

2018

Comparative Effectiveness of Conventional and Novel Sampling Methods for the Recruitment of Sexual Minority Identified Women

Sarah M. Piperato
University of South Carolina

Follow this and additional works at: <https://scholarcommons.sc.edu/etd>



Part of the [Epidemiology Commons](#)

Recommended Citation

Piperato, S. M.(2018). *Comparative Effectiveness of Conventional and Novel Sampling Methods for the Recruitment of Sexual Minority Identified Women*. (Doctoral dissertation). Retrieved from <https://scholarcommons.sc.edu/etd/4800>

This Open Access Dissertation is brought to you by Scholar Commons. It has been accepted for inclusion in Theses and Dissertations by an authorized administrator of Scholar Commons. For more information, please contact digres@mailbox.sc.edu.

Comparative Effectiveness of Conventional and Novel Sampling Methods for the
Recruitment of Sexual Minority Identified Women

by

Sarah M. Piperato

Bachelor of Science
State University of New York College at Cortland, 2011

Master of Science
Indiana University of Pennsylvania, 2014

Submitted in Partial Fulfillment of the Requirements

For the Degree of Doctor of Philosophy in

Epidemiology

The Norman J. Arnold School of Public Health

University of South Carolina

2018

Accepted by:

Melinda Forthofer, Major Professor

Myriam Torres, Committee Member

Andrew Ortaglia, Committee Member

Jessamyn Bowling, Committee Member

Cheryl L. Addy, Vice Provost and Dean of the Graduate School

© Copyright by Sarah M. Piperato, 2018
All Rights Reserved.

DEDICATION

For my partner, Jamie Piperato, for your endless love and support.

ACKNOWLEDGEMENTS

First, I would like to thank my mentor, Lyndie Forthofer, who has supported and guided me throughout my graduate experience. Her guidance has been instrumental in my development as a researcher and epidemiologist. She has not only shown me how to be a professional but also the importance of balancing your work and hobbies and that it is possible to be a well-rounded person in academia. I would also like to thank my dissertation committee, Myriam Torres, Jessamyn Bowling, and Andrew Ortaglia, for their time and support throughout the dissertation process. Your knowledge, support, and encouragement were vital in helping me achieve my goals.

I would also like to acknowledge the funding that made this research possible. This research was supported in part by Grant Number T32-GM081740 from NIH-NIGMS.

ABSTRACT

Sexual minority identified (SMI) women have an amplified risk for risky health behaviors and chronic health conditions. Current research on mechanisms related to health disparities in SMI women is limited. Research targeting SMI women has relied on small, convenience samples to address health disparities. Due to the nature of this population, probability sampling methods are ineffective and inefficient and cost prohibitive. The purpose of this dissertation was threefold. First, we examined the current state of literature to gain insight on prevalent sampling strategies used to access SMI women for health-related research. Second, we compared the efficacy of two sampling strategies, convenience sampling and respondent-driven sampling, for recruiting SMI women for a health survey. Finally, we examined the prevalence of cardiometabolic risk factors and associations with minority stressors.

We found that the majority of recent health studies have used non-probability, convenience sampling techniques to reach sexual minority identified women. This finding supported our second aim, examining the efficacy of respondent-driven sampling for recruiting SMI women for health research. Unfortunately, we had limited success garnering a sufficient sample size using respondent-driven sampling. The shortcomings we experienced using respondent-driven sampling were likely due to modifications made to the sampling method. Finally, we did not observe any associations between cardiometabolic risk factors and minority stressors in this sample of sexual minority identified women. Low prevalence of cardiometabolic risk factors and

homogeneity of the sample likely contributed to the lack of observable associations.

Future research among SMI women should focus on improving sampling methodology, intentionally working towards reaching a more diverse sample of women.

TABLE OF CONTENTS

Dedication	iii
Acknowledgements	iv
Abstract	v
List of Tables	viii
List of Figures	ix
Chapter 1: INTRODUCTION.....	1
Chapter 2: A SYSTEMATIC REVIEW OF SAMPLING STRATEGIES TO RECRUIT SEXUAL MINORITY IDENTIFIED WOMEN FOR HEALTH RESEARCH.....	9
Chapter 3: COMPARATIVE EFFECTIVENESS OF RESPONDENT-DRIVEN SAMPLING AND CONVENIENCE SAMPLING METHODS FOR RECRUITING SEXUAL MINORITY IDENTIFIED WOMEN FOR HEALTH RESEARCH.....	23
Chapter 4: AN EXAMINATION OF ASSOCIATIONS BETWEEN MINORITY STRESSORS AND CARDIOMETABOLIC RISK FACTORS AMONG SEXUAL MINORITY IDENTIFIED WOMEN	37
Chapter 5: SUMMARY	58
References.....	62
Appendix A: SYSTEMATIC REVIEW SEARCH TERMS	73
Appendix B: HEALTH SURVEY	75

LIST OF TABLES

Table 2.1 Characteristics of Studies of Health Outcomes in Sexual Minority Women Published Between January 2013 and December 2017.....	20
Table 3.1 Sample Characteristics of Sexual Minority Identified Women	35
Table 3.2 Comparison of Sample Characteristics of Sexual Minority Identified Women	36
Table 4.1 Characteristics of Sexual Minority Identified Women	47
Table 4.2 Cardiometabolic Risk Factors Among Sexual Minority Identified Women	48
Table 4.3 Crude and Adjusted Logistic Regression Analysis of Associations between Cardiometabolic Risk Factors and Perceived Discrimination.....	49
Table 4.4 Crude and Adjusted Logistic Regression Analysis of Associations between Cardiometabolic Risk Factors and Perceived Stress	50
Table 4.5 Crude and Adjusted Logistic Regression Analysis of Associations between Cardiometabolic Risk Factors and Internalized Homophobia	51
Table 4.6 Associations Between Minority Stressors and Cardiometabolic Risk Factors Adjusted for Resilience	52
Table 4.7 Reduced Sample Characteristics of Sexual Minority Identified Women	53
Table 4.8 Cardiometabolic Risk Factors Among Sexual Minority Identified Women, Reduced Sample	54
Table 4.9 Crude and Adjusted Logistic Regression Analysis of Associations between Cardiometabolic Risk Factors and Perceived Discrimination, Reduced Sample	55
Table 4.10 Crude and Adjusted Logistic Regression Analysis of Associations between Cardiometabolic Risk Factors and Perceived Stress, Reduced Sample	56
Table 4.11 Crude and Adjusted Logistic Regression Analysis of Associations between Cardiometabolic Risk Factors and Internalized Homophobia, Reduced Sample	57

LIST OF FIGURES

Figure 1.1 Minority stress processes in lesbian, gay, and bisexual populations.....	8
Figure 2.1 Eligibility Criteria for Studies of Physical Health Outcomes in Sexual Minority Identified Women Published Between January 2013 and December 2017	19

CHAPTER 1

INTRODUCTION

Sexual Minority Identified Women

Lesbian, bisexual, gay and transgender (LGBT) communities were recently designated a health disparity population by the National Institutes of Health.¹ Historically, three main components of sexual orientation have been considered.² Sexual attraction is the least frequently used measure, referring to one's desire towards a partner of a particular sex or both sexes.³ A more commonly used measure, sexual behavior, has referred to individuals' physical sexual experiences with partners of one or more sex.³ Finally, sexual self-identification refers to individuals' self-recognition of their sexuality, including labels such as lesbian, bisexual, and heterosexual.^{3,4}

Research on social experiences such as discrimination, victimization, homophobia, and social support benefit most from the measurement of sexual self-identification.³ Measures of sexual self-identification encompass an individuals lived social experiences due to social identification within a minoritized group.³ Therefore, self-identification is more useful in identifying individuals who participate in LGBT social spaces or who experience social stigmatization due their identification outside of the heterosexual norm.³ For the purposes of this study, we will be focusing on the experiences and health outcomes of sexual minority identified (SMI) women. We choose to use the term *sexual minority identified* because we believe that the perception of ones lived experiences are filtered through the lens of ones' identities. For this reason, we

believe that focusing on identity rather than sexual behavior will capture a more accurate representation of the individuals lived experiences.

Health Disparities

Sexual minority identified women experience amplified risk for multiple health-related behaviors and chronic health conditions. Compared to heterosexual identified women (HSI), SMI women have been found to be more likely to engage in risky drinking, cigarette smoking, illicit drug use, and cancer-related health risk behaviors.⁵⁻⁸ Participation in increased risky health behaviors has been documented across age groups in SMI women.^{5,6} Additionally, previous research has shown SMI women to have greater odds of chronic health conditions including; obesity, cardiovascular disease, breast cancer, and mental health conditions, compared to HSI women.⁸⁻¹¹

Health disparities are not consistent across LGBT sub-groups with differences emerging between SMI women and SMI men.^{5,6,12} In a study of LGB older adults conducted by Fredriksen-Goldsen, et al., SMI women were more likely to have cardiovascular disease and obesity whereas SMI men were more likely to suffer from poor physical health and living alone.⁶ Due to potential differences in the experiences and health outcomes of SMI women and SMI men it is prudent to examine these groups separately. Health disparities among SMI women are gaining increased attention; however, research addressing correlates of these disparities is still limited.

Minority Stress Model

The Minority Stress Model attempts to explain how the cumulative effects of stress induced by disconnect with dominant societal norms may contribute to health disparities in sexual minoritized groups.¹³ The minority stress model is a hybrid of

multiple social and psychological frameworks including: societal reaction theory, symbolic interaction theory, and social comparison theories, among others.¹³⁻¹⁸ Minority stress, a central concept in the model, is believed to arise from the conflict between identification in a minoritized group and dominant societal values.¹³ This tenet of the model draws upon social comparison theory and social reaction theory, which posit that the social environment provides a basis for meaning and organization of one's lived experiences.¹³ For example, if an individual experiences negative regard from others they are more likely to develop a negative self-regard.¹³ Additionally, the minority stress model incorporates elements of social reaction theory which address the effects of stigma and the resulting responses from individuals.¹³ Due to stigmatization, individuals who deviate from the "norm" may develop adaptive and maladaptive behaviors leading to further deviance.¹³

The main tenet of the minority stress model is that stressors are unique to minoritized populations and act above and beyond commonly expected societal stressors.¹⁹ Meyer's (2003) model (Figure 1) describes stress processes including, perceived prejudice, internalized homophobia, negative coping strategies, expectations of rejection, and concealment of identity.¹⁹ These stressors are assumed to be chronic and socially based, implying an increased cumulative effect of stressors, beyond that of non-minoritized populations.¹⁹ Framing research using the minority stress model provides the ability to examine the health effects of unique stigmatizations experienced by sexual minority identified women.

Cumulative stress has been associated with increased risk for cardiovascular outcomes.²⁰⁻²³ A path model from stressful life events to cardiovascular outcomes

suggests metabolic syndrome as an intermediate variable between stressful life events and cardiovascular outcomes.²³ Sexual minority identified women are at an increased risk for multiple cardio-metabolic risk factors.^{8,9,22} Variables associated with increased risk for cardio-metabolic risk factors among sexual minority identified women are largely unknown. Use of the minority stress model to investigate associations between unique stressors associated with identification in a minoritized population and cardio-metabolic risk factors associated with metabolic syndrome will provide insight into the pathway between identification as a sexual minority and increased cardiovascular disease risk.

Non-Probability Sampling

Research on the health of SMI women has been hindered by the inability to recruit adequate samples of SMI women in population-based samples.²⁴ Therefore, inferences in previous studies have been limited by small sample sizes, and convenience sampling methods.²⁵ Such sampling methods can result in biased, unreliable results, thereby increasing potential for stigmatization, inadequate policy, and health care providers ill-equipped to address the needs of SMI women.²⁵

Hardly reached cannot be sampled using conventional probability sampling methods because no sampling frame has been established. The inability to utilize probability sampling in many invisible populations such as LGBT sub-populations has led to the development of alternative, non-probability-based sampling methods. Three main types of non-probability sampling are convenience sampling (CS), purposive sampling (PS) and chain-referral sampling (CR). CS entails data collection from resources that are readily available to the researchers such as, LGBT centers, student groups and web-based organizations.²⁵⁻²⁷ Researchers using CS are unable to take into

consideration biases associated with participation because there is no conceptual definition of the population of interest. CS is the most commonly used sampling strategy for recruitment of LGBT participants currently in practice.²⁵ PS is a type of non-probability sampling in which the researcher intentionally selects certain individuals from within a source population that they believe will fit the needs of the study.²⁶ PS allows the researcher to control the population sample based on specific characteristics; however, PS is susceptible to similar sources of bias as CS. CR sampling recruits study participants by utilizing referral methods from participant's social networks.²⁵⁻²⁷ The main advantage of CR sampling is the ability to expand the source population of the study to include members of minoritized groups that may have been hidden, but are able to be located through their social ties with other group members.²⁵⁻²⁷

Respondent-Driven Sampling

Respondent-driven sampling was developed as a procedure to sample invisible populations for which no established sampling frame exists.²⁸ Sometimes, membership in such populations involves stigmatized or illegal behavior, leading to privacy concerns associated with exposure of identification within the group.²⁸ Thus, catchment of such groups is often limited within population based sampling strategies.²⁸

A subset of chain-referral sampling, respondent-driven sampling relies on the utilization of participants' existing social networks and incentivized participation to recruit the sample.^{28,29} Respondent-driven sampling initiates recruitment through selection of initial seed participants.²⁸ Seeds are then encouraged to utilize their social networks to make referrals to prospective participants.²⁸ A dual incentive system provides compensation for initial study participation and for successful recruitment of

each additional participant.²⁸ Recruited participants are also provided the opportunity to recruit additional participants, with the same compensation structure offered to seed participants.²⁸

A more structured protocol compared to traditional chain-referral techniques, respondent-driven sampling also provides the ability to calculate an individual's degree of connectedness and relative inclusion probabilities, thus allowing for adjustments due to selection bias.^{30,31} The calculation of inclusion probabilities assists in bridging the gap between probability and non-probability based samples. In theory, the sample recruited using respondent-driven sampling will reach 'equilibrium' in six recruitment waves or less.²⁷ Magnani et al., describes equilibrium as the convergence of estimates around a stable sample composition, implying that sample composition will not change from additional waves of recruitment.²⁷

Purpose of the dissertation

The objective of this dissertation is to explore sampling frameworks for the recruitment of sexual minority identified women. This objective will provide insight on best practices of recruiting an invisible population of SMI women. The secondary objective of this dissertation is to test the Minority Stress Model's applicability to understanding associations between minority stressors and selected metabolic risk factors in a sample of SMI women.

