

OBSTETRIC HISTORY AND SEXUAL HEALTH SCREENING
AMONG SEXUAL MINORITY WOMEN

Madelyne Z. Greene

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Supervisor of Dissertation

Graduate Group Chairperson

Salimah H. Meghani, PhD, MBE, RN, FAAN

Eileen T. Lake, PhD, MSN, MA, BSN, FAAN

Associate Professor of Nursing

Associate Professor of Nursing

Dissertation Committee:

Marilyn S. Sommers, PhD, RN, FAAN; Professor Emerita of Nursing

Tonda L. Hughes, PhD, RN, FAAN; Professor of Nursing (Columbia University)

Alexandra Hanlon, PhD; Research Professor of Nursing

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ABSTRACT

OBSTETRIC HISTORY AND SEXUAL HEALTH SCREENING AMONG SEXUAL MINORITY WOMEN

Madelyne Z. Greene, MS, RN

Salimah H. Meghani, PhD, MBE, RN, FAAN

Sexual minority women (SMW) face multiple barriers to sexual and reproductive health care including cervical cancer screening and sexually transmitted infection (STI) screening. Despite beliefs that they are not at risk for STIs or cervical cancer, most SMW should be screened according to standard clinical guidelines. Aspects of obstetric history, including pregnancy, birth, and elective termination, may represent opportunities for these two types of screening. Guided by intersectionality theory, we reviewed the existing literature for evidence that health care experiences may be correlates to cervical cancer screening among SMW. The review identified important healthcare experience factors, including hormonal contraceptive use, pregnancy history, provider-recommended cervical cancer screening, previous discrimination in health care settings, and disclosing one's sexual orientation to providers. We then performed secondary analyses employing cross-sectional data from the Chicago Health and Life Experiences of Women (CHLEW) Study, a diverse sample of SMW. The primary aim was to examine associations between obstetric history and the outcomes of cervical cancer and STI screening. In our final logistic regression model of cervical cancer screening, older age was associated with decreased odds (β 0.98, $p < 0.01$) of past year Pap testing. Having health insurance (β 1.72,

p<0.01) and being Black/African American (β 1.61, p<0.05) were associated with increased odds of past year Pap testing. Variables significantly associated with increased odds of STI testing included higher numbers of lifetime sex partners (β 6.07, p <0.0001 for the highest quartile group), and being bisexual (β 3.13, p<0.0001). An annual income \geq \$75,000 was associated with decreased odds of STI testing compared to an income of <\$15,000 (β 0.41, p 0.004). Decision tree analysis revealed the significance of age at coming out, early sexual initiation, and early drinking on the two screening outcomes; the models also identified specific subgroups of SMW that were less likely to report Pap testing, including SMW over 60 years old. Overall, our findings suggest the need for primary, longitudinal studies of SMW's sexual and reproductive health. They also illustrate the significance of developmental milestones on later sexual health outcomes, and support the validity of intersectionality theory in investigating cervical cancer screening among SMW.

TABLE OF CONTENTS

ACKNOWLEDGMENTS	II
ABSTRACT	IV
LIST OF TABLES	VII
LIST OF FIGURES.....	VIII
CHAPTER 1: BACKGROUND AND INTRODUCTION TO PROBLEM	1
CHAPTER 2: CORRELATES TO CERVICAL CANCER SCREENING AMONG SEXUAL MINORITY WOMEN: AN INTEGRATIVE REVIEW OF HEALTH CARE EXPERIENCES.....	38
CHAPTER 3: ASSOCIATION OF OBSTETRIC HISTORY AND CERVICAL CANCER SCREENING IN A COMMUNITY SAMPLE OF SEXUAL MINORITY WOMEN.....	80
CHAPTER 4: SEXUAL HEALTH SCREENING AMONG SEXUAL MINORITY WOMEN: A DECISION TREE ANALYSIS.....	112
CHAPTER 5: GENERAL CONCLUSION	154
APPENDIX	185

LIST OF TABLES

CHAPTER 2:

Table 1.	
Summary of Studies Included in Review.	60
Table 2.	
Summary of Health Care Experience Factors in Reviewed Studies.	69

CHAPTER 3:

Table 1.	
Demographic Characteristics of the Sample.	99
Table 2.	
Logistic Regression Model Showing the Odds of Participants Having a Pap Test Within the Past Year.	100
Table 3.	
Logistic Regression Model Showing the Odds of Participants Having STI Testing Within the Previous 5-8 Years.	101

CHAPTER 4:

Table 1.	
Sample Characteristics and Distributions of Key Variables.	136
Table 2.	
Distributions of Variables Included in Pap Test Decision Tree Model.....	137
Table 3.	
Statistics Describing Performance of the Decision Tree Model Predicting Past Year Pap Test.	138
Table 4.	
Distributions of Variables Included in STI Test Decision Tree Model.....	139
Table 5.	
Statistics Describing Performance of the Decision Tree Model Predicting STI Testing Within the Previous 5-8 Years.....	140

