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Health Disparities Among Sexual and Gender Minorities

Jennifer Keeley

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HEALTH DISPARITIES AMONG SEXUAL
AND GENDER MINORITIES

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Abstract

Decades of research has shown that sexual and gender minorities (SGMs) experience adverse health and mental health outcomes to a greater extent than their heterosexual peers. The need to better understand and eliminate health disparities in the SGM population was recognized by the National Institute on Minority Health and Health Disparities (NIMHD) at NIH. The Secretary of Health at the Department of Health and Human Services approved the designation of the SGM population as a health disparities population in 2016 and called for SGM studies to examine the health needs of the SGM population across SGM subgroups via large representative samples of the SGM population. This cross-sectional study drew from the 2016 Behavioral Risk Factor Surveillance System (BRFSS) to examine the mental health outcome of mental health distress across SGM subgroups in a large representative sample of SGMs and heterosexual adults in the US population. A series of multiple logistic regression analyses were conducted to assess the odds for SGM subgroups to experience more days of mental health distress relative to heterosexual peers. SGM subgroups had significantly greater odds for experiencing both 1-14 days and 15-30 days of mental health distress relative to their heterosexual peers; however, the magnitude of these odds differed across SGM subgroups. Bisexual females had notably greater odds of experiencing more days of mental health distress (OR=5.40, CI 4.16-7.01) while the lesbian females had notably lower odds of mental health distress across SGM subgroups. The odds for lesbian females to experience 1-14 days of mental health distress were no longer significantly greater than their heterosexual peers when adjusting for sociodemographic factors; lesbian females no longer had significantly greater odds of experiencing more days of mental health distress (1-14 days and 15-30 days) than their heterosexual peers when adjusting for education, income, and age; Multiracial females who identified as lesbian had significantly lower odds of experiencing mental health distress relative to White (non-Hispanic) heterosexual females (OR=.09, CI .92-.93). The findings from this study support the conclusions put forth in the current SGM research: SGMs have greater odds of experiencing mental health distress compared to their heterosexual

peers; however, these odds vary across SGM subgroups and within sociodemographic segments of the SGM population.

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HEALTH DISPARITIES AMONG SEXUAL ORIENTATION MINORITIES

Introduction

Several decades of research and public health data have shown that particular segments of the population experience unfavorable health outcomes and engage in health-risk behaviors to a greater extent than the general population (Benz, Espinosa, Welsh, & Fontes, 2011; Eltom, Tchounwou, & Rice, 2011; National Center for Health Statistics, 2016; Office of Minority Health, 2011). This body of research and public health reports have documented disparities in the health and health risk behaviors of particular ethnic and racial groups, socioeconomic classes, and age and gender specific segments of the population. These disparities span from the prevalence and high incidence rates of various chronic health conditions, infectious diseases, mental health illnesses, and various health risk behaviors (Center of Disease Control and Prevention [CDC], 2016; Lick, Durso, & Johnson, 2013).

A more recently recognized segment of the population with significant health disparities is the population of sexual and gender orientation minorities (SGMs) (Daniel & Butkus, 2015; Healthy People 2020, 2017). Earlier research and public health data have documented significant disparities in the prevalence of sexually transmitted diseases, adverse mental health conditions, and various health risk behaviors among SGM populations (Daniel & Butkus, 2015; Institute of Medicine, 2011; Jabson, Farmer, & Bowen, 2014; Meyer, 2016; Tjepkema, 2008). Although these and other health disparities have been well documented among SGMs, adverse health conditions continue to persist within this segment of the population (CDC, 2016; Healthy People 2020, 2018; van Anders, 2015).

Addressing and ultimately eliminating the health disparities that continue to persist among SGMs has become an explicitly recognized goal of prominent and less prominent public

health organizations (CDC, 2016; Healthy People 2020, 2016, 2018). Toward this end, public health entities have called for SGM studies to draw from large representative samples of SGM populations to examine health disparities of SGMs across SGM subgroups in conjunction with sociodemographic factors associated with health disparities in SGM populations (Gonzales, , & Henning-Smith, 2016). This study contributes toward this end. This study specifically draws from the 2016 Behavioral Risk Factor Surveillance System (BRFSS)(BRFSS, 2016) to (a) examine differences in the health outcome of mental health distress across sexual orientation subgroups and (b) further examine the extent and the manner in which sociodemographic factors contribute to differences in mental health distress across SGM subgroups in a large representative sample of SGMs and heterosexual adults in the US population.

The first section of this study presents the background on health disparities in the US population. This section begins with an overview of the health disparities that first emerged in the US population and further details the health equity initiatives of the federal government and public health entities that unfolded over the last several decades. This section continues to narrow in on the health disparities of SGM populations and further details the SGM health equity initiatives of the federal government and public health entities that unfolded over the last decade. The current research that this study draws from and builds upon is then presented. This section concludes with the research objectives and the research questions that this study sought to address.

Background

Health Disparities and Health Equity Initiatives

Disparities in health outcomes and health risk behaviors of particular segments of the population emerged as a public health concern in the late 1970's and early 1980's. Significant

disparities were particularly noted in the health and health risk behaviors of Black males. Reports from the National Institutes of Health (NIH) and other health entities found that Black males had a shorter life expectancy and significantly higher rates of heart disease, diabetes, cancer, infant mortality, lower birth weights, and substance abuse behaviors compared to other ethnic and racial groups in the US population (Commission on Social Determinants of Health, 2008; Secretary's Task Force on Black and Minority Health, 2016).

In 1985, the Department of Health and Human Services (DHHS) established the Task Force on Black and Minority Health to assess the extent of the health disparities among ethnic and racial minorities and to put forth a national agenda for eliminating these disparities. The final report from the task force noted significant disparities in the health and health risk behaviors of Black ethnic minorities and other ethnic and racial minority groups in the US population. The task force put forth a national agenda for eliminating these health disparities that included (a) improving data collection processes to monitor the health and health needs of particular segments of the population, (b) addressing the unique needs of particular segments of the population via health promotion programs and outreach endeavors, and (c) improving access to quality health care (Secretary's Task Force on Black and Minority Health, 2016).

The federal government continued to work toward the elimination of health disparities in the US population with the enactment of the Minority Health and Health Disparities Research and Education Act of 2000 (Public Law 106–525, 2000). The enactment of the Minority Health and Health Disparities Research Act gave formal recognition to populations with health disparities via putting forth the definition of a health disparity population. A health disparity population was defined as “a population that has a significant disparity in the overall rate of disease incidence, prevalence, morbidity, mortality, or survival rates in the population as

compared to the health status of the general population” (PL 106-255, 2000). The Minority Health and Health Disparities Research Act established the *National Center of Minority Health and Health Disparities* (NCMHD) to work with the NIH to advance health equity within populations that have been identified as a health disparity population. The director of the NCMHD was established as the authorizing entity for designating a population as a health disparity population (NIH, 2004).

The NCMHD transitioned to an NIH entity in 2010 and became the *National Institute of Minority Health and Health Disparities* (NIMHD). As an institute of the NIH, the NIMHD was given the authority and responsibility of (a) establishing and supporting a research infrastructure that identifies and addresses the health disparities in health disparity populations, (b) engaging in health minority research, and (c) developing and implementing health equity programs and community outreach endeavors that address the health needs in health disparity populations.

SGM Health Disparities and Health Equity Initiatives

In 2015, the newly appointed director of the NIMHD, Eliseo Perez-Stable, gave formal recognition to SGMs as a distinct segment of the population and designated the SGM population as a health disparity population (NIH, 2015). Perez-Stable defined SGMs as a population that “encompasses lesbian, gay, bisexual, and transgender populations, as well as those whose sexual orientation, gender identity and expressions, or reproductive development varies from traditional societal, cultural, or physiological norms” (NIH, 2015, Perez-Stable, para 2). Perez-Stable noted that the designation of SGMs as a health disparity population was a significant milestone for the SGM population. Perez-Stable further noted this designation was a significant accomplishment of the SGM constituents of the minority health and health disparities entities of the NIH and other public health organizations and research entities that took over a decade to achieve. The

SGM constituents of the NIH and other public health organizations and research entities achieved this end via putting forth a comprehensive and culminating portfolio of SGM research and research findings. *SGM Health and Research Portfolio*, established the need to address the health disparities of the SGM population. Drawing from the SGM health and research portfolio, Perez-Stable noted that there are significant disparities in the health of SGMs and that “the extent and causes of health disparities are not fully understood, and research on how to close these gaps is lacking” (para. 3).

The SGM research portfolio and culminating report of the SGM health and research entities drew from several decades of research and public health data that showed significant disparities in the health and health risk behaviors of SGMs (Institute of Medicine, 2011). The earlier SGM research focused on the prevalence of sexually transmitted diseases and health-risk behaviors among SGMs in the adult population. This body of research continued to show a high prevalence of sexually transmitted diseases, mental health illnesses, and health-risk behaviors among SGMs (Conron et al., 2010; Ward, Dahlhamer, Galinsky, & Joest, 2015.).

The report from the SGM health and research entities noted that although earlier studies showed significant disparities in the health and health-risk behaviors of SGMs, the SGM research was limited by a lack of SGM data from population-based data sources (Institute of Medicine, 2011). The lack of population-based SGM data sources limited SGM studies to non-random descriptive studies with small and non-representative study samples that were often retrieved from sexual minority organizations or sexual minority oriented clinical settings (Coulter, Kenst, Bowen, & Scout, 2014; Meyers, 2016; Weissman, & Hasnain-Wynia, 2011). The lack of population-based SGM data sources further limited earlier studies to overly simplistic study designs that often examined SGMs as a homogenous population and examined a

single health outcome or health risk behavior in isolation of other co-morbid factors or pertinent sociodemographic attributes of SGMs (Thomeer 2013). As the SGM population is comprised of distinct SGM subgroups and spans across sociodemographic segments of the population (Fredriksen-Goldsen, Simoni, Kim, Lehavot, Walters, Lang, J., et al., 2014; Macapagal, Bhatia, & Greene, 2016; Smalley, Barefoot, & Warren, 2016), these earlier studies fell short of providing the insights needed to address the unique health needs of this segment of the population (Gates, 2017; Gorman, Denney, Dowdy, & Medeiros, 2016).

The NIH began to move forward with addressing the health disparities of the SGMs in 2009. The NIH specifically commissioned the Institute of Medicine (IOM) to assess the SGM research and to put forth a research agenda to identify and address the health needs of SGMs. The IOM presented their findings in the 2011 IOM report, *The Health of LGBT People*. The IOM report identified the shortcomings and gaps in the SGM research and called for SGM studies to identify and further examine the health needs of SGM subgroups across sociodemographic subpopulations (NIH IOM Report, 2009). The IOM report further noted the need for more population-based data sources with SGM orientation identification data and put forth the recommendation for additional NIH funding to support public health organizations that collect SGM identification data in population-based surveillance system surveys (NIH IOM Report, 2009).

The U.S. Department of Health and Human Services further advanced efforts to address the needs of SGMs in the 2011 *Healthy People 2020* report (Healthy People 2020, 2011). The US Department of Health and Human Services specifically added the goal of improving the health, safety, and well-being of SGMs to the *Healthy People 2020* health initiative. The US Department of Health and Human Services further noted the need for population-based

surveillance systems to include SGM identity questions as a means of monitoring progress toward this goal (Health People 2020, 2018).