Specific Aims

Aim 1: Evaluate evidence regarding sampling approaches for recruitment of SMI women and the potential contribution of RDS by conducting a systematic review

of current recruitment strategies used to garner samples of SMI women from the past 5 years.

Research Question 1.1: What is the current standard of practice for recruiting samples of SMI women?

Research Question 1.2: What are the benefits/detriments to current recruitment strategies compared to RDS?

Aim 2: Compare and contrast the efficacy of RDS and CS recruitment strategies among SMI women in a metropolitan area in the Southeastern United States.

Research Question 2.1: What are the similarities and differences in sample size, cost and sample characteristics between the RDS sample and the CS sample?

Research Question 2.2: How do comparisons of sample characteristics differ between the post-weight RDS sample and the CS sample and the pre-weighted RDS sample and CS sample?

Aim 3: To determine the direction of the relationship between minority stressors; perceived discrimination, perceived stress, and internalized homophobia and cardio-metabolic risk factors in SMI women residing in the Charlotte, NC metropolitan area.

Research Question 3.1: Are perceived discrimination, perceived stress, and internalized homophobia associated with cardio- metabolic risk factors in a sample of SMI women?

Research Question 3.2: Do high rates of resiliency act as protection against cardio-metabolic risk factors in a sample of SMI women?

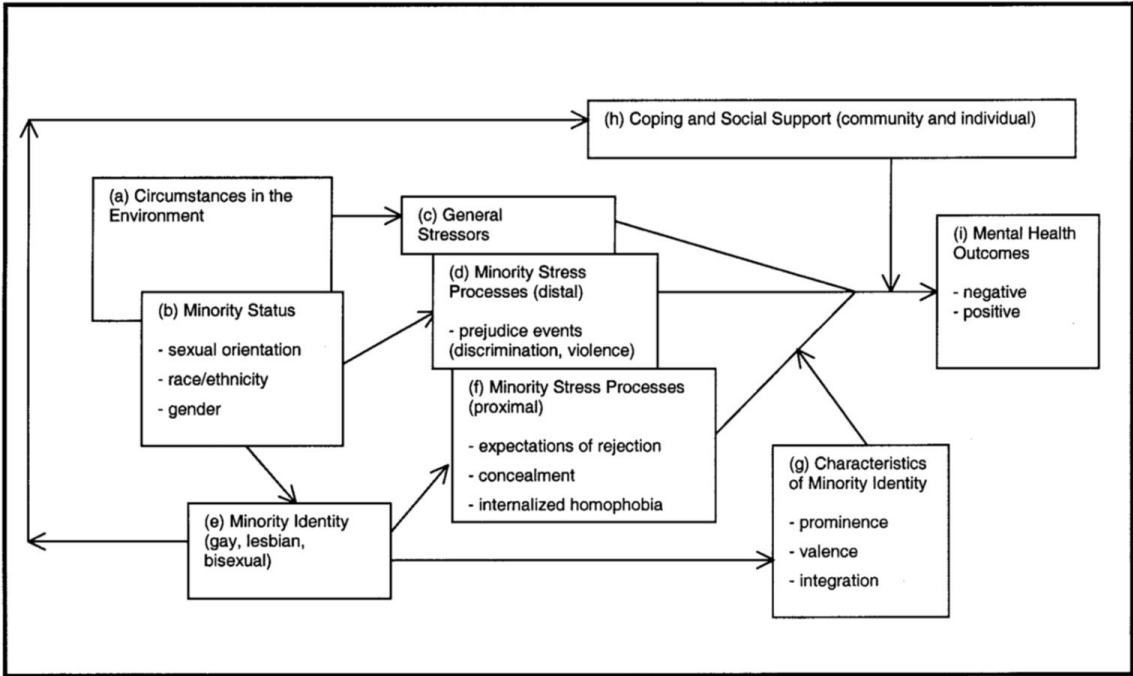


Figure 1.1 Minority stress processes in lesbian, gay, and bisexual populations¹⁹

CHAPTER 2

A SYSTEMATIC REVIEW OF SAMPLING STRATEGIES TO RECRUIT SEXUAL MINORITY IDENTIFIED WOMEN FOR HEALTH RESEARCH

Background

Sexual minority identified women (SMI) are at an increased risk for multiple health outcomes compared to their heterosexual identified peers. Although health disparities between these population have been established in the scientific literature, many estimates have relied on convenience sampling approaches and small sample sizes which may limit their generalizability. Below is a brief description of common types of sampling methods specifically examined for use with sexual minority populations.

Traditional surveillance systems employ probability sampling methods to examine trends found in the general population. The main premise of probability sampling is that each person in the population has a nonzero chance of being included in the study sample.³² Issues arise when using probability sampling techniques for sexual minority populations. Simple random sampling is prohibitively expensive when targeting sexual minority samples.^{25-27,33} The population percentage of sexual minorities is estimated at 3.5%, meaning that an exorbitantly large sample would have to be screened to recruit an acceptable sample of sexual minority identified individuals.³⁴ These samples would likely be too small to address research questions regarding variability within the sexual minority community.²⁴ Additionally, using more complex sampling strategies such as cluster or stratified sampling is impractical because no sampling

framework currently exists for sexual minority populations.²⁵⁻²⁷ Researchers have attempted to circumvent these issues by targeting geographic areas with known large populations of sexual minority individuals.³⁵ However, the results of such studies are not likely to be generalizable, as sexual minorities who live in large metropolitan areas are unlikely to have experiences comparable to those of sexual minorities in less urban environments. Due to the difficulty, expense, and lack of sampling frames, researchers have relied on nonprobability sampling techniques for reaching sexual minority communities.

Nonprobability sampling methods are often used in studies of sexual minority individuals as alternatives to costly probability sampling techniques. Nonprobability sampling, sometimes called convenience sampling, is any sampling technique in which the inclusion probability is unknown for individuals within the sample.²⁵ Though not an exhaustive list, we will discuss some examples of commonly used nonprobability sampling methods for recruitment of sexual minority individuals.

Time-space sampling attempts to limit sampling bias by establishing a sampling frame. Researchers using time-space sampling first identify venues that the target population frequents. Next, they observe the venues at different times during the day to gather information on the number of people in the target population that are likely to be at that venue at specific times of the day. A sampling frame of time-space units is established based on the information gathered. Finally, the researchers randomly choose times to visit each venue with the goal of interviewing all potential participants at the venue during that time. Challenges are presented when using time-space sampling with sexual minority populations. For example, researchers are not immediately able to

determine that a person is a sexual minority without asking them to disclose their sexual identity. Therefore, if people are unwilling to disclose this information the sampling frame will be biased. Additionally, if a researcher does not have a full sample of all venues then the results of their study may be biased towards individuals who frequent specific types of venues. For example, studies that recruit sexual minorities from LGBT-focused bars will likely find that sexual minorities have higher rates of alcohol consumption compared to heterosexual individuals. Time-space sampling is also very time consuming and costly due to the amount of surveillance work that is required prior to data collection.

Snowball sampling is a chain referral method in which researchers capitalize on participants social networks to increase the scope of the study outreach. When using snowball sampling, initial participants may be recruited in a variety of ways including community centers, advertisements, or individuals known to the researcher.^{25,27} Participants are encouraged to share the study information with those who would qualify in their social network. Snowball sampling can be useful for reaching individuals who may not have been reached through primary outreach methods. However, bias may occur as participants are likely to be more socially connected, or similar to those who recruited them.²⁵ Snowball sampling can be useful for reaching a larger audience, but due to the unstructured nature of this technique and potential biases, the resulting conclusions are likely not generalizable.

Respondent-driven sampling also utilizes participant's social networks to drive study recruitment. A structured chain referral method, respondent-driven sampling employs a dual incentive system to encourage successful recruitment and participation

from referees.²⁸ Initial seeds are recruited via the researcher's connections, local community organizations, or advertisements and are provided an incentive to participate in the study. Seeds are then provided with a set number of referral coupons to refer qualified participants through their social networks. The seed participants are provided a secondary incentive if their referees participate. The referees are offered the same incentive scheme as the seed participants. This system of dual incentives is structured to encourage participation based on individual incentives as well as peer-pressure from those who referred the participant.²⁸ In addition to a dual incentive system, respondent-driven sampling allows the researcher to estimate an individual's inclusion probability based on questions provided in the study materials.³⁶ Though respondent-driven sampling is not a probability sampling technique, the ability to estimate inclusion probabilities and thus weight the sample assists in limiting biases associated with nonprobability sampling techniques. Using respondent-driven sampling for sexual minority populations may improve the reach of the study beyond those who are involved in lesbian, gay, bisexual, and transgender (LGBT) organizations.

The purpose of this systematic review is to synthesize and critique the current state of sampling methods for inclusion of sexual minority women for health research. We will discuss the types of sampling methods that have been used by researchers addressing health outcomes among sexual minority women and critique the strengths, potential for biases and the generalizability of the results.

Methods

This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.³⁷ We conducted a thorough

literature search of PubMed, PsychInfo, and CINAHL complete. A description of the electronic database searches is available in Appendix A.

Inclusion and Exclusion Criteria

Inclusion criteria were peer-reviewed English-language studies, data collected in the United States, published in 2013-2017, and adults 18 years and older. Additionally, studies included a measure of sexual orientation or sexual identity and contained a physical health-based outcome measure (physical disease state, cause-specific or all-cause mortality, or disease prevalence). We excluded reviews, gray literature, studies with male participants, samples sizes less than 50, studies with mental health outcomes, patient-provider outcomes, and health screening and vaccination outcomes.

Data Extraction

Articles were assessed by one reviewer in two phases: 1. title and abstract review 2. full text review. The initial search retrieved 1,994 articles (Figure 1). After excluding duplicate studies, we examined the title and abstract based on our inclusion and exclusion criteria. We determined that 159 articles warranted full-text review. The final sample consisted of 13 articles. Descriptions of the study's source, sample, outcomes, and sampling strategies were extracted and summarized in Table 1.

Results

The initial search of PubMed, PsychInfo, and CINAHL complete retrieved 1,994 articles (Figure 1). Duplicate articles were removed, resulting in 1,787 articles examined for this review. Through title and abstract review 1,628 articles were identified as not meeting inclusion criteria.

Full-text review of the remaining 159 articles identified 13 articles that were eligible for inclusion. Excluded articles including the following: review papers (2), validation studies (3), theory, policy, or position statements (39), and studies lacking a physical health outcome measure (102). The 102 articles that did not include physical health outcomes focused on outcomes that were mental health outcomes, maternity/fertility outcomes, behavioral risk factors, patient-provider relationships, and screening studies.

Summary of Sampling Strategies

Table 1 summarizes the data source, sample, outcomes, and sampling strategy of the 13 eligible articles.^{8,38,47-49,39-46} Only two of the thirteen studies used probability sampling.^{8,48} Both studies aggregated data from the National Health and Nutrition Examination Survey (NHANES) from multiple years.^{8,48} Farmer et al. (2013)⁸ aggregated NHANES data from 2001-2008 and Reiter & McRee (2017)⁴⁸ aggregated data from 2003-2012.

The remaining 11 articles used nonprobability sampling techniques.^{8,38,47,49,39-46} Convenience or snowball sampling was used in 8 of the 11 studies.^{38,39,41-43,46,47,49} Two of the articles that used convenience sampling used data from the Healthy Weight in Lesbian and Bisexual Women Study.^{41,42} The Healthy Weight in Lesbian and Bisexual Women Study recruited 367 participants from five sites using community organizations, websites, newsletters, and listservs.⁴¹ National samples were collected via online surveys using listservs, invitations, and social media advertisements by three studies.^{39,47,49} The three studies that used national, online surveys garnered the largest samples of sexual minority women compared to other studies that used convenience sampling.^{39,47,49} The

remaining three studies used convenience sampling methods focused on specific geographic areas including Chicago³⁸, Pittsburgh⁴³, and a five-site intervention with sites in Washington, DC, New York City, St. Louis, Columbia, MO, and San Francisco.⁴⁶ Although limited to specific geographic areas, similar methods were used to recruit the samples for each of these three studies.^{38,43,50}

The remaining three articles used online panels⁴⁵, a clinical sample⁴⁴, and modified respondent-driven sampling.⁴⁰ Mason & Lewis (2015) recruited 814 lesbian women via online panels.⁴⁵ The panel members were recruited by market research firms through advertisements, emails, and postal invitations.⁴⁵ Data from the Women's Health Initiative was used to compile a sample of 1,884 sexual minority women by Levahot et al. (2016).⁴⁴ The Women's Health Initiative gathered information, including sexual identity, from 40 clinical centers from across the United States.⁴⁴ Finally, modified respondent-driven sampling was used to recruit lesbian and bisexual women for wave 3 of the Chicago Health and Life Experiences of Women Study.⁴⁰ The first two waves of the Chicago Health and Life Experiences of Women Study utilized a convenience sampling approach.³⁸

Summary of Study Outcomes

The majority of articles examined multiple physical health outcomes. The most common physical health outcomes examined involved cardiometabolic risk factors.^{8,38,39,41-43,45-47} Weight status or body mass index was a primary outcome in seven of the articles.^{39,41-43,45-47} The remaining three articles examined all-cause and cancer specific mortality⁴⁴, HPV infection⁴⁸, and overactive bladder and stress urinary incontinence.⁴⁹ Additional outcomes assessed by each article are summarized in Table 1.