LIST OF FIGURES

CHAPTER 1:

Figure 1. A visual model depicting multiple intersecting axes of privilege and oppression.....	19
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CHAPTER 2:

Figure 1. Flowchart of study selection process.	59
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CHAPTER 4:

Figure 1. Decision Tree model predicting Pap testing within the previous year.....	134
Figure 2. Decision Tree model predicting STI testing within the previous 5-8 years.....	135

CHAPTER 1:
BACKGROUND AND INTRODUCTION TO PROBLEM

Introduction

Sexual and reproductive health (SRH) broadly refers to the health and wellness of an individual with respect to their sexuality, sexual experiences, and reproductive system (United Nations Population Fund, 2017). The maintenance of SRH requires both the ability to achieve sexual and reproductive goals and the prevention and early detection of diseases of the reproductive system. Sexual minority women (SMW), those who identify as lesbian, gay, bisexual, queer, or other non-heterosexual identities, have SRH needs similar to their heterosexual counterparts. However, evidence demonstrates that SMW face multiple barriers to the maintenance of their SRH including difficulty accessing safe and affirming health care, poor knowledge of their SRH health needs, and increased likelihood of some risk behaviors such as smoking (Brown & Tracy, 2008a), excess alcohol use (T. L. Hughes, 2003; Parks & Hughes, 2005; Talley, Hughes, Aranda, Birkett, & Marshal, 2014a; Wilsnack et al., 2008), early sexual debut (Brown & Tracy, 2008a; Goldberg & Halpern, 2017; Saewyc, Poon, Homma, & Skay, 2008), and unplanned pregnancy (Charlton et al., 2013; Herrick, Kuhns, Kinsky, Johnson, & Garofalo, 2013; Tornello, Riskind, & Patterson, 2014).

Reproductive history is an aggregate component of SRH that reflects an individual's history of pregnancies and their outcomes, age at menarche and menstrual history, fertility, and use of contraceptives. Reproductive history is a crucial element of overall SRH. However, relatively little is known about the reproductive histories of SMW (Marrazzo & Stine, 2004). Some evidence suggests that many sexual minority adults have had children and are parenting (Black, Gates, Sanders, & Taylor, 2000; Gates, 2013). However, SMW may lack familiarity or comfort with pregnancy planning behaviors

(Institute of Medicine, 2011), and are at risk for unplanned pregnancy (Charlton et al., 2013; Herrick et al., 2013). Some evidence shows that bisexual women have particularly high rates of unplanned pregnancy (Tornello et al., 2014). Studies of partnered lesbians' use of assisted reproductive technologies (ARTs) reveal experiences of heteronormativity and discomfort in their interactions with reproductive health care providers (Chapman, Wardrop, Zappia, Watkins, & Shields, 2012; Institute of Medicine, 2011; Yager, Brennan, Steele, Epstein, & Ross, 2010).

Regular preventive care including screening for diseases of the reproductive system such as cervical cancer is another important component of SRH. Some evidence suggests that SMW may be at increased risk for certain gynecologic cancers compared to their heterosexual peers and at higher risk for STIs than previously documented (Bauer et al, 2001). Sexual minority women may be more likely to experience modifiable risk factors for cervical cancer including earlier age at sexual debut, lower rates of oral contraceptive use, and higher rates of smoking (Brown & Tracy, 2008a). They are also less likely to receive appropriate screening and treatment for various sexual and reproductive conditions than heterosexual women (Brown & Tracy, 2008a; Institute of Medicine, 2011). Some studies have shown that sexual minority women receive fewer Pap tests than heterosexual women (Agénor, Krieger, Austin, Haneuse, & Gottlieb, 2014a; Agénor, Krieger, Austin, Haneuse, & Gottlieb, 2014b; Charlton et al., 2011; Charlton et al., 2014; Institute of Medicine, 2011).

A major cause of these disparities in SRH may be lower access to safe, affirming, and high quality health care among SMW. Some research has revealed evidence of disparities in health care utilization among SMW compared to heterosexual women

(Buchmueller & Carpenter, 2010; Gonzales & Blewett, 2014; Heck, Sell, & Gorin, 2006; Owens, Riggle, & Rostosky, 2007; van Dam, Koh, & Dibble, 2001). Specifically, evidence suggests that SMW use emergency services and seek mental health care more often than heterosexual women (Cochran, Mays, & Sullivan, 2003; Sanchez, Hailpern, Lowe, & Calderon, 2007), and access preventive care, including sexual health screening, less often than heterosexual women (Cochran et al., 2001). Barriers to health care for SMW include lower rates of health insurance, fear of and previous experiences of discrimination in health care settings, lack of knowledge among providers about sexual minority health, low perceived severity of or susceptibility to sexual and reproductive illnesses, and dissatisfaction with previous health care encounters (Institute of Medicine, 2011). Additionally, SMW may be less likely to use other SRH services like hormonal contraceptives (Brown & Tracy, 2008a). Some contributory factors, such as lack of health insurance, have been relatively well documented and studied (Blosnich, John, PhD, MPH, Bossarte, Silver, & and Silenzio, Vincent, MD, MPH, 2013; Buchmueller & Carpenter, 2010; Heck et al., 2006). However, other barriers, including the quality of care and discrimination or discomfort in health care settings, have not been well studied (Institute of Medicine, 2011).