The findings and recommendations put forth in the 2011 IOM report supported efforts to move forward with designating SGMs as a health disparities population. The NIH began to work toward this end via establishing the Sexual and Gender Minority Research Office (SGMO) and forming the Sexual and Gender Minority Research Coordinating Committee (SGM RCC) within the SGMO to manage and coordinate the SGM health equity initiatives of the NIH. The SGM RCC was given the task of assessing the current SGM research and identifying the SGM research needs and monitoring and coordinating the development of the SGM health and research portfolio in accordance with the recommendations put forth by the IOM (NIH, 2013). The SGM RCC findings were presented in the 2012 NIH FY 2016-2020 Strategic Plan to Advance Research on the Health and Well-Being of Sexual and Gender Minorities (2014).

The SGM RCC report continued to confirm significant disparities in the health and health risk behaviors of SGMs and further noted significant differences in the health disparities of specific SGM populations across racial and ethnic subgroups. SGMs were found to be 1.5 times more likely to experience depression and anxiety disorders than their heterosexual peers and sexually transmitted infections. The SGM RCC found that HIV/AIDS continued to be significantly more prevalent among SGMs compared to their heterosexual peers. They further identified significant disparities in the prevalence and incidence rates of sexually transmitted infections and HIV/AIDS among particular ethnic and racial groups of SGMs. These findings included a statistically significantly higher prevalence of sexually transmitted infections and HIV/AIDS among gay, Black men compared to gay men who were either White or Latino.

The SGM RCC report documented significant disparities in the health of SGM females compared to their heterosexual peers as well. The SGM RCC found that lesbian and bisexual women were at greater risk for cervical, ovarian, and breast cancer compared to their heterosexual peers. Cardiovascular disease was found to be more prevalent among lesbian and bisexual women. Bisexual women were found to have a higher prevalence of diabetes compared to their heterosexual peers (NIH Sexual and Gender Minority Research Committee, 2014).

Bränström, Hatzenbuehler, and Pachankis (2016) examined differences in the physical health of SMs in conjunction with age and gender among sexual minority individuals and heterosexuals in Sweden (Bränström, Hatzenbuehler, & Pachankis, 2016). This study showed that sexual minority health disparities are more prominent among sexual minority youth and young adults than among older SM populations. Fredrickson, Kim, Shui, and Bryan (2017) examined disparities in chronic health conditions in conjunction with age and gender of SM individuals. The findings of this study continued to show important differences in the prevalence of chronic health conditions among gender and age specific SM segments of the population

The SGM RCC report identified methodological flaws and shortcomings with earlier SGM studies and pointed to small sample sizes and non-representative study samples that precluded the findings of earlier studies from addressing the health needs of this segment of the population. The SGM RCC highlighted the need for SGM studies to examine the health needs of SGMs in large representative populations of SGMs and to examine the health and health risk behaviors of SGMs across SGM subgroups in conjunction with sociodemographic attributes of SGMs that are associated with favorable and less favorable health outcomes and health risk behaviors of SGM populations. The SGM RCC report noted the need for population-based data sources to provide SGM data to support the call for more rigorous and comprehensive SGM

research studies. The final report of the SGM RCC put forth the recommendation for public health organizations to include SGM data in population-based health surveillance systems (SGM Strategic Plan, 2014).

The call for public health organizations to collect sexual orientation data in public health surveillance system surveys was addressed by prominent public health organizations over the last several years. The CDC added sexual orientation identification survey items in the National Health and Nutrition Examination Survey (NHANES) and the National Health Interview Survey (NHIS) in 2011 and 2013, respectively. In 2016 the CDC added sexual orientation as an optional demographic question in the *BRFSS* survey (Centers for Disease Control and Prevention [CDC], 2016).

Current SGM Research: Findings and Research Implications

With sexual and gender orientation included in the demographic portion of public health surveillance system surveys, a growing number of scholars have addressed the call for additional SGM studies that identify and further examine the unique health needs and the health risk behaviors of SGMs in representative samples of SGMs in the adult population (Jeong, Veldhuis, Aranda, & Hughes, 2016; Operario, Bamarel, Grin, Kahler, Marchall, et al., 2015; Rosario, Everett, Reisner, Austin, Buchting, et al., 2014). Operario et al. (2015) drew from the NHANES to examine the prevalence of sexually transmitted diseases and mental health conditions in conjunction with the health risk behaviors of tobacco use, alcohol consumption, and illicit drug use behaviors of SGMs. The researchers noted the inconsistent findings in the current SGM research and addressed these inconsistencies via examining the prevalence of sexually transmitted diseases and mental health conditions. This was done in conjunction with health risk behaviors of SGMs across gender-specific SGM subgroups in a large representative sample of

SGMs in the adult population. The prevalence of these health outcomes and health risk behaviors were examined across gender specific SGM subgroups while adjusting for age, race/ethnicity, education, employment, marital status, family income, health insurance status, and access to regular health care. Significant differences were found in the sociodemographic attributes of SGMs and their heterosexual peers.

The findings from this study further showed significant differences in the health and health risk behaviors of SGMs across gender-specific sexual orientation subgroups. The differences in health outcomes and health risk behaviors of gender-specific SGM subgroups continued to be significant when adjusting for age, race/ethnicity, education, employment, marital status, family income, health insurance status, and access to a regular health care. Based on the findings of their study, Operario et al. pointed to the need for additional studies to identify and further examine sociodemographic factors associated with the health and health risk behaviors of SGMs across gender-specific SGM subgroups.

Jackson, Aenor, Johnson, Austin, and Kawachi (2016) addressed the need to examine health and health risk behaviors of sociodemographic subgroups of SGMs in a 2016 study. The researchers drew from the NHIS data to examine the prevalence of several health outcomes and health-risk behaviors of SGMs across SGM subgroups stratified by age and gender. The study findings continued to show significant differences in the prevalence of adverse health outcomes and health risk behaviors of SGMs across SGM subgroups and heterosexual males and females in the adult population. The findings from this study further showed significant differences in health outcomes across age and gender specific SGM subgroups. Drawing from these findings, the researchers noted the need for studies to continue to examine health disparities of SGMs across SGM subgroups stratified by sociodemographic factors – including ethnicity, income, and

education level. The researchers specifically noted that these studies are needed to “inform future health interventions that meet the needs of diverse groups of sexual minorities – including those of color and those from low-income backgrounds, who remain understudied and underserved” (p.10).

Lunn, Cui, Zack, Thomson, Blank, and Yehia (2017) addressed the need to examine the health and health risk behaviors of SGMs across sociodemographic segments of the SGM population in a population-based study in 2017. The researchers drew from Healthy People 2020 and the NHIS to examine the health indicators put forth in Healthy People 2020 via the corresponding data from the NHIS. The study examined the health indicators of binge drinking, smoking, drug use, HIV testing, colon cancer screening, and obesity. The study findings showed significant differences in the prevalence of health and health risk behaviors of particular SGM subgroups - including the prevalence of drug use and obesity among lesbian women. The researchers noted the need for studies to identify and further examine sociodemographic factors that mediate adverse health outcomes and health risk behaviors among particular SGM subgroups.

Gonzalez and Henning-Smith (2017) addressed the need to identify and further examine health disparities of SGM subgroup populations in a 2017 cross-sectional study that drew from the 2016 BRFSS survey data to examine a series of health outcomes and health risk behaviors of SGM adults across SGM subgroups. Gonzalez and Henning-Smith specifically examined the prevalence of the following health outcomes and health risk behaviors across SGM subgroups: (a) mental distress, (b) diagnosed depression, (c) physical and functional health status, (d) diagnosed chronic health conditions (cardiovascular disease, cancer, asthma, arthritis, and cardio obstructive pulmonary disease), (e) obesity, (f) cigarette smoking, and (g) binge drinking. These

health outcomes and health risk behaviors were examined across the gender-based sexual orientation subgroups of (a) lesbian women, (b) gay men, (c) bisexual women, (d) bisexual men, (e) heterosexual women, and (f) heterosexual men. Differences in the health outcomes and health risk behaviors were examined while adjusting for the demographic and socioeconomic characteristics of age, ethnicity, relationship status, education level, household.

The findings from their study continued to show significant differences in health outcomes and health risk behaviors of SGMs when compared to their heterosexual peers. These differences, however, varied across gender-based sexual orientation subgroups. Gonzalez and Henning-Smith noted that the variability and inconsistencies in these health outcomes and health risk behaviors of SGMs point to the need for SGM studies to examine the health and the health risk behaviors of SGMs across SGM subgroups. Gonzalez and Henning-Smith also pointed the need to further examine sociodemographic factors associated with differences in health disparities across SGM subgroups. As noted by Gonzalez and Henning-Smith, “research should examine health outcomes at the intersections of marginalized identities, including sexual minorities from different racial, ethnic, geographic, and socioeconomic backgrounds” (p. 6).

SGM Studies: Mental Health Outcomes

The current study examined the mental health outcome of mental health distress across SGM subgroups via a population-based cross-sectional study of SGMs and heterosexual adults in the US population. A substantial body of research has shown that SGMs experience adverse mental health outcomes to a greater extent than their heterosexual peers. While this body of research brought to light important disparities in mental health outcomes among SGMs, earlier studies tended to examine SGMs as a homogenous population and did not distinguish between gender-based SGM subgroups (Feinstein & Dyar, 2017; Li, Pollitt, & Russell, 2016; Plöderl &

Tremblay, 2015). The examination of SGMs as a homogenous population precluded studies from identifying important differences in mental health outcomes across SGM subgroups (Ross et al., 2017; Ulrich, 2011).

Ross et al. (2017) noted these shortcomings in a 2017 meta-analysis of SGM studies that reported mental health outcomes across SGMs subgroups and specifically among individuals who identify as bisexual. A systematic review of n=1,073 SGM studies that examined the mental health outcomes of depression and anxiety was conducted to identify studies that included data from individuals who identify as bisexual. Among the n=1,073 studies that were reviewed, n=511 provided mental health data for individuals who identified as bisexual. The data from n=51 studies was included in the meta-analysis of depression and anxiety rates among SGMs who identified as bisexual. The analyses of the pooled data continued to show significantly lower rates of depression and anxiety among heterosexuals and individuals who identified as bisexual had greater or equal odds of experiencing depression and anxiety relative to individuals who identified as gay and lesbian. Ross et al. identified possible factors that contribute to the negative mental health outcomes among bisexual individuals and noted the implications that these findings have for public health programs and interventions aimed at addressing the mental health needs of individuals who identify as bisexual (Ross et al., 2017).

The findings and conclusions put forth by Ross et al. (2017) support the research recommendations and research needs identified by Gonzalez and Henning-Smith (2017) and the SGM RCC of the NIH (2011). Specifically, the findings and conclusions put forth by Ross et al. highlight the need for SGM studies to examine mental health outcomes of SGMs across SGM subgroups and to further examine socio-demographic factors that contribute to differences in mental health outcomes across SGM subgroups. This study addresses this need.

Research Objectives and Research Questions

This study drew from the 2016 BRFSS to examine differences in the odds for SGMs to experience more days of mental health distress relative to their heterosexual peers across SGM subgroups in a large representative sample of SGMs and heterosexual adults in the US population. This study further examined the extent and the manner in which socio-demographic factors contributed to the odds of experiencing more days of mental health distress across sexual orientation subgroups. The specific objectives of this study were (a) to assess the odds for SGM subgroups to experience more days of mental health distress relative to their heterosexual peers and (b) to identify sociodemographic factors that contribute to the odds for SGMs to experience more days of mental health distress across SGM subgroups. The corresponding research questions that this study addressed were as follows:

RQ 1: Do SGMs have greater odds of experiencing more days of mental health distress per month relative to their heterosexual peers?

RQ 2: Do SGM subgroups have *different* odds of experiencing more days of mental health distress per month relative to their heterosexual peers?