Discussion

These findings support prior assumptions that research aimed at recruiting sexual minority identified women has been limited by the inability to capture adequate samples using probability sampling techniques.²⁴ Out of 13 identified articles only two used probability sampling methods.^{8,48} However, both articles used the same source, the National Health and Nutrition Examination Survey. Additionally, each of these studies had to aggregate multiple years of data to reach an adequate sample size.^{8,48}

Probability sampling is a particularly difficult strategy for research with sexual minority populations. Firstly, sexual orientation or sexual identity has never been collected by the U.S. Census. A lack of reliable data makes the development of sampling frames prohibitively difficult.^{26,27,51} Since sexual minority populations are not identifiable via sampling frames, individuals need to be screened for inclusion thus increasing the cost, time, and effort needed to develop a sampling frame for this population.²⁶ Additionally, identifying sexual minority individuals for research is further complicated by the sensitive nature of identification.^{25-27,52} Sexual minority individuals may be reluctant to identify themselves to researchers for fear of stigmatization and discrimination.²⁵⁻²⁷ Finally, questions developed to collect sexual identity measures may be limiting researchers' abilities to enumerate sexual minority populations.⁵² Depending on race, ethnicity, socioeconomic status, and age, sexual minority individuals may choose different identity labels⁵², highlighting the need for inclusivity and thoughtfulness when developing sexual identity questions.^{53,54}

The majority of the articles identified utilized a convenience sampling or snowball sampling technique. Although convenience sampling approaches have assisted

researchers in reaching larger samples of sexual minority identified women, the generalizability of the results is limited.²⁵⁻²⁷ Such sampling methods can result in biased, unreliable results, increasing potential for selection bias, volunteer bias, and biases based on venue.²⁵ Inappropriate use of biased results can lead to poor policy decisions, increased stigmatizations, and ill-informed healthcare providers.²⁵ The heavy reliance on convenience sampling approaches for recruiting sexual minority identified women for health research is resultant on the expense and difficulty of reaching sexual minority populations. More novel, structured sampling techniques need to be tested and developed for reaching this hardly reached population.

One such novel approach is respondent-driven sampling. One article identified used respondent-driven sampling to recruit 366 sexual minority women for the third wave of the Chicago Health and Life Experiences of Women (CHLEW) study.⁴⁰ Respondent-driven sampling is a unique form of non-probability sampling because it is structured to allow for the calculation of inclusion probabilities after data collection has been completed.²⁸ Using the estimated inclusion probabilities, data can be weighted to adjust for differences in participant's probability of being included.^{28,29} Using respondent-driven sampling rather than traditional chain-referral sampling techniques may help minimize biases associated with non-probability sampling techniques without having to engage in the time consuming and costly process of developing a sampling frame.

Implications

Future studies should address the need for more robust sampling strategies for sexual minority identified women. Developing, testing, and improving conventional and new sampling techniques is an important process for improving the state of the literature

about sexual minority identified women's health. Researchers need to focus on developing and using strategies that limit potential biases associated with non-probability sampling techniques. Encouraging the use of more robust sampling techniques will enhance how policy, research, and medical professionals are informed of the needs of sexual minority identified women.

Conclusions

With this work, we intended to inform researchers of the current state of sampling methodology used for accessing sexual minority identified women. The majority of recent health studies have used non-probability, convenience sampling techniques to reach sexual minority identified women. Relying on convenience sampling approaches can induce bias and limit the generalizability of their findings. Researchers working with this population need to prioritize the testing and development of sampling approaches that will minimize bias and provide more generalizability of their results.

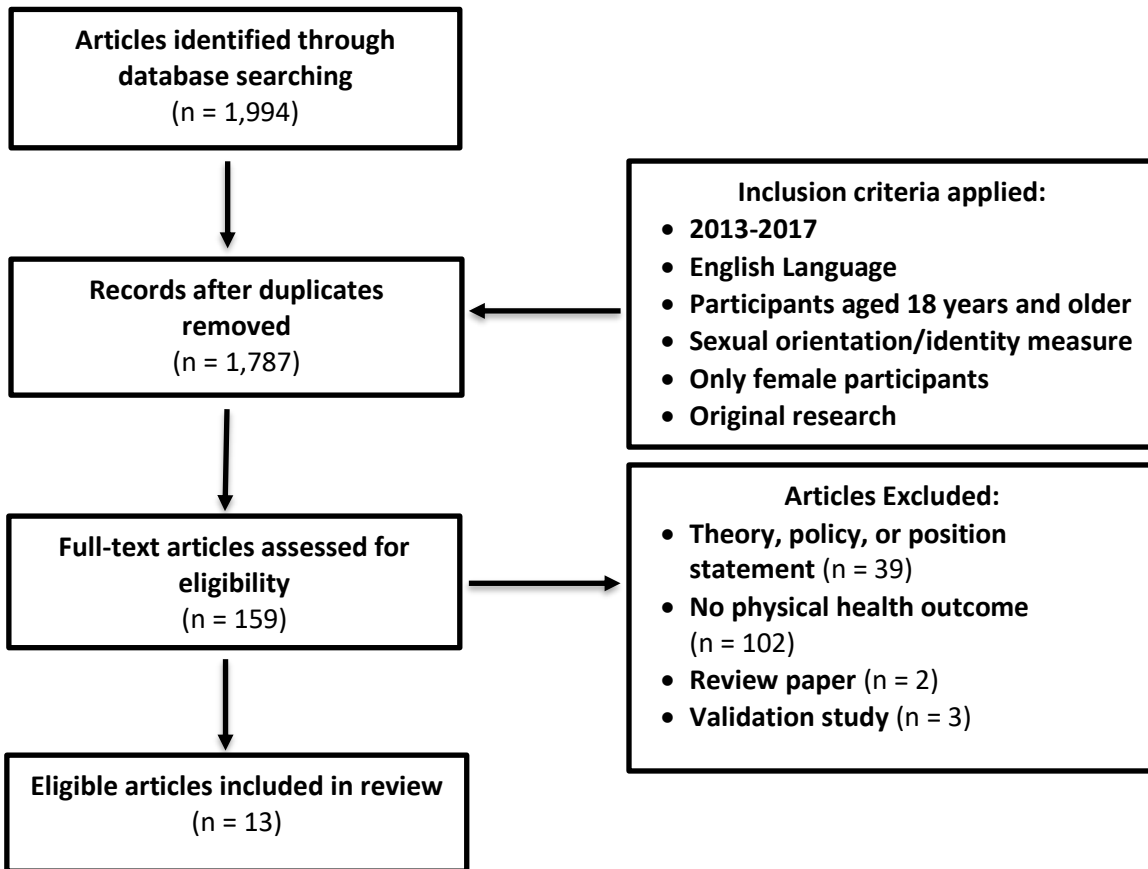


Figure 2.1 Eligibility Criteria for Studies of Physical Health Outcomes in Sexual Minority Identified Women Published Between January 2013 and December 2017

Table 2.1 Characteristics of Studies of Health Outcomes in Sexual Minority Women Published Between January 2013 and December 2017

Authors	Source of Data and Sample	Outcome(s)	Sampling Strategy
Anderson et al. (2014)	Source: Chicago Health and Life Experiences of Women study; National Study of Health and Life Experiences of Women study. Sample: Lesbian women (n = 394) Heterosexual women (n = 482)	Cardiovascular conditions, metabolic conditions, immune disease.	Convenience sample: advertisements and flyers, snowballing.
Barefoot et al. (2015)	Source: Nationwide Online Survey. Sample: Lesbian women (n = 895)	Body Mass Index, physical activity, diet.	Convenience sample: national online questionnaire, LGBT organization listservs, advertisements.
Bostwick et al. (2015)	Source: Wave 3 of the Chicago Health and Life Experiences of Women study. Sample: Bisexual women (n = 139) Lesbian women (n = 227)	Self-assessed physical health, hypertension, diabetes, cancer, heart disease, sexually transmitted infection.	Respondent-driven sampling: modified with no primary incentive, \$20 compensation for each of 3 possible referral participation.
Eliason et al. (2016)	Source: Healthy Weight in Lesbian and Bisexual Women Study. Sample: Lesbian and Bisexual women (n = 376)	Quality of life, nutrition, substance use, physical activity, weight.	Convenience sample: five sites; used local community organizations, events, newsletters, websites, and/or listservs. Two sites recruited at medical clinics.
Farmer et al. (2013)	Source: National Health and Nutrition Examination Survey (2001-2008). Sample: Sexual minority women (n = 437) Heterosexual women (n = 5,356)	Framingham General CVD risk score: high-density lipoprotein, total cholesterol, systolic blood pressure, diabetes, current smoking status, antihypertensive medication, sex, age.	Probability sample: Nationally representative cross-sectional survey.

Ingraham et al. (2016)	Source: Healthy Weight in Lesbian and Bisexual Women Study. Sample: Lesbian and Bisexual women ≥ 40 (n = 266).	Quality of life, nutrition, substance use, physical activity, weight.	Convenience sample: five sites; used local community organizations, events, newsletters, websites, and/or listservs. Two sites recruited at medical clinics.
Kinsky et al. (2015)	Source: Epidemiologic Study of Health Risk in Women. Sample: Sexual minority women (n = 479) Heterosexual women (n = 400)	Metabolic syndrome, body mass index, hazardous drinking, depression.	Convenience sample: newspaper and radio advertisements, community health events, LGBT events, and the University of Pittsburgh broadcast phone-message system.
Levahot et al. (2016)	Source: Women's Health Initiative Sample: Sexual minority women (n = 1,884) Heterosexual women (n = 135,755)	All-cause mortality, cancer-specific mortality	Clinical sample: 40 clinical centers in the United States
Mason & Lewis (2015)	Source: Online Panels Sample: Lesbian women (n = 814)	Weight	Online panels: panel members are recruited by market research firms via advertisements, email, postal invitations.
McElroy et al. (2016)	Source: Five site intervention program Sample: Lesbian and Bisexual Women (n = 333)	Weight, physical activity	Convenience sample: Five sites; partnered with local LGBT community or resource centers.
Molina et al. (2014)	Source: Nationwide Online Survey. Sample: Lesbian and Bisexual women (n = 1029)	Body mass index, diabetes, hypertension	Convenience sample: national web-based survey, 200 listservs from LGB organizations
Reiter & McRee (2017)	Source: National Health and Nutrition Examination Survey (2003-2012). Sample: Lesbian women (n = 87)	HPV infection	Probability sample: Nationally representative cross-sectional survey.

	Bisexual women (n = 243) Heterosexual women (n = 6,571) Other (n = 203)		
Sturm et al. (2014)	Source: Internet-based survey. Sample: Women who have sex with women (n = 1,566).	Overactive bladder, stress urinary incontinence	Convenience sample: internet-based survey, invitations, listservs, social media.

CHAPTER 3

COMPARATIVE EFFECTIVENESS OF RESPONDENT-DRIVEN SAMPLING AND CONVENIENCE SAMPLING METHODS FOR RECRUITING SEXUAL MINORITY IDENTIFIED WOMEN FOR HEALTH RESEARCH

Introduction

Research on the health of sexual minority individuals has been hindered by the inability to capture adequate samples of sexual minority identified (SMI) individuals using population-based samples.²⁴ Therefore, inferences in previous studies have been limited by small sample sizes, and convenience sampling methods.²⁵ Such sampling methods can result in biases and limited generalizability, thereby increasing potential for stigmatization, inadequate policy, and health care providers ill-equipped to address the needs of SMI individuals.²⁵ Hardly reached populations cannot be sampled using conventional probability sampling methods because no sampling frame has been established.

Convenience sampling is the most commonly used sampling strategy for recruitment of LGBT participants currently in practice.²⁵ Convenience sampling entails data collection from resources that are readily available to the researchers such as, LGBT centers, student groups and web-based organizations.²⁵⁻²⁷ Researchers using convenience sampling are unable to take into consideration biases associated with participation because there is no standardized conceptual definition of the population of interest. The inability to utilize probability sampling in many hardly reached populations such as

LGBT sub-populations has led to the development of alternative, non-probability-based sampling methods.

Respondent-driven sampling was developed as a procedure to sample invisible populations for which no established sampling frame exists.²⁸ Sometimes, membership in such populations involves stigmatized or illegal behavior, leading to privacy concerns associated with exposure of identification within the group.²⁸ Thus, catchment of such groups is often limited within population-based sampling strategies.²⁸

A subset of chain-referral sampling, respondent-driven sampling relies on the utilization of participants' existing social networks and incentivized participation to recruit the sample.^{28,29} Respondent-driven sampling initiates recruitment through selection of initial seed participants.²⁸ Seeds are then encouraged to utilize their social networks to make referrals to prospective participants.²⁸ A dual incentive system provides compensation for initial study participation and for successful recruitment of each additional participant.²⁸ Recruited participants are also provided the opportunity to recruit participants, with the same compensation structure offered to seed participants.²⁸

A more structured protocol compared to traditional chain-referral techniques, respondent-driven sampling also provides the ability to calculate an individual's degree of connectedness and relative inclusion probabilities, thus allowing for adjustments due to selection bias.^{29,36} The calculation of inclusion probabilities assists in bridging the gap between probability and non-probability-based samples. In theory, the sample recruited using respondent-driven sampling will reach 'equilibrium' in six recruitment waves or less.²⁷ Magnani et al., (2005) describes equilibrium as the convergence of estimates around a stable sample composition, implying that sample composition will not change

from additional waves of recruitment.²⁷ To determine inclusion probability participants must identify how many people they know in the population of interest. The inclusion probability is proportional to the participant's degree of connectedness within the population of interest.⁵⁵ The sampling and estimation techniques for respondent-driven sampling rely on five assumptions: (1) respondents maintain reciprocal relationship with individuals who they know to be members of the target population, (2) respondents are all linked into a single component in the network, (3) sampling is with replacement, (4) respondents can accurately report their personal network size or equivalently, their degree, and (5) peer recruitment is a random selection of the recruiter's peers.³⁰

The purpose of this study is to examine the efficacy of a modified respondent-driven sampling technique for recruiting SMI women. We modified the compensation structure of traditional respondent driven sampling to determine if a more cost-effective version of respondent-driven sampling would be efficacious. Funding for sexual minority health research is extremely lacking, therefore, validating methods that are both methodologically rigorous and cost-effective needs to be prioritized.⁵⁶ We recruited two samples of SMI women from a large metropolitan area in the South Eastern United States; one using respondent-driven sampling and one using a traditional convenience sampling approach. Comparisons were made to examine the effectiveness of using respondent-driven sampling to garner a sample of SMI women.

