citizens in the United States*. American journal of public health, 2009. **99**(7): p. 1322.
258. Ku, L. and S. Matani, *Left out: immigrants' access to health care and insurance*. Health Affairs, 2001. **20**(1): p. 247.
259. Antecol, H. and K. Bedard, *Unhealthy Assimilation: Do Immigrants Converge to American Weights?* Claremont McKenna College—Working Paper Series, 2004.
260. Garfield, R.L., et al., *The impact of national health care reform on adults with severe mental disorders*. American Journal of Psychiatry, 2011. **168**(5): p. 486-494.
261. Buerhaus, P.I. and S.M. Retchin, *The dormant National Health Care Workforce Commission needs congressional funding to fulfill its promise*. Health Affairs, 2013. **32**(11): p. 2021-2024.
262. Ryu, A.J., et al., *The Slowdown In Health Care Spending In 2009–11 Reflected Factors Other Than The Weak Economy And Thus May Persist*. Health Affairs, 2013. **32**(5): p. 835-840.
263. Gordon, A.R. and I.H. Meyer, *Gender nonconformity as a target of prejudice, discrimination, and violence against LGB individuals*. Journal of LGBT Health Research, 2008. **3**(3): p. 55-71.
264. McCabe, S.E., et al., *Sexual orientation, substance use behaviors and substance dependence in the United States*. Addiction, 2009. **104**(8): p. 1333-1345.
265. Cahill, S. and H. Makadon, *Sexual Orientation and Gender Identity Data Collection in Clinical Settings and in Electronic Health Records: A Key to Ending LGBT Health Disparities*. LGBT Health, 2014. **1**(1): p. 34-41.