RQ 3: Which the following sociodemographic factors have a statistically significant effect on the odds of SGMs to experience more days of mental health distress per month relative to their heterosexual peers: (a) race / ethnicity, (b) education level, (c) annual income, and (d) age?

Methodology

Survey Instrument

This study was a population-based cross-sectional study that drew from the 2016 BRFSS to examine the prevalence of the health outcome of mental health distress across sexual orientation subgroups in a large nationally representative sample of SGMs and heterosexual adults in the US population. The BRFSS is an ongoing telephone-based health surveillance survey of the Center for Disease and Prevention Control (CDC) that is conducted by the individual state health departments in each state and participating US territories each year. The BRFSS uses a rigorous telephone survey protocol with random digit dialing to obtain health-related data from a representative sample of randomly selected adults in the US population in each state each year (CDC, 2016, 2017)

The BRFSS questionnaire is constructed by the individual state health departments under the guidance of the CDC. The CDC provides each state with a set of standardized core questions that are consistent across the BRFSS survey administered in each state. The CDC provides additional questions as optional modules that each state health department may choose to include in the respective state BRFSS survey. The BRFSS survey in each state may also include state-specific survey items developed by the respective state health departments and approved for BRFSS inclusion via the CDC each year. The resultant BRFSS survey for each state consists of (a) a set of standardized common core questions, (b) one or more optional modules with additional sets of survey items, and (c) additional state-specific survey items that address health issues pertinent to specific states (CDC, 2017).

The BRFSS survey is administered by either an in-house surveying entity of the state health department in each respective state each year or the state health departments may choose

to have the BRFSS survey administered by a state-contracted call center or a BRFSS affiliated university. The state health department collects the BRFSS data from the respective surveying entity and submits the data to the CDC at regular intervals throughout each year. The CDC assists each state health department with the data collection process as needed until a complete BRFSS data set is obtained.

The CDC uses rigorous weighting methods with iterative proportion fitting procedures to provide weighted adjustments for the BRFSS data obtained from each state. The weighting procedures provide data weights that adjust the BRFSS data for unequal selection probabilities and non-response and non-coverage errors in the sampling frames of the adult populations in each state. Prior to 2011, the BRFSS data was weighted using post-stratification methods that adjusted the data for known age-race/ethnicity-gender population proportions in geographic regions within each state. The more rigorous weighting and raking procedures allows for the inclusion of both cellular and landline telephone users in the BRFSS sampling frame. This provides a means to adjust the data for the overlapping sampling frames of adults with cellular telephones and adults who reside in households with and without a landline telephone. The more rigorous weighting method with iterative proportion fitting procedures also allows for additional demographic factors to be incorporated into the data weighting process. The demographic factors used in the 2016 BRFSS data weighting process included education level, marital status, age, as well as age by gender, and age by race / ethnicity. The resultant data weights adjust the BRFSS data to reflect a representative sample of adults in and across the populations of interest. A detailed overview of the BRFSS data weighting procedures is provided by the CDC on the respective website and delineated in Appendix C.

The CDC added sexual orientation and gender identity to the BRFSS as an optional survey module in 2014. The following states choose to include the sexual orientation and gender identity module on the BRFSS questionnaire in 2016: California, Connecticut, Delaware, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kentucky, Louisiana, Massachusetts, Minnesota, Mississippi, Missouri, Nevada, New York, Ohio, Pennsylvania, Rhode Island, Texas, Vermont, Virginia, Washington, and Wisconsin. The BRFSS participants in these twenty-five states were asked if they consider themselves to be (a) straight, (b) lesbian or gay, (c) bisexual, or (d) other. The sexual orientation response options also included (e) unsure / don't know, and (f) refused to answer.

Study Sample

The sampling frame for the current study was limited to the BRFSS participants in the twenty-five states that chose to include the sexual orientation and gender identity module on the 2016 BRFSS questionnaire and BRFSS participants in these twenty-five states who self-identified their sexual orientation as heterosexual, lesbian or gay, or bisexual on the respective sexual orientation survey item. The BRFSS data from this sampling population was downloaded from the CDC's BRFSS website and transferred to an SPSS data file. The original data set contained 192,445 participants identifying as straight, 3,057 identifying as lesbian or gay, and 3,433 identifying as bisexual.

The disparate sample sizes called for further adjustments to be made to the study sample to ensure that the study would have the statistical power needed to identify group differences at the $p=.05$ level of statistical significance. This statistical power was achieved via randomly selecting a sample of 10,000 heterosexual subjects from the original pool of heterosexual subjects for inclusion in the study. The case selection and variable recoding option in SPSS were

then used to recode the BRFSS sexual orientation response options into the following gender-specific sexual orientation categories: (a) gay-male, (b) bisexual-male, (c) heterosexual-male, (d) lesbian-female, (e) bisexual-female, and (f) heterosexual-female. A Boolean operation to select (sex=male & identifier=lesbian or gay) was used to identify gay men, and a Boolean operation to select (sex=female & identifier=lesbian or gay) was used to identify lesbian women. A final sample size of 16,490 SGMs and heterosexual men and women was ultimately retained.

Survey Measures

The health outcome of mental health distress was examined across sexual orientation subgroups via the corresponding self-reported data from the 2016 BRFSS survey. The 2016 BRFSS survey measured the health outcome of mental health distress via the following common core survey item:

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?

The CDC converted the frequency (days) of mental health distress into a categorical measure of mental health distress with the following response options: (a) 0 days of mental health distress per month, (b) 1-14 days of mental health distress per month, and (c) 15-30 days of mental health distress per month. The BRFSS study participants were also given the response option of “I do not know”. This study examined differences in the health outcome of mental health distress across sexual orientation subgroups via the weighted frequencies of each categorical response option.

There were n=207 survey respondents in the sampling frame for this study who responded “I don’t know” for this survey item. An examination of the data showed that this

segment of the initial study sample was relatively evenly distributed across sexual orientation subgroups. Per the ambiguity of this response option and the extent and manner in which this segment of the initial study sample spanned across each sexual orientation subgroup – this response option for mental health distress was excluded and the respective respondents were omitted from the study sample.

The BRFSS survey data was also used to assess the extent and the manner in which the following sociodemographic factors contribute to the odds of experiencing mental health distress across sexual orientation subgroups: (a) ethnicity/race, (b) education level, (c) annual income, and (d) age. The demographic attribute of race / ethnicity was a categorical survey item with the following response options: (a) White only, non-Hispanic, (b) Black only, non-Hispanic, (c) Hispanic, (d) Multiracial, non-Hispanic, and (e) Other. The sociodemographic attribute of education level was an ordinal measure of the highest level of education that was attained that consisted of the following response options: (a) did not graduate high school, (b) graduated high school, (c) attended college or technical school, and (d) graduated from college. The sociodemographic factor of income level was assessed via a categorical ordinal variable with the following response options: (a) Less than \$15,000, (b) \$15,000–\$24,999, (c) \$25,000–\$34,999, (d) \$35,000–\$49,999, and (e) \$50,000 +. Age was also measured as a categorical ordinal variable with the following response options: (a) 18–24, (b) 25–34, (c) 35–44, (d) 45–54, (e) 55–64, and (f) 65 and older.

Data Weights

A weighted data file was created using the *complex samples* add-on module in SPSS 25.0. The BRFSS data in the SPSS data file were weighted using the strata, cluster, and final weighting variables provided by the CDC. The data weights adjusted the BRFSS data for

unequal selection probabilities and nonresponse and non-coverage errors in the respective BRFSS sampling populations. The state-level data were further adjusted to reflect the sampling population of adults in the twenty-five states in the study sample (Modular Data for Analysis: 2016 BRFSS, 2017). The strata and cluster weighting variables of `_STSTR` and `_PSU` were selected for the corresponding strata and cluster weighting options. `_LLCPWT` was selected for the final sample weight for the complex samples plan file. All analysis was conducted using the complex samples plan file.

Data Analyses

SPSS 25.0 was used to examine differences in the self-reported mental health outcome measure of “mental health distress days per month” (0 days, 1-14 days, 15-30 days) across sexual orientation subgroups and to identify sociodemographic factors that contribute to differences in the odds for SGMs to experience more days of mental health distress relative to their heterosexual peers across SGM subgroups. All data analyses were completed using the complex samples add-on module in SPSS 25.0. The sociodemographic make-up of the study sample was examined via the complex samples cross tabs data analysis option. The complex samples cross tabs analyses option was also used to examine the distribution of study subjects who reported 0 days versus 1-14 days and 15-30 days of mental health distress per month. The complex samples logistic regression data analysis option was then used to examine the odds for SGM subgroups to experience more days (1-14 days and 15-30 days versus 0 days) of mental health distress relative to their heterosexual peers. The odds for SGM subgroups to experience more days of mental health distress relative to their heterosexual peers was examined for male sexual orientation subgroups and female orientation subgroups via separate logistical regression models. A series of logistic regression analyses were then conducted to assess the extent and the

manner in which the sociodemographic factors of race/ethnicity, education, income level, and age contributed to the odds for male and female SGM subgroups to experience more days of mental health distress relative to their heterosexual peers.

Each logistic regression analyses was conducted with “0 Days of Mental Health Distress” as the reference category for the health outcome of mental health distress. The sexual orientation reference groups were *heterosexual male* and *heterosexual female* for male and female logistic regression models, respectively. The reference category for race/ethnic was White (non-Hispanic). The reference categories for the sociodemographic factors of education and income level were “completed a college degree” and “\$50,000 and above”, respectively. The reference group for age was “65 and older”.

The unweighted (n) and weighted (%) frequency measures were used to assess the sociodemographic make-up of the respective segments of the study sample. The Odds Ratios (ORs) and Confidence Intervals (CI) were used to assess the odds for SGM subgroups to experience more days of mental health distress relative to their heterosexual peers and to assess the extent and the manner in which the sociodemographic factors of race/ethnicity, education, income level, and age contributed to those odds. Each logistic regression model was assessed for statistical and practical significance via the adjusted Chi-square and Pseudo R-squared statistics. The contribution that sexual orientation and the sociodemographic factors of race/ethnicity, education, income, and age made to the regression models were assessed via the logistic regression coefficients [OR] and the respective Wald statistic. The statistical significance of each regression model and individual predictors of mental health distress were assessed at the $p < .05$ level of statistical significance.

Results

Sociodemographic Characteristics of Study Sample

Table 1 presents the sociodemographic make-up of the study sample via the unweighted (n) and weighted (%) distribution of study participants across sociodemographic subgroups. The study sample had a relatively even distribution of males (n=7473, 49%) and females (n=9160, 51%); with n=9160, however, females made up a slightly larger segment of the study sample. The study subjects included a randomly selected representative sample of n=10,000 heterosexual males and females (see Methods); with n=4403 heterosexual males and n=5597 heterosexual females, heterosexual males and heterosexual females made-up a representative segment of 27.7% and 27.8% of the study sample, respectively. The study sample included all male and female adults who self-identified as gay, lesbian, or bisexual on the 2016 BRFSS survey. With n=1818 males who identified as gay and n=1253 males who identified as bisexual, gay males and bisexual males represented 12.1% and 9.2% of the study sample, respectively. With n=2180 females who identified as lesbian and n=1239 females who identified as bisexual, lesbian females and bisexual females represented 7.7% and 15.5% of the study sample, respectively.