Methods

Data collection occurred over a six-week time period. Participants were eligible for this study if they met all of the following criteria: (1) Self-identification as a woman, (2) Self-identification as a sexual minority, (3) Primary residence in the Charlotte, North

Carolina metropolitan area, (4) between the ages of 18 and 64. Operationally, SMI women included women who self-identified as anything other than heterosexual, including lesbian, gay, bisexual, homosexual, pansexual, asexual, queer, etc. Compliance with rules, regulations and training requirements for human subject research were followed and Institutional Review Board approval was obtained from the University of South Carolina.

Location

Recruitment efforts took place in the Charlotte-Concord-Gastonia metropolitan statistical area. The Charlotte, NC metropolitan area was selected due to its large population size of approximately 2.34 million people according to the U.S. Census Bureau.⁵⁷ Approximately 3.4% of women in the United States identify as lesbian or bisexual.³⁴ Assuming that this percentage is applied to the Charlotte, NC metropolitan area, approximately 79,500 lesbian or bisexual identified women would reside within this metropolitan area. Multiple LGBT based organizations exist in the Charlotte, NC metropolitan area, indicating an active LGBT community.

Respondent-Driven Sampling

Recruitment

RDS initiates recruitment through selection of seed participants. Seeds are encouraged to utilize their social networks to make referrals to prospective participants. Seed participants were recruited through LGBT community organizations and researchers' connections from previous work in the Charlotte, NC metropolitan area. Ten initial seed participants were recruited. Each seed participant was provided the opportunity to refer five additional participants. Secondary respondents were encouraged

to continue referral efforts with the possibility of referring a maximum of five additional respondents each. Participants were linked to their recruits using a system of referral codes. Weekly emails were sent to remind seeds to encourage their referees to complete the survey.

Due to poor referral response rates, after four weeks of data collection, twenty individuals who were recruited via convenience sampling were offered the opportunity to participate in the referral program. Two participants agreed to participate and were provided five referral codes. Each new seed only successfully recruited one additional participant.

Compensation

For the purposes of this study we utilized a modified compensation scheme. Participants were entered into a primary contest to win one of four \$250 gift cards for completing the health survey. Participants were eligible for a secondary contest for one of two \$500 gift cards based on the number of participants they recruit; each new recruit resulted in an additional entry into the drawing. Traditionally, incentive schemes in RDS provide a small, automatic compensation for participation in the questionnaire and a separate compensation for each successful referral. Due to budgetary limitations and to prevent limitations in sample size, we provided a drawing of a larger value compensation to incentivize participation. Compensation was higher for the secondary contest to provide greater incentive to encourage referrals to complete the questionnaire.

Convenience Sample

Recruitment

In the convenience sampling framework, participants were recruited using a combination of recruitment strategies. LGBT community organizations were utilized to recruit participants through meetings, posters, email listservs, and social media accounts.

Facebook advertisements, targeted to the Charlotte, NC geographic area were used to recruit participants anonymously who may be less likely to have contact with LGBT community organizations. Participants were encouraged to share access to the survey via community connections and through email and social media.

Compensation

Participants were entered into a primary contest to win one of four \$250 gift cards upon completion of the survey. Participants recruited through convenience sampling will not be eligible to participate in the secondary contest.

Confidentiality

All data collection was conducted online, allowing participants to complete questionnaire information in an environment that is private and comfortable for each individual. Web-based data collection was conducted via Qualtrics and stored at the University of South Carolina on a locked, password protected server. Qualtrics uses Transport Layer Security encryption for all transmitted data as well as high-end firewall systems and scans to protect data from penetration and adheres to all data requirements set by HIPPA and HITECH (Health Information Technology for Economic and Clinical Health Act) to ensure confidentiality of data. All participants were assigned a study ID number; files

listing these IDs are stored on a password protected university server. All data analysis used study ID number for identification.

Statistical Analysis

Pearson chi square tests and t-tests were used to make comparisons between recruitment samples for demographic categories including age, race, sexual identity, level of education, relationship status and income to determine if differences in recruitment samples exist. Due to the low response garnered through RDS we were unable to weight the sample. Therefore, all comparisons made were calculated using the unweighted RDS sample. This did not allow us to account for degree of connectedness among the RDS sample.

Due to data collection occurring within the same sample population, there was potential for participants to participate in both questionnaires. Multiple checks were used to identify and discourage dual participation. The questionnaires included screening questions asking participants if they have participated before, how they were recruited for the study, if they have received other invitations to participate, and if they have seen these questions before.

Results

The study sample consisted of 289 responses, 269 individuals were recruited via convenience sampling methods and 20 individuals were recruited via RDS. Due to the small sample obtained through RDS, it was necessary to collapse the identity categories of the remaining demographic variables. Therefore, sexual identity was combined to make two categories; gay/lesbian and bisexual/pansexual/other. Education was collapsed to less than bachelor's degree and bachelor's degree or higher. Personal annual income

was analyzed as less than \$25,000 and greater than or equal to \$25,000. Relationship status was minimized to single/divorce/separated compared to married/committed relationship.

Respondents recruited through convenience sampling methods were significantly younger compared to those recruited via RDS (25.08, SD = 6.70; 29.72, SD = 8.86; $p = 0.0427$). Sexual identity differed significantly between the two sampling strategies ($p = 0.0004$). Half of the respondents recruited through RDS identified as gay/lesbian, while the remaining half identified as bisexual, pansexual, or other identification. Meanwhile, only 16.60% of individuals recruited via convenience sampling identified as gay/lesbian, with the remaining 83.40% identifying as bisexual, pansexual, or other identification. Respondents recruited through RDS were also significantly more likely to make at least \$25,000 or more compared to those recruited through convenience sampling ($p = 0.0128$). No significant differences were observed in relationship status, race/ethnicity or level of education between the two sampling strategies.

Discussion

Although we observed statistically significant differences between the convenience sample and RDS sample, our ability to make inferences about the sampling strategies is limited by the low response rate for the RDS sample. We believe that there are multiple reasons why the RDS sample failed to recruit a sample size similar to the convenience sample. We will discuss methods that we used to modify RDS for the purposes of our study and lessons learned from working with RDS.

Firstly, due to budgetary limitations, we chose to modify the compensation structure for the RDS arm of this study. Traditional RDS methods provide a small

primary incentive for participation as well as a secondary incentive for successfully referring additional participants.²⁸ For example, the ‘seed’ participant may be offered \$10 for completing the questionnaire and an additional \$15 for each referee that participates in the study. We did not want to limit the number of participants based on our limited budget size therefore, we used a modified compensation structure. The modified compensation structure was designed to allow for RDS to have unlimited recruitment potential without budgetary constraints. We chose to examine the efficacy of this modification due to historic under-funding of sexual minority studies.⁵⁶

Each participant was entered in a drawing to win one of four \$250 Amazon gift cards for completing the online questionnaire. For the secondary incentive participants were entered in a drawing to win one of two \$500 Amazon gift cards for each successful referee, meaning that they could be entered up to 5 times into the secondary incentive drawing. The secondary drawing was for higher value gift cards to encourage ‘seed’ participants to refer additional participants.

In hindsight, we believe that the modified compensation structure was not incentive enough to encourage the chain-referral process to be successful. Participants may have been less likely to engage with their referees because the chance of receiving compensation was not as appealing as definitive compensation. In future studies, we would suggest that researchers use the traditional compensation scheme. A main premise of RDS is to use the combination of monetary compensation and social pressures to participate in the study. We hypothesize that our modified incentive system was not enticing enough to drive the progression of the referral chains.

Secondly, recruitment of ‘seed’ participants may benefit from in-person meetings. We initiated contact with seed participants via email to gauge willingness to participate. When the seed expressed interest in participating, we sent additional information about the questionnaire, referral structure, and expectations. All potential seeds were encouraged to ask questions, express concerns, and telephone or personal contact was offered if clarifications were needed. We focused on email communication to maintain a level of privacy for the seed participants.

Traditionally, RDS methodology has required personal contact with the researchers to participate in the study. This personal contact was originally used to ensure that the participant was, in fact, a member of the target community.²⁸ For example, early RDS studies were used to sample injection drug users.²⁷ Personal contact was required to ensure that participants had visible signs of injection drug use.²⁷ This method was used to prevent recruitment of individuals outside of the target community for the sole purpose of monetary gain via the dual compensation structure. Since identification as a sexual minority cannot be verified through personal contact, we chose to use online communication methods. Stigmatization of sexual minority individuals may cause people to be unwilling to identify themselves openly to researchers.^{26,27,52} Therefore, we believed that using online communication would increase our reach to those whom may be unlikely to openly identify as a sexual minority.

Moving forward, we believe that making personal contact, at minimum, with the seed participants would ensure that they completely understand their roles as a seed participant. Requiring a physical meeting would solidify their interest in participating in

the study and allow researchers to stress the importance of their role to the successful completion of the study.

Finally, our study had a recruitment period of 6 weeks. Data collection ended after 6 weeks because the volume of responses had diminished significantly compared to the first three weeks of collection. The first week of data collection we received 13 out of the 20 responses. Only one response was completed after the third week. RDS participants received weekly reminders to encourage their referees to participate in the questionnaire. After the first two weeks of recruitment efforts no new referees completed the questionnaire. Despite reminders, encouragements, and offers of additional compensation (doubling of secondary drawing entries) participants were not successfully referring new participants. A longer recruitment period would provide time to add more waves of seed participants. By recruiting additional seed participants, we may have accessed seeds whom were more amenable to referring SMI women from their social networks.

Overall, convenience sampling methods were more successful at reaching a greater number of SMI women compared to RDS methods. Although we hypothesized that RDS would reach a larger, more diverse sample of SMI women, we did not observe this within our study. We believe that our shortcomings using RDS methods were in fact due to the modifications that we made to the method. Additional studies using traditional RDS methods among SMI women are needed to verify the efficacy of using RDS within this population.

Conclusions

Statistically significant differences were observed for age, income, and relationship status between the sampling methods. These differences may have been driven by the small RDS sample which required us to collapse most of the demographic variables. We tested a modified version of RDS in this study. We did not find that modifying the compensation scheme in RDS was efficacious and likely drove the insufficient recruitment of SMI women using this method. Future studies should utilize traditional RDS methodology, specifically the incentive structure, to recruit hardly reached populations.

Table 3.1 Sample Characteristics of Sexual Minority Identified Women (N = 289)

Characteristics	Convenience Sample (n = 269)	Respondent-Driven Sample (n = 20)
Age, mean(SD)	25.08 (6.79)	29.72 (8.86)
Race/Ethnicity, %(n)		
White/Caucasian	77.63 (177)	78.95 (15)
Black/African American	9.21 (21)	10.53 (2)
Hispanic/Latina	6.14 (14)	0 (0)
Asian/Pacific Islander	2.63 (6)	0 (0)
Other	4.39 (10)	10.53 (2)
Sexual Identity, %(n)		
Bisexual	44.91 (119)	22.22 (4)
Gay/Lesbian	16.60 (44)	50.00 (9)
Pansexual	22.26 (59)	11.11 (2)
Queer	7.55 (20)	16.67 (3)
Asexual	6.42 (17)	0 (0)
Other	2.26 (6)	0 (0)
Highest Level of Education, %(n)		
Less than high school	0.88 (2)	0 (0)
High school/GED	10.53 (24)	0 (0)
Some college	39.04 (89)	10.53 (2)
Associate	10.09 (23)	5.26 (1)
Bachelors	20.61 (47)	26.32 (5)
Some graduate school	4.39 (10)	31.58 (6)
Graduate degree	14.47 (33)	26.32 (5)
Personal Annual Income, %(n)		
\$0-9,999	31.46 (84)	0 (0)
\$10,000-24,999	29.21 (78)	31.58 (6)
\$25,000-49,999	22.10 (59)	36.84 (7)
\$50,000+	17.23 (46)	31.58 (6)
Relationship Status		
Single	41.26 (111)	26.32 (5)
Married	14.13 (38)	26.32 (5)
Divorced	2.23 (6)	5.26 (1)
Separated	2.23 (6)	5.26 (1)
Widowed	0 (0)	0 (0)
Living with Partner	15.99 (43)	26.32 (5)
Committed Relationship	21.56 (58)	10.53 (2)
Other	2.60 (7)	0 (0)

Table 3.2 Comparison of Sample Characteristics of Sexual Minority Identified Women (N = 289)

Characteristics	Convenience Sample (n = 269)	Respondent-Driven Sample (n = 20)	p-value
Age, mean(SD)	25.08 (6.79)	29.72 (8.86)	0.0427
Race/Ethnicity, %(n)			0.4774
White/Caucasian	77.63 (177)	78.95 (15)	
Other	22.37 (51)	21.05 (4)	
Sexual Identity, %(n)			0.0004
Bisexual/Pansexual/Other	83.40 (221)	50.00 (9)	
Gay/Lesbian	16.60 (44)	50.00 (9)	
Highest Level of Education, %(n)			0.0707
< Bachelors	60.53 (138)	15.79 (3)	
> Bachelors	39.47 (90)	84.21 (16)	
Personal Annual Income, %(n)			0.0128
< \$25,000	60.67 (162)	31.58 (6)	
> \$25,000	39.33 (105)	68.42 (13)	
Relationship Status			0.4521
Single/Divorces/Separated	45.72 (123)	36.84 (7)	
Married/Committed Relationship	54.28 (146)	63.16 (12)	

CHAPTER 4
AN EXAMINATION OF ASSOCIATIONS BETWEEN MINORITY STRESSORS
AND CARDIOMETABOLIC RISK FACTORS AMONG SEXUAL MINORITY
IDENTIFIED WOMEN

Introduction

Growing evidence supports the importance of targeted research addressing health disparities among sexual minority identified individuals. The largest body of evidence of health disparities in this population centers on elevated behavioral risk factors. Sexual minority identified (SMI) individuals are more likely to report heavy drinking, past or present illicit drug use, and tobacco use compared to heterosexual individuals.^{8,58-61} Among women, previous research has shown SMI women have greater odds of chronic health conditions including; obesity, cardiovascular disease, asthma, and breast cancer.^{8,9,62} Additionally, SMI women have significantly elevated odds of being diagnosed with depression, anxiety, ADHD, suicide, and receiving psychological counseling.⁶² Health disparities among SMI women are gaining increased attention; however, research addressing correlates of these disparities is still limited.