The race/ethnic make-up of the study sample was predominantly White (non-Hispanic) (n=12602, 63.1%). There were n=1128 participants who self-identified as Black (non-Hispanic) and n=1218 participants who self-identified as Hispanic, representing 10.6% and 15.9% of the study sample, respectively. There were n=808 study participants who self-identified their race/ethnicity as Other and n=499 study participants self-identified as Multiracial, representing 6.8 % and 2.1% of the study sample, respectively. There were 235 study participants (1.5% of the study sample) who did not know or refused to specify their race/ethnicity. The age distribution of the study sample spanned from n=1519 (8.9%) subjects who were 18-24 years in

age to n=4688 (15.2%) subjects who were 65 years in age and older. The predominant income level of the study subjects was \$50,000 +, representing 40.1% of the study sample. While there were more subjects who had a college degree (n=6654) than subjects who attended but did not graduate from college (n=4888), the weighted percent of study participants who attended but did not graduate from college (32.7%) was slightly greater than the weighted percent of study participants who had a college degree (27.4%).

Table 1

Sociodemographic Characteristics of Study Sample

Sexual Orientation	Unweighted (n)	Weighted (%)
Male (n=7473, 49%)		
Gay	1818	12.1%
Bisexual	1253	9.1%
Heterosexual	4403	27.8%
Female (n=9016, 51%)		
Lesbian	1239	7.7%
Bisexual	2180	15.5%
Heterosexual	5597	27.7%
Race/Ethnicity		
White	12602	63.1%
Black	1128	10.6%
Hispanic	1218	15.9%
Multiracial	499	2.1%
Other	808	6.8%
Age		
18-24	1519	18.9%
25-34	2108	20.0%
35-44	1960	15.5%
45-54	2686	15.5%
54-64	3529	14.8%
65+	4688	15.2%
Education		
> High School	1108	12.5%
High School	4301	27.4%
Attended College	4488	32.7%
College Graduate	6554	27.0%
Unsure	39	0.3%
Income		
> \$15000	1595	10.1%
\$15000-\$24,999	2338	14.3%
\$25,000-\$34,999	1500	8.7%
\$35,000-\$49,999	2012	11.7%
\$50,000 +	6812	40.8%
Total (Study Sample)	16490	100%

*Note. Race/Ethnicity *non-Hispanic. Weighted % by Sociodemographic Subgroup. N Excludes Unsure and No Response.*

Sociodemographic Characteristics of Sexual Orientation Subgroups

Table 2 and Table 3 present the sociodemographic make-up of the study sample by male and female sexual orientation subgroups, respectively. The sociodemographic make-up of sexual orientation subgroups by gender continued to reflect the study sample. Study participants were predominantly White (non-Hispanic) across each sexual orientation subgroup. Study participants who had a college degree made up the largest segment of each sexual orientation subgroup. Heterosexual males and males who identified as bisexual were the only sexual orientation subgroups with slightly more participants who did not attend college than participants who attended college. Study participants who did not graduate from high school made up the smallest segment of the study sample across all sexual orientation subgroups. Males who identified as gay had the greatest weighted percent of study participants who had a college degree. Bisexual males and females had the greatest weighted percent of study participants who did not graduate from college.

While an annual income of \$50,000 and above was the predominant income level in each sexual orientation subgroup, this segment of the study sample was notably larger among heterosexual males and males who identified as gay relative to males who identified as bisexual and heterosexual and SGM females. Heterosexual males and heterosexual females had a smaller weighted percent of individuals with an annual income of less than \$15,000 (7.2% and 9.0%, respectively) than SGM males and SGM females and bisexual males and bisexual females had a smaller percent of individuals with an annual income of \$50,000 and above across male and female sexual orientation subgroups. SGM males and SGM females made up a larger segment of the study participants who were 18-24 years in age and 25-35 years in age while heterosexual

males and heterosexual females made up a larger segment of the study participants who were 45 years in age and older.

Table 2

Sociodemographic Characteristics of Male Sexual Orientation Subgroups

Variables	Gay (n=4403)		Bisexual (n=1818)		Heterosexual (n=1253)		Total	
	n	%	n	%	n	%	(n)	%
Race/Ethnic ID								
Black*	91	8.5%	104	12.9%	272	9.6%	467	10.0%
Hispanic*	156	14.9%	129	17.1%	294	17.7%	579	16.9%
White	1404	65.2%	860	58.1%	3410	62.9%	567	62.6%
							4	
Multiracial	59	1.6%	45	2.8%	119	2.0%	223	2.0%
Other	86	8.6%	82	7.7%	239	6.2%	407	7.1%
Total	1818	100.0%	1252	100.0	4403	100.0	747	100.0
				%		%	3	%
Age								
18-24	180	18.2%	230	26.5%	294	15.3%	704	18.1%
25-34	281	22.9%	204	25.1%	442	16.6%	927	19.8%
35-44	193	12.8%	134	12.8%	521	16.5%	848	14.9%
45-54	378	20.2%	170	12.5%	699	16.0%	124	16.4%
							7	
54-64	427	15.9%	242	12.3%	1031	17.8%	170	16.3%
							0	
65+	359	10.0%	272	10.8%	1416	17.8%	204	14.6%
							7	
Total	1818	100.0%	1252	100%	4403	100.0	747	100.0
						%	3	%
Education								
> High School	57	5.6%	113	14.6%	337	13.7%	507	11.9%
High School	335	23.6%	381	30.8%	1242	32.4%	195	29.9%
							8	
Attended College	460	31.6%	348	34.7%	1086	27.8%	189	30.0%
							4	
College Graduate	961	38.8%	409	19.9%	1727	25.7%	309	27.8%
							7	
Unsure/No Answer	5	0.5%	1	0.1%	11	0.4%	17	0.4%
Total	1818	100.0%	1252	100.0	4403	100.0	747	100.0
				%		%	3	%
Income								
> \$15000	202	10.3%	148	14.6%	303	7.2%	653	9.4%
\$15000-\$24,999	229	11.9%	216	14.9%	486	10.4%	931	11.6%
\$25,000-\$34,999	134	5.8%	146	13.6%	354	8.8%	634	9.0%
\$35,000-\$49,999	217	14.1%	149	11.3%	556	11.9%	922	12.4%
\$50,000 +	876	48.1%	429	31.2%	2167	48.2%	347	45.0%
							2	
Unsure/No Answer	160	9.7%	164	14.3%	537	13.4%	861	12.7%
Total	1818	100.0%	1252	100.0	4403	100.0	747	100.0
				%		%	3	%

*Note. Race/Ethnicity *non-Hispanic. Weighted % by Sociodemographic Subgroup. N Excludes Unsure and No Response.*

Table 3

Sociodemographic Characteristics of Female Sexual Orientation Subgroups

Variables	Lesbian (n=5597)		Bisexual (n=1239)		Heterosexual (n=2180)		Total	
	n	%	n	%	n	%	(n)	(%)
Ethnic/Racial ID								
White	928	56.6%	1568	63.5%	4432	65.6%	6928	63.6%
Black	93	14.3%	156	10.0%	412	10.9%	661	11.2%
Hispanic	85	16.8%	212	15.8%	342	14.0%	639	15.0%
Multiracial	52	3.1%	112	3.8%	111	1.0%	275	2.2%
Other	66	8.1%	103	5.8%	232	6.6%	401	6.6%
Unsure	15	1.0%	29	1.1%	68	1.9%	112	1.5%
Total	1239	100.0%	2180	100.0%	5597	100.0%	9016	100.0%
Age								
18-24	109	19.4%	488	36.4%	217	10.2%	814	19.6%
24-34	177	20.3%	550	29.6%	454	15.1%	1181	20.3%
35-44	130	15.3%	356	15.0%	626	17.0%	1112	16.1%
45-54	266	20.2%	281	8.8%	892	16.5%	1439	14.7%
54-64	312	12.5%	230	5.0%	1287	18.4%	1829	13.4%
65+	245	12.2%	275	5.2%	2121	22.8%	2641	15.8%
Total	1239	100.0%	2180	100%	5597	100.0%	9016	100.0%
Education								
> High School	65	12.1%	157	14.1%	379	12.8%	601	13.1%
High School	251	21.7%	548	26.6%	1544	25.1%	2343	25.0%
Attended College	298	35.7%	689	37.2%	1606	34.2%	2593	35.3%
College Graduate	622	30.4%	782	21.7%	2053	27.7%	3457	26.3%
Unsure/No Answer	3	0.1%	4	0.4%	15	0.2%	22	0.2%
Total	1239	100.0%	2180	100.0%	5597	100.0%	9016	100.0%
Income								
> \$15000	135	12.8%	290	13.1%	517	9.0%	942	10.8%
\$15000-\$24,999	160	13.8%	409	20.3%	837	15.9%	1406	16.9%
\$25,000-\$34,999	102	7.4%	210	9.2%	554	8.4%	866	8.5%
\$35,000-\$49,999	153	10.2%	257	12.1%	680	10.6%	1090	11.0%
\$50,000 +	563	43.4%	664	26.7%	2113	40.5%	3340	36.7%
Unsure/No Answer	126	12.4%	350	18.5%	896	15.6%	1372	16.0%
Total	1239	100.0%	2180	100.0%	5597	100.0%	9016	100.0%
Total N (%)	5597		1239		2180		9016	

Note. Race/Ethnicity = non-Hispanic. Weighted % by Sociodemographic Subgroup. N Excludes Unsure and No Response.

Prevalence of Mental Health Distress

Table 4 and Table 5 present the unweighted (n) and weighted (%) prevalence of mental health distress days per month by male and female sexual orientation subgroups. The majority of study participants reported having mental health distress 0 days per month (n=9869; 56.2%). There were n=4111 study participants who reported having mental health distress 1-14 days per month and n=2303 study participants who reported having mental health distress 15-30 days per month, representing a 27.0% and 15.7% of the study sample, respectively. Among those who reported 0 days of mental health distress, n=5002 were females and n=4867 were males. While there were slightly more females than males who reported 0 days of mental health distress, males had a greater weighted percent of study participants reported 0 days of mental health distress (61.8%) than females who reported 0 days of mental health distress per month (50.9%). In turn, females had a greater weighted percent of study participants who reported 1-14 days of mental health distress per month (n=2441, 54.2%) and 15-30 days of mental health distress per month (n=1453, 62.7%) than males.

Females who identified as bisexual were the only sexual orientation subgroups that had a greater percent of individuals who experienced mental health distress 1-14 days (36.2%) and 15-30 days (32.6%) per month versus 0 days of mental health distress (30.1%). Heterosexual males and heterosexual females had a greater percent of individuals who reported having 0 days of mental health per month across all sexual orientation subgroups (62.8% and 70.1% respectively). Heterosexual males continued to have a smaller percent of individuals who reported having mental health distress 1-14 days per month as well as 15-30 days per month across sexual orientation subgroups (19.6% and 8.7%, respectively). The percent of individuals who reported 1-14 days and 15-30 days of mental health distress per month was relatively similar among

females who identified as lesbian (29.1%, 19.8%) and gay (32.7%, 15.1%) and bisexual males (32.3%, 17.5%).

Table 4

Mental Health Distress Across Male Sexual Orientation Subgroups

Mental Health Distress	Sexual Orientation						Total	
	Gay		Bisexual		Heterosexual		(n)	(%)
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)
0 Days	974	51.0%	650	48.6%	3243	70.8%	4867	61.8%
1-14 Days	549	32.7%	351	32.3%	770	19.6%	1670	25.2%
15 -30 Days	279	15.1%	232	17.5%	338	8.7%	849	11.9%
Unknown / Not Sure	16	1.1%	19	1.6%	52	0.9%	87	1.1%
Total	1818	100.0%	1252	100.0%	4403	100.0%	7473	7473

Note. Weighted % per sexual orientation subgroups

Table 5

Mental Health Distress Across Female Sexual Orientation Subgroups

Mental Health Distress	Sexual Orientation						Total	
	Lesbian		Bisexual		Heterosexual		(n)	(%)
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)
0 Days	643	50.4%	756	30.1%	3603	62.7%	5002	50.9%
1-14 Days	373	29.8%	778	36.3%	1290	24.1%	2441	28.7%
15-30 Days	212	19.1%	610	32.0%	631	12.3%	1453	19.4%
Unknown / Not Sure	11	0.7%	36	1.6%	73	0.8%	120	1.0%
Total	1239	100.0%	2180	100.0%	5597	100.0%	9016	100.0%

Note. Weighted % per sexual orientation subgroups.

Table 6 presents the unweighted (n) and weighted (%) of study participants who experienced 0 days versus 1-14 days and 15-30 days of mental health distress per month across sociodemographic subgroups. There continued to be more study participants who reported 0 days versus 1-14 days and 15-30 days of mental health distress per month across sociodemographic subgroups in the study sample. There were more study participants who reported 0 days versus 1-14 days and 15-30 days of mental health distress per month across racial/ethnic groups. Study participants who identified as Other had the greatest percent of study participants who reported 0 days of mental health distress per month. Study participants who identified as Multiracial had the smallest percent of study participants who reported 0 days of mental health distress per month (40.2%). Participants identifying as Multiracial had the largest weighted percent of study participants who reported 1-14 days and 15-30 days of mental health distress per month (28.7%, 30.8%, respectively).

There continued to be more study participants who reported 0 days versus 1-14 days and 15-30 days of mental health distress per month across annual income level and education level groups in the study sample. The percent of study participants who reported 0 days versus 1-14 days and 15-30 days of mental health distress per month showed a modest decrease in mental health distress as income level increased. A slight increase in mental health distress was noted as income level decreased. Study participants who earned less than \$15,000 per year and \$15,000-24,999 per year had a slightly greater percent of individuals who experienced mental health distress 1-14 days and 15-30 days per month than their peers with higher income levels. While study participants with an annual income of \$50,000 or more had the lowest weighted percent of study participants who experienced 15 -30 days of mental health distress per month (9.8%), a

weighted percent of 27.6% of study participants who had an annual income of \$50,000 and above experienced 1-14 days of mental health distress per year.

Study participants who had a college degree had a slightly greater segment of study participants who reported 0 days of mental health distress (59.6%) than study participants who did not graduate from high school and those who graduated from high school and participants who attended college. Study participants who had a college degree also had a smaller segment of study participants who reported 15-30 days of mental health distress per month (10.1%) than study participants who did not graduate from high school (24.4%) and those who graduated from high school (16.2%) and who attended college (16.8%). Study participants with a college degree, however, had a larger weighted percent of study participants who experienced 1-14 days of mental health distress (29.4%) than study participants who did not graduate from high school (20.9%) and those who graduated from high school (25.1%) and those who attended college (29.1%). Study participants who attended college had a greater percent of individuals who experienced mental health distress 1-14 days per month than those who did not graduate from high school and those who graduated from high school but did not attend college. Study participants who did not graduate from high school, however, had the greatest weighted percent of study participants who experienced mental health distress 15-30 days per month. With the weighted percent of study participants who reported 0 days of mental health distress per month spanning from 13.6% to 20.5% across age groups, the age of study participants who reported 0 days of mental health distress per month was relatively evenly distributed across age groups.

Table 6

Mental Health Distress across Sociodemographic Subgroups of the Study Sample

	0 Days		1-14 Days		15-30 DAYS		Total	
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)
Race/Ethnicity								
White	7654	55.7%	3133	27.5%	1667	15.7%	12602	100.0%
Black	677	56.2%	254	24.2%	178	18.6%	1128	100.0%
Hispanic	671	58.3%	336	27.8%	194	12.8%	1218	100.0%
Multi-Racial	243	40.2%	144	28.7%	108	30.8%	499	100.0%
Other	491	62.3%	202	25.9%	108	11.1%	808	100.0%
Did Not Identify	133	49.3%	42	18.7%	48	27.2%	235	100.0%
Total	9869	56.2%	4111	27.0%	2303	15.7%	16490	100.0%
Education Level								
>High School	592	53.2%	226	20.9%	258	24.4%	1108	100.0%
High school	2614	57.4%	922	25.1%	692	16.2%	4301	100.0%
Some College	2517	53.4%	1172	29.1%	746	16.8%	4488	100.0%
Degree	4116	59.6%	1785	29.4%	606	10.1%	6554	100.0%
No Response	30	75.1%	6	7.7%	1	4.0%	39	100.0%
Total	9869	56.2%	4111	27.0%	2303	15.7%	16490	100.0%
Annual Income								
> \$15,000	697	39.1%	410	31.0%	455	28.0%	1595	100.0%
\$15,000-\$24,999	1218	47.5%	606	29.7%	480	21.9%	2338	100.0%
\$25,000-\$34,999	881	56.1%	384	28.0%	218	15.0%	1500	100.0%
\$35,000-\$49,999	1235	60.0%	490	23.4%	268	15.7%	2012	100.0%
\$50,000+	4487	62.2%	1768	27.6%	519	9.8%	6812	100.0%
Unsure	1351	57.1%	453	22.0%	363	18.3%	2233	100.0%
Total	9869	56.2%	4111	27.0%	2303	15.7%	16490	100.0%
Age								
18-24	585	40.4%	541	36.7%	379	21.9%	1519	100.0%
25-34	970	49.3%	694	31.2%	417	18.1%	2108	100.0%
35-44	1024	55.3%	581	25.6%	334	18.4%	1960	100.0%
45-54	1517	57.4%	753	27.4%	390	14.0%	2686	100.0%
55-64	2240	65.5%	797	21.6%	452	12.2%	3529	100.0%
65+	3533	75.7%	745	15.5%	331	7.6%	4688	100.0%
Total	9869	56.2%	4111	27.0%	2303	15.7%	16490	100.0%

Note. Race/Ethnicity = non-Hispanic. Weighted % by Sociodemographic Subgroup. N Excludes Unsure and No Response.

Mental Health Distress: Logistic Regression Models

Table 7 and Table 8 present the results of the logistic regression analyses that assessed the odds for SGM males and SGM females to experience more days of mental health distress per month relative to their heterosexual peers. Table 7 presents the ORs and CIs for SGM males to experience 1-14 days and 15-30 days of mental health distress per month (versus 0 days of mental health distress) relative to their heterosexual peers. Table 8 presents the ORs and CIs for SGM females to experience 1-14 days and 15-30 days of mental health distress per month (versus 0 days of mental health distress) relative to their heterosexual peers. With $X^2 = 81.8$ and $X^2 = 181.2$ the logistic regression models were a statistically significant means to classify mental health distress among SGM males and SGM females, respectively. With Cox & Snell=.045, however, sexual orientation was only able to explain 4.5% of the variation in mental health distress among SGM males relative to their heterosexual peers within the male segment of the study sample (Cox & Snell statistic=.045; McFadden=0.024). With Cox & Snell=.088, sexual orientation was able to explain 8.8% of the variation in mental health distress within female segment of the study sample (Cox & Snell=.088).

An examination of the individual Odds Ratios for the male segment of the study sample shows that both males who identified as gay and males who identified as bisexual had statistically significantly greater odds of experiencing mental health distress 1-14 days per month ($t=-6.54, p<.000$; $5.91, p<.000$) and 15-30 days per month ($t=5.65, p<.000$; $t=6.53, p<.000$) relative to their heterosexual peers. With OR=2.32 and OR=2.40, the odds of experiencing 1-14 days of mental health distress per month and 15-30 days of mental health distress per month was 2.32 and 2.40 times greater for males who identified as gay relative to their heterosexual peers. With OR=2.40 and OR=2.9, the odds of experiencing mental health distress 1-14 days and 15-30

days per month was 2.40 and 2.90 times greater for males who identified as bisexual relative to their heterosexual peers.

An examination of the ORs for the female segment of the study sample shows that both females who identified as lesbian and females who identified as bisexual had statistically significantly greater odds of experiencing mental health distress 1-14 days per month and 15-30 days per month relative to their heterosexual peers. With OR=1.54 and OR=3.14, females who identified as lesbian and females who identified as bisexual had 1.54 and 3.14 times the odds of experiencing 1-14 mental health distress days per month relative to their heterosexual peers. With OR=1.92 and OR=5.40, females who identified as lesbian and females who identified as bisexual had 1.92 and 5.4 times the odds of experiencing 15-30 days of mental health distress each month compared to their heterosexual peers.

Table 7

Mental Health Distress Odds for SGM Males Relative to Heterosexual Males

Sexual Orientation	Mental Health Distress	OR	CI	p
Gay Males	1-14 Days	2.31	1.80-2.97	.000
	15-30 Days	2.40	1.77-3.26	.000
Bisexual Males	1-14 Days	2.40	1.80-3.21	.000
	15-30 Days	2.93	2.12-4.05	.000

Notes. Wald=81.8; Cox & Snell=.045

Table 8

Mental Health Distress Odds for SGM Females Relative to Heterosexual Females

Sexual Orientation	Mental Health Distress	OR	CI	p
Lesbian Females	1-14 Days	1.54	1.10-2.14	.011
	15 + Days	1.92	1.34-2.76	.000
Bisexual Females	1-14 Days	3.14	2.51-3.91	.000
	15 + Days	5.40	4.16-7.01	.000

Notes. Wald=182.53; Cox & Snell=.088

Adjusted Logistic Regression Models

The next set of logistic regression models assessed the effect that the sociodemographic factors of race/ethnicity, education level, annual income, and age had on the odds for SGM males and SGM females to experience more days of mental health distress per month relative to their heterosexual peers. Table 9 presents the ORs and CIs for gay and bisexual males to experience more days of mental health distress relative to their heterosexual peers when adjusting for differences in mental health distress attributed to the set of sociodemographic factors. With $X^2 = 56.40$ ($p < .001$), the logistic regression model of mental health distress by male sexual orientation continued to be a statistically significant means to classify mental health distress within the male segment of the study sample when adjusting for the set of sociodemographic factors. With Cox & Snell = .065, the model was able to explain 6.5% of the variation in mental health distress across male sexual orientation subgroups. Hence the set of sociodemographic factors made a slight improvement in the regression model within the male segment of the study sample.

When adjusting for the set of sociodemographic factors, males who identified as gay and males who identified as bisexual continued to have statistically significantly greater odds of experiencing mental health distress 1-14 days and 15 -30 days per month relative to their heterosexual male peers. With OR=1.96 and OR=2.22, gay males had 1.96 and 2.22 the odds of experiencing mental health distress 1-14 days and 15-30 days per month relative to their heterosexual peers. With OR=1.93 and OR=2.19, bisexual males had 1.93 and 2.19 greater odds of experiencing mental health distress 1-14 days and 15 -30 days per month relative to their heterosexual peers.

Table 9 continues to present the sociodemographic subgroups within the male segment of the study sample that had statistically significant odds for experiencing more days of mental health distress relative to the respective reference group. Black (non-Hispanic) males were the only racial/ethnic group that had significantly greater odds of experiencing more days of mental health distress days relative to White (non-Hispanic) males. Interestingly, Hispanic males had significantly lower odds of experiencing more days of mental health distress relative to White (non-Hispanic) males. Males who graduated from high school but did not attend college had significantly lower odds of experiencing 1-14 days of mental health distress relative to males who had a college degree; however, males who did not complete high school had significantly greater odds of experiencing 15-30 days of mental health distress per month relative to males who had a college degree. Males with an annual income of less than \$15,000 and males with an annual income of \$15,000-\$50,000 had significantly greater odds of experiencing more days of mental health distress relative to males with an annual income of \$50,000 and above; with OR=4.5, males with an annual income of less than \$15,000, however, had notably greater odds of experiencing more days of mental health distress per month relative to males with an annual income of \$50,000 or above across all income levels. Males who were younger had significantly greater odds of experiencing more mental health distress days per month relative to males who were 65 years in age with a decreasing trend as age increases.