SMI women and the LGBT population have historically experienced systematic inequalities and discrimination including former classification of LGBT identification as a psychiatric disorder, federal and state laws against marriage, legal employment and housing discrimination, and social stigmatization. Despite the repeal of federal mandates such as “Don’t Ask, Don’t Tell”⁶³ and the legalization of same-sex marriage⁶⁴, laws

discriminating against LGBT individuals persist in much of the United States.⁶⁵ Social stigmatization of LGBT individuals can be sustained through ingrained prejudice and overt homophobia. As suggested by the minority stress model, identification in a minoritized group increases stress levels and is associated with adverse health outcomes.⁶⁶⁻⁶⁸

The minority stress model is based on two main premises, (1) LGBT individuals experience unique stressors based on experiences of prejudice and discrimination and (2) these unique stressors are associated with adverse mental and physical health outcomes.^{19,69} Reports of experiences of minority stress among LGB adults have been associated with poorer overall health and increased physical health problems compared to those experiencing less minority stressors.⁷⁰ Physical health symptom severity has also been associated with experiences of victimization and discrimination among SMI adults.⁷¹ Experience of minority stressors may be driving health disparities in the SMI women population.⁷² An intersectional approach to the effects of minority stressors on health disparities among SMI women is needed to improve understanding of health disparities.

Sexual minority identified women experience simultaneous oppressions due to their multiple identities.⁷³ Exploring health disparities among SMI women must use an intersectional lens to attempt to address these multiple identities. SMI women experience oppression based on their status as women, as sexual minorities, and based on any other identities that they hold (race, class, ability, etc.). An intersectional analysis of SMI women's health is necessary to understand the underlying reason for experiences of health disparities.

Intersectional analyses operate on two levels; individual and societal.⁷⁴ Health disparities among SMI women have traditionally been studied as an individual matter. Previous literature had focused on associations between individual health behaviors and health outcomes. However, when we explore these health issues through the lens of the minority stress model we acknowledge the ways in which societal issues may contribute to health disparities within this population. According to Nancy C.M. Hartsock (1983), individuals can move outside of oppressive systems but this is only significant when at the systemic level.⁷⁵ Applications of these theoretical perspectives to the study of SMI women's health disparities are gaining interest among researchers and policymakers. The purpose of this study is to examine the associations between minority stressors (perceived discrimination, perceived stress, and internalized homophobia) and cardiometabolic risk factors. We believe that high levels of minority stressors will be positively associated with greater cardiometabolic risk among SMI women.

Methods

Study Sample

SMI women were recruited from the Charlotte-Concord-Gastonia metropolitan statistical area as part of a larger study comparing sampling methods for recruitment of SMI women. Individuals were included in the study if they self-identified as a sexual minority woman (defined as any sexual identity other than heterosexual), were 18 years or older, and lived in the Charlotte, NC metropolitan area. Participants were primarily recruited through LGBT organizations, listservs, online advertisements, and posters. Additionally, respondent driven-sampling (RDS) was used as a secondary sampling technique. Respondent-driven sampling is a structured chain referral sampling method

designed to reach hardly reached populations.²⁸ Respondent-driven sampling utilizes participant's social networks to advance study recruitment. Initial "seed" participants are recruited based on their community connectedness and provided a primary incentive for their participation. Seeds are then provided coupon codes to refer individuals from their social network who qualify for the study. When seeds' referees completed the survey, the seed participants were provided a secondary incentive.

Participants completed an online survey via Qualtrics. Participation was incentivized via a primary gift card drawing. Each participant was entered into a drawing to win one of four \$250 gift cards for completing the health survey. Participants in the respondent-driven sampling arm of recruitment were provided a secondary incentive of entry into a secondary gift card drawing for one of two \$500 gift cards if their referees completed the health survey.

Measures

Demographics

Demographic information included age, race/ethnicity, sexual identity, gender identity, income, relationship status, education, height, and weight.

Perceived discrimination

A perceived discrimination scale developed and validated by Molero, et al., 2013, was used to determine level of perceived discrimination.⁷⁶ The perceived discrimination scale measures four dimensions of discrimination; blatant group discrimination, subtle group discrimination, blatant individual discrimination and subtle individual discrimination. This scale was specifically validated for use with gay and lesbian study participants.

Perceived stress

The perceived stress scale measured participants' individualized perceived stress level (Cohen, 1983).⁷⁷ The perceived stress scale is designed to measure the degree to which participants feel their lives are overwhelming, unpredictable and uncontrollable. The perceived stress scale was developed to reach a general audience and therefore is not specific to any sub-population.

Internalized homophobia

The internalized homophobia scale is a 9-item questionnaire used to assess an individual's level of self-sexual stigmatization.^{13,78} The internalized homophobia scale has been validated for use in non-heterosexual populations. A 5-point Likert scale is used to assess each of the 9 items from *disagree strongly* to *agree strongly*.

Perceived Resilience

The brief resilience scale is a 5-item Likert scale that assesses an individuals' ability to recover from adverse life events.⁷⁹ The brief resilience scale has been validated as a reliable means of assessing an individuals' ability to recover from adverse events.⁷⁹ Answers are scored using a 5-point Likert scale from *strongly disagree* to *strongly agree*.⁷⁹

Cardio-metabolic risk factors

Cardio-metabolic risk factors will be assessed through self-report of prior diagnosis from a medical professional of diabetes, prediabetes, high blood sugar, obesity, hypertension, and high cholesterol, cardiovascular disease, and stroke.

Statistical Analysis

Descriptive statistics were used to present socio-demographic information for the total sample of SMI women. Multivariable regression analyses were used to examine associations between minority stressors and cardio-metabolic risk factors. All models were adjusted for race/ethnicity and income. These covariates were chosen based on their likely effect on minority stressors. Additional multivariable regression analyses were run to adjust for resilience. A sensitivity analysis was performed to examine potential differences between the full sample and a reduced sample, removing individuals that were recruited using respondent-driven sampling.

Results

The study sample consisted of 289 SMI women with a mean age of 25.38 (SD= 7.02). The majority of participants identified as bisexual (43.46%) or pansexual (21.55%). The sample was predominantly White/Caucasian (78.10%), attended college (~90%), and had a personal annual income of less than \$25,000 (58.42%). A full description of sample characteristics can be found in Table 1.

Most cardiometabolic risk factors were not prevalent in this sample (Table 2). The most prevalent risk factors were obesity (35.99%), high blood pressure (8.39%), high cholesterol (7.30%), tobacco use ever (35.38%), and alcohol use (defined as consuming alcohol more than two times) (78.70%). Due to the distribution of cardiometabolic risk factors, multivariable logistic regression analyses were run for the previously listed five risk factors. Adjusted multivariable logistic regression models found no association between perceived discrimination and any cardiometabolic risk factors (Table 3). A significant association was observed between obesity and perceived stress (OR= 1.80,

95% CI 1.05, 3.11). However, after adjusting for race/ethnicity and income, this association was no longer observed (AOR= 1.37, 95% CI 0.75, 2.50). There were no other associations observed between perceived stress and cardiometabolic risk factors (Table 4). Internalized homophobia was not significantly associated with any cardiometabolic risk factors (Table 5). Finally, after adjusting for resilience, not significant differences were observed in associations between perceived discrimination, perceived stress, or internalized homophobia and cardiometabolic risk factors (Table 6).

Sensitivity analyses were conducted to determine if the sampling method of the participants affected the results. Participants recruited via respondent-driven sampling were removed from the study sample and all statistical analyses were repeated. Only one model's outcome was affected by removal of the RDS subsample. A statistically significant association was observed between perceived stress and obesity when adjusting for resilience (AOR= 2.46, 95% CI 1.00, 6.04) using the reduced sample compared to the full sample (AOR= 2.21, 95% CI 0.95, 5.18). Due to the minimal differences in outcomes, we will discuss the outcomes for the full sample.

Discussion

Systemic inequalities and discrimination experienced by sexual minority individuals are associated with stress above and beyond commonly expected societal stressors.¹⁹ Cumulative stress has been associated with increased risk for cardiovascular outcomes.^{20,21,23,80} Although there is ample evidence that SMI women are at an increased risk for cardiometabolic risk factors, our sample did not report a high prevalence of most cardiometabolic risk factors.^{8,9,80} This was likely due to the relatively young age of our sample (M= 25.38, SD= 7.02). Since our sample had a low prevalence of most of the

screened cardiometabolic risk factors we limited our analysis to examine the association between minority stressors and obesity, high blood pressure, high cholesterol, tobacco use, and alcohol use.

No statistically significant associations were observed between minority stressors; perceived discrimination, perceived stress, and internalized homophobia, and cardiometabolic risk factors in our sample. All of our statistical analyses were adjusted for race/ethnicity and income to account for the intersectional relationship between race/ethnicity, income, and stressful life experiences.

Despite the lack of significant associations between cardiometabolic risk factors and minority stressors, this sample may be experiencing high rates of minority stress. For example, when comparing the average internalized homophobia score between the study sample and lesbian women recruited from Sacramento, CA on average our sample scored higher on the internalized homophobia scale, indicating greater feelings of internalized homophobia.⁷⁸ Additionally, compared to a sample of lesbian women ($M=3.18$, $SD=0.77$) collected by Molero et al., 2013, our sample's mean perceived discrimination score ($M=3.50$, $SD=0.56$) was significantly higher.⁷⁶ These differences may be due to the geographic location of our sample, in the South Eastern United States. Differences in cultural climates for SMI individuals between the areas in which we are comparing likely stimulated the differences observed. Regardless of comparatively high rates of minority stressors in our sample we were not able to observe associations with cardiometabolic risk factors.

Our secondary analysis of the sample added the covariate resilience. No significant differences in our outcomes were observed after adjusting for resilience.

Resilience has been defined as the ability of an individual to bounce back, recover, or grow in response to adversity.⁸¹ Individuals with high levels of resilience may be able to ameliorate some of the effects of chronic stress associated with minority stressors.

Limitations

The lack of observed associations in this study are likely due to the homogeneity of our sample. Our sample was relatively young, majority white, and college educated. Additionally, likely due to its age distribution, our sample had a low prevalence of most cardiometabolic risk factors, thus limiting statistical power for analyses predicting such risk factors. A larger, more heterogeneous sample may have yielded significantly different results, particularly had the sample been older.

Several additional limitations should be considered. First, the use of online survey data may induce recall bias associated with reporting prior diagnoses or experiences. Recall bias may be an issue in any study that requests participants to report information retrospectively. Recall bias is induced when participants misreport information due to incorrect recall. Secondly, the cross-sectional study design does not allow researchers to establish temporality and therefore causality can not be recognized. Finally, social acceptability bias may be present in this study as participants may have been unwilling to report negative experiences associated with minority stressors.

Conclusions

No associations were observed between cardiometabolic risk factors and minority stressors in this sample of sexual minority identified women. Low prevalence of cardiometabolic risk factors and homogeneity of the sample are likely limiting the scope of observations. Further investigations into the effects of minority stressors on the health

of sexual minority identified women are warranted. Intentional sampling of a larger, more diverse, sample would benefit future studies.

**Table 4.1 Characteristics of Sexual Minority Identified Women
(N = 289)**

Characteristics	
Age, mean (SD)	25.38% (7.02)
Race/Ethnicity, % (n)	
White/Caucasian	78.10% (189)
Black/African American	9.09% (22)
Hispanic/Latina	5.79% (14)
Asian/Pacific Islander	2.48% (6)
Other	4.55% (11)
Sexual Identity, % (n)	
Bisexual	43.46% (123)
Gay/Lesbian	18.73% (53)
Pansexual	21.55% (61)
Queer	8.13% (23)
Asexual	6.01% (17)
Other	2.12% (6)
Highest Level of Education, % (n)	
Less than high school	0.83% (2)
High school/GED	9.92% (24)
Some college	38.43% (93)
Associate	9.50% (23)
Bachelors	20.66% (50)
Some graduate school	4.96% (12)
Graduate degree	15.70% (38)
Personal Annual Income, % (n)	
\$0-9,999	29.39% (82)
\$10,000-24,999	29.03% (81)
\$25,000-49,999	22.94% (64)
\$50,000+	18.64% (52)
Resilience Score, mean (SD)	2.83% (0.84)
Perceived Discrimination Score, mean (SD)	3.50% (0.56)
Blatant Group Discrimination	3.95% (0.67)
Subtle Group Discrimination	3.98% (0.67)
Blatant Individual Discrimination	2.79% (0.75)
Subtle Individual Discrimination	3.34% (0.90)
Perceived Stress Score, mean (SD)	3.23% (0.55)
Internalized Homophobia Score, mean (SD)	16.52% (6.24)

Table 4.2 Cardiometabolic Risk Factors Among Sexual Minority Identified Women

Risk Factor	Yes, % (n)	No, %(n)
Alcohol Use >2x	78.70 (218)	21.30 (59)
Obesity	35.99 (104)	64.01 (185)
Tobacco Use Ever	35.38 (98)	64.62 (179)
High Blood Pressure	8.39 (23)	91.61 (251)
High Cholesterol	7.30 (20)	92.70 (254)
Prediabetes	4.74 (13)	95.26 (261)
High Blood Sugar	1.47 (4)	98.53 (269)
Diabetes	0.73 (2)	99.27 (273)
Cardiovascular Disease	0.73 (2)	99.27 (272)
Stroke	0 (0)	100.00 (273)

Table 4.3 Crude and Adjusted Logistic Regression Analysis of Associations between Cardiometabolic Risk Factors and Perceived Discrimination

	Perceived Discrimination			
	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Obesity	1.10 (0.66, 1.82)	0.7216	1.17 (0.63, 2.15)	0.6234
High Blood Pressure	1.10 (0.52, 2.35)	0.7987	0.92 (0.38, 2.22)	0.8603
High Cholesterol	1.16 (0.52, 2.59)	0.7266	1.14 (0.47, 2.79)	0.7721
Tobacco Use	1.30 (0.83, 2.05)	0.2533	1.34 (0.79, 2.27)	0.2763
Alcohol Use	1.39 (0.82, 2.34)	0.2209	1.25 (0.68, 2.33)	0.4743

Odds ratios and p-values for factors associated with perceived discrimination were obtained using separate multivariable logistic regression analyses adjusting for race/ethnicity and income.