The effect that each sociodemographic factor had on the odds for SGM males to experience more days of mental health distress relative to their heterosexual peers was further examined via a series of separate logistic regression models that examined the main effect and interaction effects separately for each sociodemographic factor. The effect that each sociodemographic factor had on the odds to experience more days of mental health distress was

further examined via a series of logistic regression analyses that assessed the odds for each sociodemographic subgroup to experience more days of mental health distress relative to the respective reference group within the male and female segment of the study sample. The results of each series of logistic regression analyses are presented in Appendix A and Appendix C.

Table 9

Adjusted Mental Health Distress Odds of SGM Male Subgroups and Significant

Sociodemographic Factors

Significant Predictors		1-14 Days			15-30 Days				
		OR	95% CI	P	OR	95% CI	P		
Sexual Orientation	Gay Male	1.958	1.506	2.547	.000	2.222	1.661	2.973	.000
	Bisexual Male	1.930	1.426	2.614	.000	2.187	1.595	2.999	.000
Race/Ethnicity	Black					1.563	1.021	2.393	.040
	Hispanic					.512	.341	.767	.001
Education Level	>High School					2.062	1.312	3.240	.002
	High School	.754	.563	1.009	.058				
Income Level	> \$15,000	1.942	1.222	3.088	.005	4.496	2.930	6.899	.000
	\$15k-\$25k					2.860	1.947	4.200	.000
	\$35k-\$50k					1.527	1.013	2.301	.043
Age	18-24 Yrs	4.214	2.840	6.251	.000	3.060	1.861	5.031	.000
	25-34 Yrs	2.350	1.651	3.346	.000	2.564	1.618	4.064	.000
	35-44 Yrs	2.022	1.363	2.999	.000	3.286	2.028	5.323	.000
	45-54 Yrs	2.066	1.466	2.911	.000	1.832	1.141	2.942	.012
	55-64 Yrs	1.603	1.152	2.229	.005	1.631	1.025	2.596	.039

Notes. Wald=56.44; Cox & Snell=.065

Table 10 presents the results of the logistic regression analyses for SGM females to experience more days of mental health distress per month relative to their heterosexual peers with all sociodemographic factors entered into the regression model. With $X^2=96.98$ ($p<.000$), the logistic regression model for the association of mental health distress among sexual

orientation subgroups continued to be of statistical significance for the female segment of the study sample when adjusting for the set of sociodemographic factors. With race/ethnic identity, education level, annual income, and age entered into the regression model, the regression model was able to explain 17% of the variation in mental health distress within the female segment of the study sample (Cox & Snell=.17). Hence, the adjusted model with the set of sociodemographic factors was a slight improvement over the original logistic regression model.

While the regression model was able to explain more of the variation in mental health distress when adjusting for the variation attributed to the set of sociodemographic factors within the female segment of the study sample, females who identified as lesbian no longer had statistically significantly greater odds of experiencing mental health distress 1-14 days per month relative to their heterosexual peers. With OR=1.73, however, females who identified as lesbian continued to have significantly greater odds of experiencing mental health distress 15-30 days per month relative to their heterosexual peers. With OR=2.32 and OR=3.80, females who identified as bisexual continued to have significantly greater odds of having more mental health distress days per month relative to their heterosexual peers.

Table 10 continues to show the sociodemographic factors that had a statistically significant effect on the odds of experiencing more days of mental health distress relative to the respective reference group within the female segment of the study sample. Interestingly, females who identified as Black (non-Hispanic), Hispanic, and Other had significantly lower odds of having more mental health distress days relative to White (non-Hispanic) females. Females who did not graduate from high school and females who graduated from high school but did not attend college had significantly lower odds of experiencing 1-14 days of mental health distress relative to females who had a college degree; however, they did have significantly greater odds

of experiencing 15-30 days of mental health distress relative to females who had a college degree. Females who attended college but did not complete a degree also had significantly greater odds of experiencing 15-30 days of mental health distress relative to females who had a college degree.

Similar to the male segment of the study sample, females who reported an annual income of less than \$15,000 and females with an annual income of \$15,000-\$50,000 had significantly greater odds of experiencing more days of mental health distress per month relative to females who reported an annual income of \$50,000 or above. Females who were 18-64 years in age had significantly greater odds of experiencing more mental health distress days per month relative to females who were 65 years in age and older.

The effect that each sociodemographic factor had on the odds for SGM females to experience more days of mental health distress relative to their heterosexual peers was further examined via a series of logistic regression models that examined the main effect and interaction effects separately for each sociodemographic factor. The effect that each sociodemographic factor had on the odds to experience more days of mental health distress was further examined via a series of logistic regression analyses that assessed the odds for each sociodemographic subgroup to experience more days of mental health distress relative to the respective reference group within the male and female segment of the study sample. The results of each series of logistic regression analyses are presented in Appendix B and Appendix C.

Table 10

*Adjusted Mental Health Distress Odds of SGM Female Subgroups and Significant**Sociodemographic Factors*

Significant Predictors		1-14 Days				15-30 Days			
		OR	95% CI		P	OR	95% CI		P
Sexual Orientation	Lesbian	1.350	.985	1.85	.062	1.733	1.208	2.486	.003
	Bisexual	2.320	1.82	2.97	.000	3.794	2.821	5.103	.000
Race/Ethnicity	Black					.566	.371	.863	.008
	Hispanic	.663	.471	.933	.018	.447	.293	.681	.000
	Other	.549	.346	.870	.011	.431	.243	.763	.004
Education Level	> High School	.581	.382	.885	.011	1.876	1.133	3.107	.014
	High School	.727	.553	.956	.023	1.380	1.000	1.905	.050
	Some College					1.438	1.056	1.957	.021
Income Level	> \$15,000	1.679	1.131	2.493	.010	3.330	2.123	5.223	.000
	\$15k-\$25k	1.453	1.037	2.034	.030	2.045	1.339	3.124	.001
	\$35k-\$50k	1.833	1.282	2.621	.001	1.982	1.256	3.128	.003
Age	18-19 Yrs	3.462	2.342	5.118	.000	4.169	2.617	6.642	.000
	25-34 Yrs	2.700	1.935	3.768	.000	3.282	2.186	4.927	.000
	35-44 Yrs	2.152	1.525	3.037	.000	3.634	2.370	5.571	.000
	45-54 Yrs	2.211	1.596	3.061	.000	3.154	2.059	4.831	.000
	55-64 Yrs	1.499	1.085	2.070	.014	2.290	1.526	3.435	.000

Notes. Wald=96.98; Cox & Snell=.17

Discussion of Findings

Summary

The findings from this study continue to show that SGM males and SGM females have significantly greater odds of experiencing more days of mental health distress per month relative to their heterosexual peers. While all SGM subgroups had statistically significantly greater odds of experiencing more days of mental health distress per month relative to their heterosexual peers, the magnitude of those odds differed across gender-based SGM subgroups. Females who identified as bisexual had notably greater odds of experiencing more days of mental health distress days across all sexual orientation subgroups. Males who identified as gay and males who identified as bisexual had relatively similar odds for experiencing more days of mental health distress per month relative to their heterosexual peers. While each regression model was statistically significant, however, the Pseudo R-square statistics showed that sexual orientation explained less than 10% of the variation in mental health distress among male and female sexual orientation subgroups.

When adjusting for the variation in mental health distress associated with the sociodemographic factors of race/ethnicity, education, income level, and age, males who identified as gay and bisexual males and bisexual females continued to have statistically significantly greater odds of experiencing more days of mental health distress relative to their heterosexual peers. Females who identified as lesbian, however, no longer had statistically significantly greater odds of experiencing 1-14 days of mental health distress relative to their heterosexual peers. While males who identified as Black had significantly greater odds of experiencing 15-30 days of mental health distress per month relative to White (non-Hispanic) males, females who identified as Black (non-Hispanic) as well as females who identified as

Hispanic and Other had significantly lower odd of experiencing more days of mental health distress per month relative to White (non-Hispanic) females.

When adjusting for the individual sociodemographic factors of education, income, and age (See Appendix A and Appendix B), females who identified as lesbian did not have statistically significantly greater odds of experiencing more days of mental health distress days relative to their heterosexual peers. When adjusting for race/ethnicity, however, multiracial females who identified as lesbian had statistically significantly greater odds of experiencing more days of mental health distress relative to their heterosexual peers who were White (non-Hispanic). Interestingly, SGM males who identified their race/ethnicity as Other had statistically significantly lower odds of experiencing more days of mental health distress compared to SGM males who were White (non-Hispanic). When accounting for the variation in mental health distress associated with age, males who identified as bisexual no longer had statistically significantly greater odds of experiencing 1-14 days of mental health distress relative to their heterosexual peers and males who identified as gay no longer had statistically significantly greater odds of experiencing 15-30 days of mental health distress relative to their heterosexual peers.

An examination of the individual sociodemographic factors shows that income level was able to explain a notable amount of the variation in mental health distress among SGM males and SGM females. SGM males and SGM females who reported an annual income of less than \$15,000 and \$15,00-\$24,000 had significantly greater odds of experiencing more days of mental health distress relative to their heterosexual peers who reported an annual income of \$50,000 and above. Furthermore, females who identified as lesbian did not have statistically significantly greater odds of experiencing more days of mental health distress relative to their heterosexual

peers when adjusting for the variation associated with income level. However, lesbians who had an annual income of less than \$15,000 and \$15,00-\$24,000 had statistically significantly greater odds of experiencing more days of mental health distress days per month relative to their heterosexual peers who reported an annual income of \$50,000 and above.

When adjusting for the variation in mental health distress associated with education level, females who identified as lesbian and who did not graduate from high school had statistically significantly greater odds of experiencing more days of mental health distress per month relative to their heterosexual peers who had a college degree. An examination of the variation in mental health distress associated with age shows that the odds of experiencing more days of mental health distress per month is statistically significantly lower among SGM males and SGM females who are 45 years in age and older.

Implications for Research and Practice

The variation in the odds for SGM male and SGM female subgroups to experience more days of mental health distress per month relative to their heterosexual peers and the main effects and interaction effects that race/ethnicity, education, income level, and age had on the odds for experiencing more days of mental health distress relative to each respective reference group have important implications for SGM research and subsequent SGM health equity endeavors. The findings from this study support the recommendations and conclusions put forth in recent SGM studies. Specifically, the findings from this study highlight the need for SGM studies to draw from large representative samples of SGMs and examine mental health outcomes of SGMs across SGM subgroups and sociodemographic segments of the SGM population. The findings from these studies will provide important insights to guide public health initiatives and

interventions aimed at addressing and alleviating the mental health needs of SGMs within specific SGM subgroups and within particular sociodemographic segments of the SGMs.

Given the higher odds for SGM females who identified as bisexual and multiracial SGMs to experience more days of mental health distress relative to their heterosexual peers, public health entities may benefit from focusing on the unique health needs of these two segments of the female SGM population. Furthermore, given the sociodemographic differences among lesbians who experience more mental health distress days relative to their heterosexual peers, public health entities should narrow in on the mental health needs of the specific sociodemographic subgroups of this segment of the SGM population accordingly. The variation in mental health distress among SGMs with higher incomes and education levels further suggests focusing health equity initiatives on SGMs with lower incomes and further assessing the health needs of SGMs across education levels. With younger SGM males and SGM females having significantly greater odds of experiencing more days of mental health distress per month relative to SGMs who are older in age, SGM health equity initiatives should also narrow in on the unique mental health needs of the younger segments of the SGM population.

Study Limitations

While this study provided valuable insights toward the disparities and unique health needs of SGM males and SGM females, it is important to recognize the limitations of these findings. The cross-sectional nature of the BRFSS precludes causal relationships to be drawn between mental health outcomes and sexual orientation and sociodemographic subgroups. The random-digit dialing telephone survey protocol used by the BRFSS also limited the study participants to adults with landline or cellular telephones; hence, the BRFSS data does not represent homeless nor incarcerated adult populations. The BRFSS data is also self-reported

data; hence, the data may be biased due to self-reporting errors and related biases inherent to self-reported data. Lastly, the BRFSS data used in this study was limited to the twenty-five states that included the Sexual and Gender Orientation module in the 2016 BRFSS survey; hence, the findings from this study are not generalizable to the entire adult population or populations in other states.

Conclusion

This study drew from a large population-based representative sample of SGMs to examine the prevalence of mental health distress across SGM subgroups and to further examine differences in mental health distress across sociodemographic subgroups in the SGM population. The findings from this study showed that SGMs continue to experience adverse mental health outcomes to a greater extent than their heterosexual peers. This study further showed that the prevalence of mental health distress differs across SGM subgroups and further varies among particular sociodemographic segments of the SGM population. These findings highlight the need to address the disparities in adverse mental health outcomes among SGMs as they persist within particular SGM subgroups and sociodemographic segments of the SGM population. Continued research that examines the health needs of particular SGM subgroups and sociodemographic segments of SGM populations will provide insights needed to guide Public health initiatives and interventions that address and ultimately eliminate disparities in mental outcomes within the SGM population.

Appendix A: Main Effects and Interaction Effects of Sociodemographic Factors on Mental Health Distress among SGM Males

The main effects and interaction effects that each sociodemographic factor had on the odds for SGM males to experience more days of mental health distress relative to their heterosexual peers was examined separately for each sociodemographic factor via a series of logistic regression models. The results of each analyses is presented in Table 11. The regression model continued to be statistically significant when adjusting for the main and interaction effects of race/ethnicity ($X^2=44.2$, $p<.001$). With Cox & Snell=.067, the regression model continued to be a slight improvement over the basic model. When adjusting for race/ethnic identity, the model was able to explain 6.7% of the variation in mental health distress.

An examination of the regression coefficients shows that males who identified as gay and males who identified as bisexual continued to have statistically significantly greater odds of experiencing mental health distress 1-14 days and 15-30 days per month compared to their heterosexual peers when adjusting for race/ ethnic identity. With OR=2.32 and OR=2.47, gay males had 2.32 and 2.47 times the odds of experiencing mental health distress 1-14 days and 15 or more days per month compared to their heterosexual peers. With OR=2.43 and OR=2.89, bisexual males had 2.43 and 2.89 times the odds of experiencing mental health distress 1-14 days and 15 or more days per month compared to their heterosexual peers when adjusting for race/ethnic identity. An examination of the individual regression coefficients for each racial/ethnic group shows that Black(non-Hispanic) and Multiracial were the only racial/ethnic groups that made a statistically significant contribution to the variation in mental health distress (15 or more days) when adjusting for sexual orientation. With OR=2.07 and OR=3.45, the odds of experiencing 15 or more days of mental health distress each month were 2.07 and 3.45 times

greater for males who identified as Black and males who identified as Multicultural compared to males who identified as White (non-Hispanic) when adjusting for sexual orientation.

When education level was entered into the regression model (adjusting for main effects and interaction effects of education level), the regression model continued to be of statistical significance ($X^2=221.6$, $p<.001$). However, the regression model was only able to explain 3.2% of the variation in mental health distress (Cox & Snell=.032). Males who identified as gay and bisexual men continued to have significantly greater odds of experiencing 1-14 days of mental health distress each month compared to their heterosexual peers. With OR=2.34 and OR=2.42, males who identified as gay and males who identified as bisexual had 2.34 and 2.42 times the odds of experiencing mental health distress 1-14 days per month compared to their heterosexual peers. With OR=1.80, males who identified as gay continued to have significantly greater odds of experiencing mental health distress 15-30 days per month relative to their heterosexual peers. Interestingly, however, when adjusting for education level, males who identified as bisexual no longer had statistically significant greater odds of experiencing mental health distress 15-30 days per month [OR=1.81; CI .91,3.60]. When adjusting for sexual orientation, males who did not graduate from high school were the only education level group that made a statistically significant contribution to the regression model. With OR=2.30, males who did not graduate from high school had 2.30 the odds of experiencing mental health distress 15-30 days per month compared to males who had a college degree (OR=2.30, $p=.003$). Education level, however, did not have a statistically significant interaction effect on the odds for SGM males to experience more days of mental health distress relative to their heterosexual peers.

When income level was entered into the regression model (adjusting for the main effects and interaction effects of income level), the regression model continued to be of statistical

significance ($X^2=104.9$, $p<.001$). With Cox & Snell=.10, the regression model was able to explain the most variation in mental health distress within the male segment of the study sample (Cox & Snell=.10).

An examination of the individual regression coefficients shows males who identified as gay and bisexual males continued to have significantly greater odds of experiencing 1-14 days of mental health distress per month and 15-30 days of mental health distress per month compared to their heterosexual peers when adjusting for income level. With OR=2.28 and OR=2.58, males who identified as gay and males who identified as bisexual had 2.28 and 2.58 times the odds of experiencing mental health distress 1-14 days per month compared to their heterosexual peers. With OR=1.82 and OR=1.87, males who identified as gay and males who identified as bisexual had 1.82 and 1.87 times the odds of experiencing mental health distress 15 or more days per month compared to their heterosexual peers. An examination of the individual regression coefficients for income level shows that males with an annual income of less than \$15,000 continued to have statistically significantly greater odds of experiencing mental health distress 1-14 days and 15-30 days per month compared to males who had an annual income of \$50,000 or greater when adjusting for sexual orientation. Males who reported an annual income of \$15,000-\$24,999 also had statistically significantly greater odds of experiencing mental health distress 15-30 days per month compared to their peers when adjusting for sexual orientation. When adjusting for sexual orientation, males who had an annual income of less than \$15,000 had 2.65 and 5.43 times the odds of experiencing mental health distress 1-14 days and 15-30 days per month compared to males who had an annual income of \$50,000 and above [OR=2.65;OR=5.43]. With OR=2.38, males who had an annual income of \$15,00-\$24,999 had 2.38 times the odds of experiencing 15-30 days of mental health distress compared to males who

had an annual income of \$50,000 and above. Once again, however, there was not a statistically significant interaction effect between the sociodemographic factor of income level and sexual orientation within the male segment of the study sample.

When age was entered into the regression model (adjusting for the main effects and interaction effects of age) the regression model continued to be of statistical significance ($X^2=118.7$, $p<.001$). With Cox & Snell=.095, the regression model was able to explain 9.5% of the variation in mental health distress when adjusting for the variation attributed to age. Interestingly, however, bisexual males no longer had statistically significantly greater odds of experiencing 1-14 days of mental health distress per month. Males who identified as gay no longer had statistically significantly greater odds of experiencing 15-30 days of mental health distress per month compared to their heterosexual peers. With OR=2.70, males who identified as gay had 2.70 times the odds of experiencing mental health distress 1-14 days per month compared to their heterosexual peers. With OR=3.49, males who identified as bisexual had 3.49 times the odds of experiencing mental health distress 15 or more days per month compared to their heterosexual peers. With the exception of males who were 35 to 45 years in age, the odds of experiencing mental health distress was significantly greater for younger males compared to males who were 65 years in age and older. Once again, there was not a statistically significant interaction effect between the sociodemographic factor of age and sexual orientation subgroups within the male segment of the study sample.

Table 11

Main Effects and Interaction Effects of Sociodemographic Factors on Mental Health Distress among SGM Males

Model	Significant Predictors	1-14 Days			15-30 Days				
		OR	95% CI	p	OR	95% CI	P		
Sexual Orientation	Gay Males	2.313	1.799	2.974	.000	2.404	1.773	3.260	.000
	Bisexual	2.402	1.797	3.212	.000	2.930	2.122	4.047	.000
Wald=81.8 Cos & Snell=.045									
Model									
Sexual Orientation	(Intercept)	.291	.244	.346	.000	.106	.083	.136	.000
X Race / Ethnicity	Gay Male	2.153	1.628	2.846	.000	2.616	1.832	3.735	.000
	Bisexual	2.292	1.598	3.287	.000	3.354	2.220	5.067	.000
Wald=44.15 Cox & Snell=.067	Black*					2.074	1.110	3.875	.022
	Multiracial					3.450	1.086	10.963	.036
Model									
Sexual Orientation	(Intercept)	.264	.214	.327	.000	.103	.068	.156	.000
X Education Level	Gay Male	2.341	1.702	3.219	.000	1.796	1.040	3.103	.036
	Bisexual	2.418	1.598	3.660	.000	1.806	.907	3.594	.092
Wald=221.6 Cos & Snell=.032	> HS					2.532	1.372	4.673	.003
	Model								
Sexual Orientation	(Intercept)	.272	.221	.336	.000	.088	.060	.129	.000
X Income	Gay Male	2.282	1.647	3.161	.000	1.816	1.058	3.116	.030
	Bisexual	2.579	1.609	4.132	.000	1.868	1.060	3.290	.031
Wald=104.93 Cox & Snell=.10	> \$15,000	2.657	1.353	5.217	.005	5.453	2.843	10.458	.000
	\$15,000-\$24,999					2.369	1.248	4.498	.008
Model									
Sexual Orientation	Gay Male	2.703	1.487	4.913	.001	1.815	.731	4.508	.199
X Age	Bisexual	1.849	.926	3.691	.081	3.485	1.211	10.033	.021
	18-24 Yrs	5.340	3.023	9.435	.000	3.067	1.353	6.954	.007
Wald=118.7 Cox & Snell=.095	25-34 Yrs	2.549	1.575	4.124	.000	2.600	1.219	5.544	.013
	35-44 Yrs	2.498	1.481	4.211	.001	3.333	1.506	7.375	.003
	45-54 Yrs	2.096	1.282	3.427	.003	1.423	.661	3.064	.367
	55-64 Yrs	1.698	1.072	2.688	.024	2.188	1.067	4.484	.033

Appendix B: Main Effects and Interaction Effects of Sociodemographic Factors on Mental Health Distress among SGM Females

The main effects and interaction effects that each sociodemographic factor had on the odds for SGM females to experience more days of mental health distress relative to their heterosexual peers was examined separately for each sociodemographic factor via a series of logistic regression models. Table 12 presents the results of this series of analyses. When race/ethnicity was entered into the regression model (adjusting for the main effect and interaction effects of racial / ethnic identity), the regression model continued to be of statistical significance ($X^2=266.99, p<.000$). With Cox & Snell=.081, the regression model was only able to explain 8.1% of the variation in mental health distress when adjusting for race/ethnic identity within female segment of the study sample (Cox & Snell=.088). Hence, the regression model was not able to explain additional variation in mental health distress above that which was already explained by sexual orientation in the study sample.