Table 4.4 Crude and Adjusted Logistic Regression Analysis of Associations between Cardiometabolic Risk Factors and Perceived Stress

	Perceived Stress			
	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Obesity	1.80 (1.05, 3.11)	0.0338	1.37 (0.75, 2.50)	0.3081
High Blood Pressure	0.86 (0.39, 1.90)	0.7003	1.12 (0.48, 2.61)	0.7976
High Cholesterol	0.94 (0.40, 2.19)	0.8764	0.84 (0.33, 2.13)	0.7109
Tobacco Use	1.35 (0.84, 2.19)	0.2209	1.46 (0.86, 2.48)	0.1664
Alcohol Use	0.86 (0.50, 1.49)	0.5854	1.05 (0.56, 1.99)	0.8731

Odds ratios and p-values for factors associated with perceived stress were obtained using separate multivariable logistic regression analyses adjusting for race/ethnicity and income.

Table 4.5 Crude and Adjusted Logistic Regression Analysis of Associations between Cardiometabolic Risk Factors and Internalized Homophobia

	Internalized Homophobia			
	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Obesity	1.03 (0.98, 1.09)	0.2121	1.02 (0.97, 1.08)	0.4371
High Blood Pressure	0.98 (0.91, 1.05)	0.5409	0.97 (0.89, 1.05)	0.3939
High Cholesterol	1.04 (0.96, 1.11)	0.3411	1.03 (0.95, 1.11)	0.5141
Tobacco Use	1.03 (0.98, 1.07)	0.2648	1.03 (0.99, 1.08)	0.1732
Alcohol Use	1.02 (0.97, 1.08)	0.3669	1.02 (0.97, 1.08)	0.4235

Odds ratios and p-values for factors associated with internalized homophobia were obtained using separate multivariable logistic regression analyses adjusting for race/ethnicity and income. *p < 0.05

Table 4.6 Associations Between Minority Stressors and Cardiometabolic Risk Factors Adjusted for Resilience

	Perceived Discrimination		Perceived Stress		Internalized Homophobia	
	AOR (95% CI)	P-value	AOR (95% CI)	P-Value	AOR (95% CI)	P-value
Obesity	1.20 (0.65, 2.25)	0.5596	2.21 (0.95, 5.18)	0.0674	1.03 (0.97, 1.08)	0.3870
High Blood Pressure	0.79 (0.32, 1.97)	0.6102	0.49 (0.14, 1.63)	0.2424	0.95 (0.88, 1.04)	0.2648
High Cholesterol	1.08 (0.44, 2.66)	0.8702	0.28 (0.08, 1.00)	0.0507	1.02 (0.94, 1.10)	0.6714
Cigarette Use	1.26 (0.74, 2.15)	0.3932	1.03 (0.51, 2.10)	0.9254	1.03 (0.98, 1.08)	0.2508
Alcohol Use	1.24 (0.66, 2.30)	0.5023	0.91 (0.40, 2.08)	0.8171	1.02 (0.97, 1.08)	0.4561

*All logistic regression analyses were adjusted for resilience, race/ethnicity, and income.

**Table 4.7 Reduced Sample Characteristics of Sexual Minority Identified Women
(N = 269)**

Characteristics	
Age, mean(SD)	25.08% (6.79)
Race/Ethnicity, %(n)	
White/Caucasian	77.63% (177)
Black/African American	9.21% (21)
Hispanic/Latina	6.14% (14)
Asian/Pacific Islander	2.63% (6)
Other	4.39% (10)
Sexual Identity, %(n)	
Bisexual	44.91% (119)
Gay/Lesbian	16.60% (44)
Pansexual	22.26% (59)
Queer	7.55% (20)
Asexual	6.42% (17)
Other	2.26% (6)
Highest Level of Education, %(n)	
Less than high school	0.88% (2)
High school/GED	10.53% (24)
Some college	39.04% (89)
Associate	10.09% (23)
Bachelors	20.61% (47)
Some graduate school	10.53% (24)
Graduate degree	14.47% (33)
Personal Annual Income, %(n)	
\$0-9,999	31.46% (84)
\$10,000-24,999	29.21% (78)
\$25,000-49,999	22.10% (59)
\$50,000+	17.23% (46)
Resilience Score, mean(SD)	2.79% (0.84)
Perceived Discrimination Score, mean (SD)	3.48% (0.55)
Blatant Group Discrimination	3.91% (0.63)
Subtle Group Discrimination	3.97% (0.67)
Blatant Individual Discrimination	2.78% (0.74)
Subtle Individual Discrimination	3.34% (0.89)
Perceived Stress Score, mean (SD)	3.26% (0.54)
Internalized Homophobia Score, mean (SD)	16.70% (6.28)

Table 4.8 Cardiometabolic Risk Factors Among Sexual Minority Identified Women, Reduced Sample

Risk Factor	Yes, % (n)	No, %(n)
Alcohol Use >2x	77.74 (206)	22.26 (59)
Obesity	37.18 (103)	62.82 (174)
Tobacco Use Ever	36.60 (97)	63.40 (168)
High Blood Pressure	9.16 (24)	90.84 (238)
High Cholesterol	7.63 (20)	92.37 (242)
Prediabetes	4.96 (13)	95.04 (262)
High Blood Sugar	1.15 (3)	98.85 (258)
Diabetes	0.76 (2)	99.24 (263)
Cardiovascular Disease	0.76 (2)	99.24 (260)
Stroke	0 (0)	100.00 (261)

Table 4.9 Crude and Adjusted Logistic Regression Analysis of Associations between Cardiometabolic Risk Factors and Perceived Discrimination, Reduced Sample

	Perceived Discrimination			
	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Obesity	1.04 (0.62, 1.77)	0.8739	1.12 (0.59, 2.14)	0.7283
High Blood Pressure	1.15 (0.53, 2.51)	0.7284	0.93 (0.37, 2.33)	0.8688
High Cholesterol	1.20 (0.52, 2.76)	0.6685	1.25 (0.49, 3.20)	0.6437
Tobacco Use	1.24 (0.78, 1.98)	0.3666	1.24 (0.71, 2.15)	0.4447
Alcohol Use	1.33 (0.77, 2.89)	0.3030	1.17 (0.61, 2.50)	0.6281

Odds ratios and p-values for factors associated with perceived discrimination were obtained using separate multivariable logistic regression analyses adjusting for race/ethnicity and income.

Table 4.10 Crude and Adjusted Logistic Regression Analysis of Associations between Cardiometabolic Risk Factors and Perceived Stress, Reduced Sample

	Perceived Stress			
	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Obesity	2.16 (1.21, 3.86)	0.0094	1.68 (0.89, 3.19)	0.1099
High Blood Pressure	0.76 (0.33, 1.75)	0.5217	1.01 (0.42, 2.43)	0.9753
High Cholesterol	0.84 (0.35, 2.06)	0.7084	0.78 (0.30, 2.03)	0.6147
Tobacco Use	1.20 (0.73, 1.99)	0.4776	1.31 (0.76, 2.28)	0.3352
Alcohol Use	0.91 (0.51, 1.61)	0.7343	1.06 (0.55, 2.04)	0.8631

Odds ratios and p-values for factors associated with perceived stress were obtained using separate multivariable logistic regression analyses adjusting for race/ethnicity and income.

Table 4.11 Crude and Adjusted Logistic Regression Analysis of Associations between Cardiometabolic Risk Factors and Internalized Homophobia, Reduced Sample

	Internalized Homophobia			
	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Obesity	1.04 (0.98, 1.09)	0.1890	1.03 (0.97, 1.09)	0.3388
High Blood Pressure	0.97 (0.90, 1.05)	0.4361	0.95 (0.88, 1.04)	0.2818
High Cholesterol	1.03 (0.96, 1.11)	0.4141	1.02 (0.95, 1.10)	0.5697
Tobacco Use	1.02 (0.98, 1.07)	0.3942	1.03 (0.98, 1.08)	0.2624
Alcohol Use	1.03 (0.98, 1.09)	0.2538	1.03 (0.97, 1.09)	0.3500

Odds ratios and p-values for factors associated with internalized homophobia were obtained using separate multivariable logistic regression analyses adjusting for race/ethnicity and income. *p < 0.05

CHAPTER 5

SUMMARY

The purpose of this dissertation was threefold; (1) to examine current sampling methods used to recruit sexual minority identified women for health research, (2) to compare the efficacy of respondent-driven sampling compared to convenience sampling for use with sexual minority identified women populations, and (3) to observe associations between cardiometabolic risk factors and minority stressors among sexual minority identified women. To address our first aim, we examined health research targeted to sexual minority identified women populations between January 2013 and December 2017 and summarized the sampling approaches utilized (Chapter 2). Next, we used two sampling methods, respondent-driven sampling and convenience sampling, to recruit sexual minority identified women from a major city in the South Eastern United States to complete a comprehensive health survey (Chapter 3). Finally, we analyzed the collected data to examine associations between cardiometabolic risk factors and minority stressors among sexual minority identified women (Chapter 4).

In Chapter 2, we retrieved 1,994 articles from PubMed, PsychInfo, and CINAHL complete for review. After examination based on inclusion criteria, 13 articles remained eligible for full review. Only two of the 13 studies used probability sampling to recruit sexual minority identified women for health research. The remaining 11 articles used non-probability sampling approaches, the majority of which used convenience or snowball sampling techniques. Reliance on convenience sampling for access to

minoritized populations induces biases and limits generalizability of study results. The results of this review accentuate the importance of developing novel sampling methodologies aimed at reducing biases and increasing diversity in research among sexual minoritized populations.

In Chapter 3, we compared the effectiveness of respondent-driven sampling to convenience sampling for recruiting sexual minority identified women. The respondent-driven sampling approach failed to recruit a sample size comparable to convenience sampling. We believe the respondent-driven sampling arm did not perform as expected due to modifications we made to the traditional technique. Due to budgetary limitations, we chose to modify the compensation structure from providing small automatic primary and secondary incentives to entry into gift card drawings as primary and secondary incentives. We believe this compensation structure was not incentive enough for participants to encourage their referees to participate. Secondly, we recruited seed participants via email communication to maintain a level of privacy due to the stigmatizing nature of identification as a sexual minority individual. In the future we will require a personalized meeting with each seed participant to ensure that they understand the magnitude of their role within the study. Overall, despite our findings that a modified version of respondent-driven sampling was unsuccessful at matching the recruitment success of convenience sampling we recommend that additional studies utilize traditional respondent-driven sampling techniques to recruit hardy reached populations. Methodologically rigorous sampling strategies are needed for this population to decrease biases in the current literature.

In Chapter 4, we examined associations between cardiometabolic risk factors and minority stressors among sexual minority identified women. We combined participants recruited via respondent-driven sampling and convenience sampling to produce a sample of 289 sexual minority identified women. The sample was predominantly white, had some college education, and a mean age of 25 years. After adjusting for race/ethnicity and income, we did not observe any statistically significant associations between selected cardiometabolic risk factors and minority stressors (perceived stress, perceived discrimination, and internalized homophobia). We additionally adjusted analyses for resilience with no observed changes. We hypothesized that the lack of significant associations was driven by the homogeneity of our sample including young age, low prevalence of cardiometabolic risk factors, and relatively high levels of reported minority stress. We recommend that further investigations into the effects of minority stressors on health of sexual minority identified women should focus on strategies for recruiting more diverse samples.

Implications and Future Research

In order to produce high quality, reliable research within sexual minority identified women populations, rigorous sampling methodology needs to be developed and tested. The current state of health research for sexual minority identified women relies heavily on convenience sampling approaches. Probability sampling among this population is prohibitive due to the cost and difficulty of establishing sampling frames. Therefore, it is imperative to focus efforts on improving research methodology for sexual minority populations. Without improvements in methodology, conclusions drawn research in this population will continue to lack generalizability and be plagued with bias.

This study both illuminates the state of methodological research among sexual minority identified women and provides insight towards addressing problems with sampling methodology. Although the modified version of respondent-driven sampling did not garner a large sample size, it provided insight for methodology moving forward. Replicating this study in a larger metropolitan area, using non-modified respondent-driven sampling may provide the evidence needed to validate the use of this novel sampling methodology with sexual minority identified women.

Further, additional research is needed to address factors associated with chronic health conditions among sexual minority identified women. Sexual minority identified women are affected by chronic health conditions at higher rates compared to heterosexual women. One hypothesis is that chronic, cumulative stressors, such as minority stressors, may be adversely affecting sexual minority identified women. Although our study did not show statistically significant associations between cardiometabolic risk factors and minority stressors, we believe these factors may be at play when addressing health issues within this population. Our sample appeared to have experiences of minority stressors beyond similar individuals surveyed using the same instruments. The heterogeneity of our sample likely caused the lack of statistical significance in our analyses.