When adjusting for race/ethnic identity, females who identified as lesbian and bisexual females continued to have significantly greater odds of experiencing 1-14 days and 15 or more days of mental health distress compared to their heterosexual peers when adjusting for race/ethnic identity. With OR=1.86 and OR=1.77, females who identified as lesbian had 1.86 and 1.77 times the odds of experiencing mental health distress 1-14 days and 15 or more days each month compared to their heterosexual peers. With OR=3.42 and OR=5.70, females who identified as lesbian had 3.42 and 5.70 times the odds of experiencing mental health distress 1-14 days and 15 or more days each month compared to their heterosexual peers. An examination of the individual regression coefficients for race/ethnic identity shows that females who identified

as multiracial had statistically significantly greater odds of experiencing mental health distress 1-14 days per month compared to females who were White (non-Hispanic). With OR=2.85, females who identified as Multiracial had 2.85 times the odds of experiencing mental health distress 1-14 days per month relative to females who identified as White (non-Hispanic) when adjusting for sexual orientation.

Interestingly, race/ethnic identity had a statistically significant interaction effect on the odds of experiencing 1-14 days of mental health distress and 15-30 days of mental health distress per month among females who identified as lesbian. With OR=.294, females who identified multiracial and lesbian had statistically significantly lower odds of experiencing mental health distress 1-14 days per month compared to their heterosexual peers who were White (non-Hispanic). However, with OR=12.058, lesbian females who identified their race / ethnicity as multiracial had 12.058 times the odds of experiencing mental health distress 15-30 days per month relative to White (non-Hispanic) heterosexual females. Importantly, however, with the confidence intervals spanning from 0.221 to 1.22, the odds for females who identified as multiracial to experience 15-30 days of mental health distress was not of statistical significance.

When education level was entered into the regression model (adjusting for the main effect and interaction effects of education level), the regression model continued to be of statistical significance ($X^2=67.2, p<.000$). With Cox & Snell=.12, the regression model was able to explain 12% of the variation in mental health distress when adjusting for education level within female segment of the study sample (Cox & Snell=.12).

When adjusting for the main effects and interaction effects of education level, females who identified as lesbian no longer had statistically significantly greater odds of experiencing more days of mental health distress relative to their heterosexual peers. With OR=2.85 and

OR=4.15, however, females who identified as bisexual continued to have significantly greater odds of experiencing 1-14 days of mental health distress and 15-30 days of mental health distress per month relative to their heterosexual peers. Interestingly, when adjusting for sexual orientation, females who did not graduate from high school had statistically significantly lower odds for experiencing 1-14 days of mental health distress per month [OR=.51]. Females who attended college but did not earn a college degree had statistically significantly greater odds [OR=1.7] of experiencing mental health distress 15-30 days per month compared to their peers with a college degree. Importantly, however, with OR=3.14 and OR=2.89, bisexual females who did not complete high school had significantly greater odds of experiencing mental health distress 1-14 days and 15-30 days per month relative to their heterosexual peers with a college degree.

When annual income was entered into the regression model (adjusting for the main effect and interaction effects of annual income), the regression model continued to be of statistical significance ($X^2=191.07, p<.000$). With Cox & Snell=.13, the regression model was able to explain 13% of the variation in mental health distress when adjusting for annual income within female segment of the study sample (Cox & Snell=.13).

When adjusting for the main effects and interaction effects of income level, females who identified as lesbian no longer had statistically significantly greater odds of experiencing more days of mental health distress per month relative their heterosexual peers. With OR=2.48 and OR=4.70, females who identified as bisexual continued to have statistically significantly greater odds of experiencing mental health distress 1-14 days and 15-30 days of per month compared to their heterosexual peers. While females who earned less than \$15,000 per year and \$15,000-\$24,999 per year no longer had statistically significantly greater odds of experiencing 1-14 days

of mental health distress per month, females who earned less than \$15,000 per year and \$15,000-\$24,999 per year continued to have statistically significantly greater odds of experiencing 15-30 days of mental health distress per month relative to their peers who earned \$50,000 or more per year. With OR=3.45 and OR=2.02, females who earned less than \$15,000 per year and \$15,000-\$24,999 per year had 3.45 and 2.02 times the odds of experiencing 15-30 days of mental health distress per month compared their peers who earned \$50,000 or more per. Interestingly, while females who identified as lesbian no longer had statistically significantly greater odds of experiencing mental health distress 1-14 days nor 15-30 days of per month when adjusting for income level, females who identified as lesbian and who had an annual income of \$15,000-\$24,000 per year had statistically significantly greater odds of experiencing mental health distress 15-30 days per month relative to their heterosexual peers with an annual income of \$50,000 or more (OR=2.90). Females who identified as bisexual and earned an annual income of \$35,000-\$49,000 also had statistically significantly greater odds of experiencing mental health distress 15-30 days per month relative to their heterosexual peers with an annual income of \$50,000 or above [OR=2.48].

When age was entered into the regression model (adjusting for the main effect and interaction effects of age), the regression model continued to be of statistical significance ($X^2=295.02, p<.000$). With Cox & Snell=.12, the regression model was able to explain 12% of the variation in mental health distress when adjusting for age within female segment of the study sample (Cox & Snell=.12).

When adjusting for age, females who identified as lesbian no longer had statistically significantly greater odds of experiencing more days of mental health distress per month relative to their heterosexual peers. With OR=1.90 and OR=2.50, bisexual females continued to have

statistically significantly greater odds of experiencing mental health distress 1-14 days and 15-30 days per month relative to their heterosexual peers when adjusting for age. With the exception of females who were 55-64 years in age, younger females continued to have statistically significantly greater odds of experiencing more days of mental health distress per month relative to females who were 65 years in age and older. Age, however, did not have a statistically significant interaction with sexual orientation within the female segment of the study sample.

Table 12

Logistic Regression Models of Mental Health Distress of Female Sexual Orientation Subgroups and Significant Sociodemographic Factors

Model	Significant Predictors	1-14 Days of Mental Health distress				15+ Days of Mental Health Distress			
		OR	95% CI		p	OR	95% CI		Sig.
			Lower	Upper			Lower	Upper	
Sexual Orientation X ² =182.3 Cox & Snell=.088	(Intercept)	.385	.339	.436	.000	.197	.165	.234	.000
	Lesbian	1.537	1.102	2.143	.011	1.924	1.339	2.764	.000
	Bisexual	3.135	2.514	3.908	.000	5.404	4.164	7.013	.000
Sexual Orientation X Racial / Ethnic Identity X ² =33.78 Cox & Snell=.081	(Intercept)	.386	.334	.445	.000	.214	.176	.261	.000
	Lesbian	1.886	1.363	2.610	.000	1.765	1.172	2.657	.007
	Bisexual	3.416	2.621	4.452	.000	5.702	4.186	7.767	.000
	Hispanic	2.854	1.376	5.918	.005				
	Multirace					.584	.339	1.007	.053
Lesbian X Multirace	.294	.092	.934	.038	12.058	2.451	59.326	.002	
Sexual Orientation X Education Level X ² =67.2 Cos & Snell=.12	(Intercept)	.441	.354	.550	.000	.137	.103	.183	.000
	Lesbian	1.446	.979	2.135	.064	1.460	.836	2.549	.183
	Bisexual	2.858	2.014	4.058	.000	4.145	2.659	6.461	.000
	> HS	.517	.315	.849	.009				
	Attended College					1.743	1.152	2.637	.009
Lesbian X > HS Diploma	3.143	1.342	7.363	.008	2.893	1.102	7.592	.031	
Sexual Orientation X Income X ² =191.07 Cox & Snell=.13	(Intercept)	.401	.328	.491	.000	.143	.100	.206	.000
	Lesbian	1.293	.818	2.045	.271	1.003	.500	2.009	.994
	Bisexual	2.477	1.729	3.548	.000	4.697	2.839	7.774	.000
	> \$15,000					3.447	1.940	6.125	.000
	\$15k-\$25k					2.019	1.155	3.529	.014
	Lesbian X \$15k-\$25k					2.879	1.022	8.106	.045
Bisexual X \$34k-\$49k					2.481	1.006	6.118	.048	
Sexual Orientation X Age X ² =295.70 Cox & Snell=.12	(Intercept)	.232	.177	.304	.000	.093	.067	.128	.000
	Lesbian	.887	.362	2.169	.792	2.434	.866	6.836	.091
	Bisexual	1.892	1.010	3.546	.047	2.501	1.177	5.315	.017
	18-24 Yrs	2.403	1.341	4.304	.003	2.816	1.210	6.554	.016
	25-34 Yrs	2.387	1.557	3.661	.000	2.353	1.337	4.142	.003
	35-44 Yrs	1.839	1.230	2.752	.003	3.157	1.958	5.091	.000
	45-54 Yrs	1.981	1.353	2.900	.000	2.325	1.378	3.923	.002
55-64 Yrs					2.221	1.370	3.600	.001	

Appendix C: Mental Health Distress Odds across Sociodemographic Subgroups

To further examine the extent and manner in which the sociodemographic factors contributed to the variation in mental health distress, a series of logistic regression analyses were conducted. Each sociodemographic factor was examined as a predictor of mental health distress 1-14 days and 15-30 days per month (versus 0 days of mental health distress) for the male and female segments of the study sample. With regard to race / ethnic identity, males and females who identified as multiracial had statistically significantly greater odds of experiencing mental health distress 1-14 days and 15-30 days per month compared to males and females who were White (non-Hispanic). With OR=1.87, Black males also had statistically significantly greater odds of experiencing 1-14 days of mental health distress per month compared to White (non-Hispanic) males. With OR=0.510, females who identified as Other had statistically significantly lower odds of experiencing 1-14 days of mental health distress per month compared to White (non-Hispanic) females. With Cox & Snell=0.016 and 0.010 for males and females, respectively, race/ethnic identity explained the least amount of variation in mental health distress within the male and female segments of the study sample.

With regard to education level, males and females who did not graduate from high school and who graduated from high school but did not attend college had statistically significantly greater odds of experiencing 15-30 days of mental health distress compared to males and females with a college degree. With Cox & Snell=0.020 and 0.022, however, education level explained only 2% of the variation in mental health distress within the male and female segments of the study sample.

With Cox & Snell=0.049, annual income explained the greatest amount of variation in mental health distress within the male segment of the study sample. With OR=5.21 and

OR=5.21, males who earned less than \$15,000 per year had statistically significantly greater odds of experiencing 1- 14 days and 15-30 days of mental health distress per month compared to their peers who made \$50,000 and above per year. With OR=1.48 and OR=3.20, females who earned less than \$15,000 per year had statistically significantly greater odds of experiencing 1- 14 days and 15-30 days of mental health distress per month compared to their peers who made \$50,000 and above. Males and females with an annual income of \$25,000-\$35,000 continued to have statistically significantly greater odds of experiencing 1-14 days and 15-30 days of mental health distress compared to their peers with an annual income of \$50,000 or above. With Cox & Snell=0.068 and .047, age explained the greatest amount of variation in mental health distress in the male and female segment of the study sample. An examination of the individual regression coefficients shows that the odds of experiencing 1-14 days and 15-30 days of mental health distress per month is statistically significantly lower for males and females who were 65 years in age and older compared to males and females in all other age brackets with the odds of experiencing mental health distress decreasing with age.

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- ❖ PhD: Curriculum & Instructional Studies, May 2002
Emphasis: Quantitative Research Methods and Instructional Design

University of Iowa

- ❖ M.A.T. in Science Education; August 1997
 - ❖ Teacher Licensure Program: May 1996
Secondary Science: Biology, Chemistry, and Physical Science
 - ❖ B.A. in Biology; May 1994
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