Overall, further research is warranted to produce more methodologically rigorous sampling methods for sexual minority populations. Additionally, research focused on factors associated with chronic health conditions among sexual minority identified women is important to begin to develop programs, and policies to address these health disparities.

REFERENCES

1. Perez-Stable E. *Directors Message: Sexual and Gender Minorities Formally Designated as a Health Disparity Population for Research Purposes.*; 2016.
<http://www.nimhd.nih.gov/about/directors-corner/message.html>.
2. Committee on Lesbian, Gay, Bisexual, and Transgender Health Issues and Research Gaps and Opportunities, Board on the Health of Select Opportunities. *The Health of Lesbian, Gay, Bisexual, and Transgender People: Building a Foundation for Better Understanding.*; 2011.
3. Beaulieu-Prévost D, Fortin M. The measurement of sexual orientation: Historical background and current practices. *Sexologies*. 2015;24(1):e15-e19.
doi:10.1016/j.sexol.2014.05.006.
4. Cass VC. The Implicatoin of Homosexual Identity Formation for the Kinsey Model and Scale of Sexual Preference. In: *Homosexuality/Heterosexuality: Conception of Sexual Orientation*. McWhirter,. New York: Oxford; 1990:239-266.
5. Rosario, M; Li, F; Wypii, D et al. Disparities by sexual orientation in frequent engagement in cancer related risk behaviors: A 12 year follow up. *Am J Public Health*. 2016;106(4):698-706.
6. Fredriksen-Goldsen KI, Kim H-J, Barkan SE, Muraco A, Hoy-Ellis CP. Health Disparities Among Lesbian, Gay, and Bisexual Older Adults: Results From a Population-Based Study. *Am J Public Health*. 2013;103(10):1802-1809.
doi:10.2105/AJPH.2012.301110.

7. Jabson JM, Farmer GW, Bowen DJ. Stress mediates the relationship between sexual orientation and behavioral risk disparities. *BMC Public Health*. 2014;14(1):401. doi:10.1186/1471-2458-14-401.
8. Farmer GW, Jabson JM, Bucholz KK, Bowen DJ. A Population-Based Study of Cardiovascular Disease Risk in Sexual-Minority Women. *Am J Public Health*. 2013;103(10):1845-1850. doi:10.2105/AJPH.2013.301258.
9. Eliason MJ, Ingraham N, Fogel SC, et al. A systematic review of the literature on weight in sexual minority women. *Womens Health Issues*. 2015;25(2):162-175. doi:10.1016/j.whi.2014.12.001.
10. Hatzenbuehler ML, Slopen N, McLaughlin KA, McLaughlin KA. Stressful life events, sexual orientation, and cardiometabolic risk among young adults in the United States. *Health Psychol*. 2014;33(10):1185-1194. doi:10.1037/hea0000126.
11. Cochran SD, Mays VM. Physical health complaints among lesbians, gay men, and bisexual and homosexually experienced heterosexual individuals: Results from the California quality of life survey. *Am J Public Health*. 2007;97(11):2048-2055. doi:10.2105/AJPH.2006.087254.
12. Jackson, CL; Agenor, M; Johnson, DA; Austin, B; Kawachi I. Sexual orientation identity disparities in health behaviors, outcomes, and services use among men and women in the United States: A cross-sectional study. *BMC Public Health*. 2016;16:1-11.
13. Meyer IH. Minority Stress and Mental Health in Gay Men. *J Health Soc Behav*. 1995;36(1):38-56.
14. Allport G. *The Nature of Prejudice*. Reading, MA: Addison-Wesley; 1954.

15. Crocker, J; Major, B; Steele C. *Social Stigma: The Handbook of Social Psychology*. Boston: McGraw-Hill; 1998.
16. Jones, EE; Farina, A; Hestrof, AH; Markus, H; Miller D. *Social Stigma: The Psychology of Marked Relationships*. New York: Freeman; 1984.
17. Link, BG; Phelan J. Conceptualizing Stigma. *Annu Rev Sociol*. 2001;27:363-385.
18. Perlin L. The sociological study of stress. *J Health Soc Behav*. 1989;30:241-256.
19. Meyer IH. Prejudice, Social Stress, and Mental Health in Lesbian, Gay, and Bisexual Populations: Conceptual Issues and Research Evidence. *Psychol Bull*. 2003;129(5):674-697. doi:10.1007/s11145-010-9260-0.How.
20. Dimsdale J. Psychological stress and cardiovascular disease. *J Am Coll Cardiol*. 2008;51(13):1237-1246.
21. Chida, Y; Steptoe A. Greater cardiovascular responses to laboratory mental stress are associated with poor subsequent cardiovascular risk status. *Hypertension*. 2010;55:1026-1032.
22. Hatzenbuehler ML, McLaughlin KA, Xuan Z. Social networks and sexual orientation disparities in tobacco and alcohol use. *J Stud Alcohol Drugs*. 2015;76(1):117-126. <http://www.ncbi.nlm.nih.gov/pubmed/25486400>. Accessed October 19, 2017.
23. Vitaliano, PP; Scanlan, JM; Zhang J et al. A path model of chronic stress, the metabolic syndrome, and coronary heart disease. *Psychosom Med*. 2002;64(3):418-435.
24. Meyer IH, Dietrich J, Schwartz S. Lifetime prevalence of mental disorders and suicide attempts in diverse lesbian, gay, and bisexual populations. *Am J Public*

- Health*. 2008;98(6):1004-1006. doi:10.2105/AJPH.2006.096826.
25. Meyer IH, Wilson PA. Sampling lesbian, gay, and bisexual populations. *J Couns Psychol*. 2009;56(1):23-31. doi:10.1037/a0014587.
 26. Barber M, Binson D, Blair J, Huebner DM, Woods WJ. Sampling in Surveys of Lesbian, Gay, and Bisexual People. *Heal Sex Minor Public Heal Perspect Lesbian, Gay, Bisexual Transgender Popul*. 2007;13(2):375-418.
doi:10.1080/19359700902761305.
 27. Magnani R, Sabin K, Saidel T, Heckathorn D. Review of sampling hard-to-reach and hidden populations for HIV surveillance. *Aids*. 2005;19(Supplement 2):S67-S72. doi:10.1097/01.aids.0000172879.20628.e1.
 28. Heckathorn DD. Respondent-Driven Sampling: A New Approach to the Study of Hidden Populations. *Soc Probl*. 1997;44(2):174-199.
doi:10.1525/sp.1997.44.2.03x0221m.
 29. Wejnert C, Heckathorn DD. Web-Based Network Sampling. *Sociol Methods Res*. 2008;37(1):105-134. doi:10.1177/0049124108318333.
 30. Salganik, MJ; Heckathorn D. Sampling and estimation in hidden populations using respondent-driven sampling. *Sociol Methodol*. 2004;34:193-239.
 31. Heckathorn D. Extensions of respondent-driven sampling: Analyzing continuous variables and controlling for differential recruitment. *Sociol Methodol*. 2007;37:151-207.
 32. Sudman S. *Applied Sampling*. San Diego: Academic; 1976.
 33. Fredriksen-Goldsen KI, Kim H-J, Bryan AEB, Shiu C, Emlet CA. The Cascading Effects of Marginalization and Pathways of Resilience in Attaining Good Health

- Among LGBT Older Adults. *Gerontologist*. 2017;57(suppl 1):S72-S83.
doi:10.1093/geront/gnw170.
34. Gates GJ. How many people are lesbian , gay , bisexual , and transgender ?
Williams Inst. 2011;(April):1-8. doi:10.1080/13691058.2012.673639.
 35. Catania, JA; Osmond, D; Stall, RD; Pollack, L; Paul, JP; Blower, S; Binson, D;
Canchola, JA; Mills, TC; Fisher, L; Choi, KH; Porco, T; Turner, C; Blair, J;
Henne, J; Bye, LL; Coates T. The continuing HIV epidemic among men who have
sex with men. *Am J Public Health*. 2001;91(907-914).
 36. Salganik MJ. Variance estimation, design effects, and sample size calculations for
respondent-driven sampling. *J Urban Heal*. 2006;83(7 SUPPL.):98-112.
doi:10.1007/s11524-006-9106-x.
 37. Moher D, Shamseer L, Clarke M, et al. Preferred reporting items for systematic
review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev*.
2015;4(1):1. doi:10.1186/2046-4053-4-1.
 38. Andersen JP, Hughes TL, Zou C, Wilsnack SC. Lifetime victimization and
physical health outcomes among lesbian and heterosexual women. Uchino BN, ed.
PLoS One. 2014;9(7):e101939. doi:10.1371/journal.pone.0101939.
 39. Barefoot KN, Warren JC, Smalley KB. An Examination of Past and Current
Influences of Rurality on Lesbians' Overweight/Obesity Risks. *LGBT Heal*.
2015;2(2):154-161. doi:10.1089/lgbt.2014.0112.
 40. Bostwick WB, Hughes TL, Everett B. Health Behavior, Status, and Outcomes
Among a Community-Based Sample of Lesbian and Bisexual Women. *LGBT
Heal*. 2015;2(2):121-126. doi:10.1089/lgbt.2014.0074.

41. Eliason MJ, McElroy JA, Garbers S, Radix A, Toms Barker L. Comparing women with and without disabilities in five-site “Healthy Weight” interventions for lesbian/bisexual women over 40. *Disabil Health J.* 2017;10(2):271-278. doi:10.1016/j.dhjo.2016.12.005.
42. Ingraham N, Eliason MJ, Garbers S, et al. Effects of Mindfulness Interventions on Health Outcomes in Older Lesbian/Bisexual Women. *Women’s Heal Issues.* 2016;26:S53-S62. doi:10.1016/j.whi.2016.04.002.
43. Kinsky S, Stall R, Hawk M, Markovic N. Risk of the Metabolic Syndrome in Sexual Minority Women: Results from the ESTHER Study. *J Women’s Heal.* 2016;25(8):784-790. doi:10.1089/jwh.2015.5496.
44. Lehavot K, Rillamas-Sun E, Weitlauf J, et al. Mortality in Postmenopausal Women by Sexual Orientation and Veteran Status. *Gerontologist.* 2016;56 Suppl 1(Suppl 1):S150-62. doi:10.1093/geront/gnv125.
45. Mason TB, Lewis RJ. Minority Stress, Depression, Relationship Quality, and Alcohol Use: Associations with Overweight and Obesity Among Partnered Young Adult Lesbians. *LGBT Heal.* 2015;2(4):333-340. doi:10.1089/lgbt.2014.0053.
46. McElroy JA, Haynes SG, Eliason MJ, et al. Healthy Weight in Lesbian and Bisexual Women Aged 40 and Older: An Effective Intervention in 10 Cities Using Tailored Approaches. *Womens Health Issues.* 2016;26 Suppl 1:S18-35. doi:10.1016/j.whi.2016.05.002.
47. Molina Y, Lehavot K, Beadnell B, Simoni J. Racial Disparities in Health Behaviors and Conditions Among Lesbian and Bisexual Women: The Role of Internalized Stigma. *LGBT Heal.* 2014;1(2):131-139. doi:10.1089/lgbt.2013.0007.

48. Reiter PL, McRee A-L. HPV infection among a population-based sample of sexual minority women from USA. *Sex Transm Infect.* 2017;93(1):25-31.
doi:10.1136/sextrans-2016-052536.
49. Sturm RM, Breyer BN, Li C-S, Subak LL, Brown JS, Shindel AW. Prevalence of overactive bladder and stress urinary incontinence in women who have sex with women: an internet-based survey. *J Womens Health (Larchmt).* 2014;23(11):935-940. doi:10.1089/jwh.2014.4878.
50. McElroy JA, Jordan JN. Sufficiently and insufficiently active lesbian, bisexual, and questioning female college students: sociodemographic factors among two age cohorts. *Womens Health Issues.* 2014;24(2):e243-9.
doi:10.1016/j.whi.2013.12.003.
51. Blair J. A probability sample of gay urban males: The tale of two-phase adaptive sampling. *J Sex Res.* 1999;36:39-44.
52. Hartman JE. Finding a needle in a haystack: Methods for sampling in the bisexual community. *J Bisex.* 2011;11(1):63-73. doi:10.1080/15299716.2011.545306.
53. Russell ST, Clarke TJ, Clary J. Are Teens “Post-Gay”? Contemporary Adolescents’ Sexual Identity Labels. *J Youth Adolesc.* 2009;38(7):884-890.
doi:10.1007/s10964-008-9388-2.
54. McCormack M. Innovative sampling and participant recruitment in sexuality research. *J Soc Pers Relat.* 2014;31(4):475-481. doi:10.1177/0265407514522889.
55. Wejnert C. Social network analysis with respondent-driven sampling data: A study of racial integration on campus. *Soc Networks.* 2010;32(2):112-124.
doi:10.1016/j.socnet.2009.09.002.

56. Voyles CH, Sell RL. Continued disparities in lesbian, gay, and bisexual research funding at NIH. *Am J Public Health*. 2015;105 Suppl 3(S3):e1-2.
doi:10.2105/AJPH.2014.302265.
57. Bureau USC. American Fact Finder.
https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_13_5YR_B01003&prodType=table. Published 2017. Accessed March 20, 2017.
58. Gonzales G, Przedworski J, Henning-Smith C. Comparison of Health and Health Risk Factors Between Lesbian, Gay, and Bisexual Adults and Heterosexual Adults in the United States. *JAMA Intern Med*. 2016;176(9):1344.
doi:10.1001/jamainternmed.2016.3432.
59. Jabson JM, Bowen DJ. Perceived stress and sexual orientation among breast cancer survivors. *J Homosex*. 2014;61(6):889-898.
doi:10.1080/00918369.2014.870814.
60. Operario D, Gamarel KE, Grin BM, et al. Sexual minority health disparities in adult men and women in the United States: National health and nutrition examination survey, 2001?2010. *Am J Public Health*. 2015;105(10):e27-e34.
doi:10.2105/AJPH.2015.302762.
61. Przedworski JM, McAlpine DD, Karaca-Mandic P, VanKim NA. Health and health risks among sexual minority women: an examination of 3 subgroups. *Am J Public Health*. 2014;104(6):1045-1047. doi:10.2105/AJPH.2013.301733.
62. Strutz KL, Herring AH, Halpern CT. Health disparities among young adult sexual minorities in the U.S. *Am J Prev Med*. 2015;48(1):76-88.

doi:10.1016/j.amepre.2014.07.038.

63. Defense D of. *Qualification Standards for Enlistment, Appointment, and Induction (DoD Directive 1304.26)*. Washington, D.C.; 1993.
<https://biotech.law.lsu.edu/blaw/dodd/corres/html2/d130426x.htm>.
64. Ohia, Department of Health et al. Obergefell et al. v. Hodges. 2015.
supremecourt.gov.
65. Campaign HR. State Maps of Laws & Policies. http://www.hrc.org/state-maps?gclid=Cj0KCQjw0PTXBRCGARIsAKNYfG2tf-smJEX7z2DYzXj5Xfk3Un-zflxUQO_6BgLpp13xHO9aQc9wmNkaAo8REALw_wcB. Published 2017.
Accessed April 20, 2018.
66. Mauss D, Jarczok MN, Fischer JE. The streamlined Allostatic Load Index: a replication of study results. *Stress*. 2016;19(6):553-558.
doi:10.1080/10253890.2016.1219718.
67. McEwan B. Mood disorders and allostatic load. *Biol Psychiatry*. 2003;54(3):200-207.
68. Sabbah, W; Watt, RG; Sheiham, A; Tsakos G. Effects of allostatic load on the social gradient in ischaemic heart disease and periodontal disease: Evidence from the Third National Health and Nutrition Examination Survey. *J Epidemiol Community Health*. 2008;62(5):415-420.
69. Frost DM, Meyer IH. Minority stress and physical health among sexual minority individuals. *J Behav Med*. 2015;38(1):1-8. doi:10.1007/s10865-013-9523-8.Minority.

70. Frost, DM; Lehavot, K; Meyer I. *Minority Stress and Physical Health among Sexual Minorities*. Los Angeles; 2011.
71. Denton F. Minority stress and physical health in lesbians, gays, and bisexuals: The mediating role of coping self-efficacy. 2012.
http://uknowledge.uky.edu/edp_etds/2/.
72. Lick, DJ; Durso, LE; Johnson K. Minority stress and physical health among sexual minorities. *Perspect Psychol Sci*. 2013;8(5):521-548.
73. Nash J. Re-thinking Intersectionality. In: McCann, CR; Kim S-K, ed. *Feminist Theory Reader: Local and Global Perspectives*. Routledge; 2017:194-203.
74. Dill, BT; Zambrana R. Critical thinking about inequality: An emerging lens. In: McCann, CR; Kim S-K, ed. *Feminist Theory Reader: Local and Global Perspectives*. Routledge; 2017:182-193.
75. Hartsock N. The feminist standpoint: Toward a more specific historical materialism. In: McCann, CR; Kim S-K, ed. *Feminist Theory Reader: Local and Global Perspectives*. Routledge; 2017:368-383.
76. Molero F, Recio P, García-Ael C, Fuster MJ, Sanjuán P. Measuring Dimensions of Perceived Discrimination in Five Stigmatized Groups. *Soc Indic Res*. 2013;114(3):901-914. doi:10.1007/s11205-012-0179-5.
77. Cohen S (Carnegie-MU, Kamarck T (University of O, Mermelstein R (University of O. A Global Measure of Perceived Stress Author (s): Sheldon Cohen , Tom Kamarck and Robin Mermelstein Source : Journal of Health and Social Behavior , Vol . 24 , No . 4 (Dec . , 1983) , pp . 385-396 Published by : American Sociological Association Stable U. 1983;24(4):385-396.

78. Herek, GM; Gillia, JR; Cogan J. Internalized stigma among sexual minority adults: Insights from a social psychological perspective. *J Couns Psychol.* 2009;56:32-43.
79. Smith, BW; Dalen, J; Wiggins, K; Tooley, E; Christopher, P; Bernard J. The brief resilience scale: Assessing the ability to bounce back. *Int J Behav Med.* 2008;15:194-200.
80. Bränström R, Hatzenbuehler ML, Pachankis JE. Sexual orientation disparities in physical health: age and gender effects in a population-based study. *Soc Psychiatry Psychiatr Epidemiol.* 2015. doi:10.1007/s00127-015-1116-0.
81. Singh, AA; Hays, DG; Watson L. Strength in the face of adversity: Resilience strategies of transgender individuals. *J Couns Dev.* 2011;89:20-27.

APPENDIX A

SYSTEMATIC REVIEW SEARCH TERMS

PubMed Medline Search Terms:

1. Sexual Minorities
 - a. Sexual minorit*[tiab]
 - b. GLBT[tiab]
 - c. Non-heterosexual*[tiab]
 - d. LGB[tiab]
 - e. LGBT [tiab]
 - f. LGBTQ[tiab]
 - g. Lesbigay*[tiab]
 - h. GLBTQ [tiab]
 - i. Lesbian*[tiab]
 - j. Lesbian [MeSH]
 - k. Bisexual*[tiab]
 - l. Bisexual [MeSH]
 - m. Homosexual*[tiab]
 - n. Queer[tiab]
 - o. Queers[tiab]
 - p. Gay[tiab]
 - q. Gays[tiab]
 - r. Sexual identit*[tiab]
 - s. Women who have sex with women[tiab]
 - t. Wsw[tiab]
 - u. Sexual orientation[tiab]
 - v. Homosexuality [MeSH]
 - w. Homosexuality, female [MeSH]
 - x. Sexual minorities [MeSH]
 - y. Same sex [tiab]
2. Not Male
 - a. Men's [tiab]
 - b. Men [tiab]
 - c. Mens [tiab]
 - d. Man [tiab]
 - e. Men's Health [tiab]
 - f. Boy [tiab]
 - g. Boys [tiab]

- h. Male [tiab]
- i. Males [tiab]
- 3. United States

CINAHL Complete and PsychInfo Search Terms:

1. Sexual Minorities
 - a. Sexual minority
 - b. GLBT
 - c. Non-heterosexual
 - d. LGB
 - e. LGBT
 - f. LGBTQ
 - g. Lesbigay
 - h. GLBTQ
 - i. Lesbian
 - l. Bisexual
 - m. Homosexual
 - n. Queer
 - p. Gay
 - r. Sexual identity
 - s. Women who have sex with women
 - t. Wsw
 - u. Sexual orientation
 - v. Homosexuality
 - y. Same sex
2. Not Male
 - a. Men's [tiab]
 - b. Men [tiab]
 - c. Mens [tiab]
 - d. Man [tiab]
 - e. Men's Health [tiab]
 - f. Boy [tiab]
 - g. Boys [tiab]
 - h. Male [tiab]
 - i. Males [tiab]
3. United State

APPENDIX B

HEALTH SURVEY

1. Please enter the number provided on your referral coupon
2. What is your relationship to the person who referred you to this survey?
 - a. Friend
 - b. Acquaintance
 - c. Coworker
 - d. Family
 - e. Closer than friend
 - f. Other:
3. What is your age?
4. What best describes your sexual identity?
 - a. Heterosexual/Straight
 - b. Bisexual
 - c. Lesbian/Gay
 - d. Pansexual
 - e. Queer
 - f. Asexual
 - g. Other:
5. Have you completed this survey before?
 - a. Yes
 - b. No
6. How would you describe your gender identity?
 - a. Cis woman
 - b. Cis man
 - c. Transgender woman
 - d. Transgender man
 - e. Gender non-binary
 - f. Genderfluid
 - g. Genderqueer
 - h. Gender diverse
 - i. Other:

7. How many people do you know that identify as a sexual minority woman (lesbian, pansexual, bisexual, queer, etc.) including friends, family, coworkers, and acquaintances in the Charlotte, NC metropolitan area?
8. Please select the racial/ethnic categories that best describe you (select all that apply)?
 - a. White/Caucasian
 - b. Black/African American
 - c. Native American
 - d. Asian/Pacific Islander
 - e. Hispanic/Latino
 - f. Other:
9. What is the highest level of education you've completed?
 - a. Less than high school
 - b. High school or GED
 - c. Some college
 - d. Associate degree
 - e. Bachelor degree
 - f. Some graduate school
 - g. Graduate degree
10. What is your annual income (from all sources)?
 - a. \$0-\$9,999
 - b. \$10,000-\$24,999
 - c. \$25,000-\$49,999
 - d. \$50,000+
11. What is your current relationship status?
 - a. Single
 - b. Married
 - c. Divorced
 - d. Separated
 - e. Widowed
 - f. Living with partner
 - g. Committed relationship
 - h. Other:
12. What is your current height?
13. What is your current weight?

14. Thinking about the last 6 months, how often have you had a drink of any type of alcoholic beverage, smoked part or all of a cigarette, or used any of the other following substances? (Please provide an answer in each row)

	Daily	A few times a week	Weekly	Rarely (less than once per week)	Once or twice	Never
Alcohol (such as beer, wine or hard liquor)						
Cigarettes (tobacco only)						
E-cigarettes or vaping products						
Marijuana or hashish (such as weed, joints, hash, hash oil)						
Illegal or illicit drugs (such as cocaine, crack, heroin, LSD, meth, inhalants like poppers or whippits)						
Prescription drugs (such as Oxycontin, Xanax, Adderall, Ambien) that weren't prescribed to you, or that you didn't take as prescribed.						

15. How satisfied are you with your life in general?

- a. Very satisfied
- b. Satisfied
- c. Neither

- d. Dissatisfied
- e. Very dissatisfied

16. Thinking about the last 6 months, how would you rate your general physical health?

- a. Excellent
- b. good
- c. average
- d. Fair
- e. Poor

17. Thinking about the last 6 months, how would you rate your general mental health?

- a. Excellent
- b. good
- c. Average
- d. Fair
- e. Poor

18. Are you currently covered by any health insurance or health coverage plan?

- a. No
- b. Yes

19. Has a doctor every diagnosed you with any of the following conditions?

Condition	Yes	No
Type 2 Diabetes		
Pre-diabetes		
High Blood Sugar		
Obesity		
Hypertension (High Blood Pressure)		
High Cholesterol		
Cardiovascular Disease		
Stroke		
Heart Attack		

20. We are interested in how you feel about the following statements. Read each statement carefully. Indicate how you feel about each statement.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
There is a special person who is around when I am in need.					

My family really tries to help me.					
I get the emotional help and support I need from my family.					
I have a special person who is a real source of comfort to me.					
My friends really try to help me.					
I can count on my friends when things go wrong.					
I can talk about my problems with my family.					
I have friends with whom I can share my joys and sorrows.					
There is a special person in my life who cares about my feelings.					
I can talk about my problems with my friends.					

21. Please indicate the extent to which you agree with each of the following statements.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I tend to bounce back quickly after hard times					
I have a hard time making it through stressful events					
It does not take me long to recover from a stressful event					
It is hard for me to snap back when something bad happens					
I usually come through difficult times with little trouble					

22. Please indicate the extent to which you agree with each of the following statements.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
In U.S. society, LGB people are visibly rejected					
U.S. society treats LGB people unfairly					
LGB people suffer from occupational discrimination					
LGB people suffer from discrimination in the health sphere					

LGB people suffer from discrimination in the legal sphere					
LGB people suffer from rejection in their daily social relations					
LGB people suffer from discrimination by some private institutions (e.g., banks, insurance companies, etc.)					
U.S. society mistrusts LGB people					
Even when people seem to accept LGB people, I think that deep down, they have some misgivings					
Even though there is no express rejection, people treat LGB people differently					
I have felt personally rejected for being LGB					
I have been treated unfairly for being LGB					
I have been discriminated against at work for being LGB					
I have been discriminated against in the health sphere for being LGB					
I have been discriminated against in the legal sphere for being LGB					
I have been rejected in my daily social relations for being LGB					
I have been the target of discriminatory actions by some private institution (e.g., banks, insurance companies, etc.) for being LGB					
Even when people seem to accept me, deep down, I think they have some misgivings because I am LGB					
Even though there is no express rejection, people treat me differently when they see I am LGB					
I feel that people mistrust me for being LGB					

23. The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate *how often* you felt or thought a certain way.

In the last month,	Never	Almost never	Sometimes	Fairly often	Very often
How often have you been upset because of something that happened unexpectedly?					
How often have you felt that you were unable to control the important things in your life?					
How often have you felt nervous and “stressed”?					
How often have you dealt successfully with irritating life hassles?					
How often have you felt that you were effectively coping with important changes that were occurring in your life?					
How often have you felt confident about your ability to handle your personal problems?					
How often have you felt that things were going your way?					
How often have you found that you could not cope with all the things that you had to do?					
How often have you been able to control irritations in your life?					
How often have you felt that you were on top of things?					
How often have you been angered because of things that happened that were outside of your control?					
How often have you found yourself thinking about things that you have to accomplish?					
How often have you been able to control the way you spend your time?					
How often have you felt difficulties were piling up so high that you could not overcome them?					

24. Please indicate the extent to which you agree or disagree with the following statements.

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
I have tried to stop being attracted to women in general					
If someone offered me the chance to be completely heterosexual, I would accept the chance					
I wish I weren't LGB					
I feel that being LGB is a personal shortcoming for me					
I would like to get professional help in order to change my sexual identity from LGB to straight					
I have tried to become more sexually attracted to men					
I often feel it best to avoid personal or social involvement with other LGB women					
I feel alienated from myself because of being LGB					
I wish that I could develop more erotic feelings about men					

25. Have you ever seen these questions before?

- a. Yes
- b. No

26. What is the first letter of the word CAT?

- a. A
- b. B
- c. C
- d. D