Aspects of reproductive history such as pregnancy may disrupt these barriers to preventive SRH services among SMW. Seeking fertility services, prenatal or birth care, or care related to elective terminations may provide an “entry point” in preventive SRH care for SMW. Pregnancy has been studied as an “entry point” into health care for various other health concerns such as smoking (Chisolm, Cheng, & Terplan, 2014; Colman & Joyce, 2003; Constantine, Slater, Carroll, & Antin, 2014; Wilkinson &

McIntyre, 2012), overweight and obesity (Chasan-Taber et al., 2015; Ferrara et al., 2011; Haakstad, Voldner, & Bo, 2013; Phelan et al., 2011; Sui, Turnbull, & Dodd, 2012; Sui & Dodd, 2013), and intimate partner violence (Deshpande & Lewis-O'Connor, 2013; Van Parys, Verhamme, Temmerman, & Verstraelen, 2014). Specifically, for SMW, locating a provider or sight for care in which they can discuss their sexual orientation and sexual history openly may increase their likelihood of returning for regular preventive care such as cervical cancer screening.

Additionally, reproductive histories that include pregnancy with various outcomes may signal to providers that SMW should be screened regularly for cervical cancer. Some of the sexual orientation-related disparity in cervical cancer screening may also be explained by health providers' misconceptions that because of their sexual identity, SMW's sexual practices do not put them at risk for STIs including human papilloma virus (HPV), the cause of virtually all cervical cancer (Marrazzo, Koutsky, Kiviat, Kuypers, & Stine, 2001a; NIH, 1996; P. L. Reiter & McRee, 2015). However, evidence shows that HPV can be transmitted between female sexual partners (Anderson, Schick, Herbenick, Dodge, & Fortenberry, 2014; Marrazzo, Stine, & Koutsky, 2000; Moszynski, 2009). Additionally, most SMW report some history of opposite-sex sexual relationships and encounters across their lifetimes, putting them at potential risk for STIs including HPV (Charlton et al., 2013; Herrick et al., 2013; Marrazzo & Stine, 2004). Since parity and hormonal contraceptive use modify risk of certain gynecological cancers including cervical cancer, providers should recognize the need for cervical cancer screening in women who report previous pregnancies or seek pregnancy related care. Therefore, the main aim of this study was to examine associations between aspects of obstetric history

and cervical cancer screening among SMW. We defined “obstetric history” as a multidimensional measure of reproductive history related to pregnancy, specifically including an individual’s history of pregnancy, birth, and elective termination.

State of the Science

Evidence for sexual-orientation related disparities in cervical cancer screening continues to be mixed (Aaron et al., 2001; Clark et al., 2009; Grindel, McGehee, Patsdaughter, & Roberts, 2006; McElroy, Wintemberg, & Williams, 2015; S. J. Roberts, Patsdaughter, Grindel, & Tarmina, 2004). However, some recent studies suggest associations between other health and health care history factors and cervical cancer screening. For example, previous experiences of discrimination in health care, discomfort with discussing sexual identity with providers, and not disclosing sexual identity to providers have all been shown to decrease the likelihood of cervical cancer screening among SMW (Agénor, Bailey, Krieger, Austin, & Gottlieb, 2015a; Clark, Bonacore, Wright, Armstrong, & Rakowski, 2003; Diamant, Schuster, & Lever, 2000a; Johnson, Nemeth, Mueller, Eliason, & Stuart, 2016; Johnson, Mueller, Eliason, Stuart, & Nemeth, 2016b; P. L. Reiter & McRee, 2015; Tracy, Schluterman, & Greenberg, 2013).

Additionally, recent studies suggest the role of “salient personal experiences” or “cues to screening” in driving cervical cancer screening among SMW (Agénor, Austin, Kort, Austin, & Muzny, 2016; Agénor et al., 2014b; Charlton et al., 2014; Eaton et al., 2008a; Johnson et al., 2016; Matthews, Brandenburg, Johnson, & Hughes, 2004). These studies indicate that seeking other services related to SRH including pregnancy-related care may act as a cue to screening. Since SMW continue to be less likely to seek these services, they may have fewer opportunities to have cervical cancer screening offered.

The majority of the recent publications examining both correlates of cervical cancer screening and reproductive history among SMW continue to report findings from samples with largely white, well-educated, and higher income SMW. While these studies certainly add to our preliminary understanding of this sexual orientation related disparity, they have limited generalizability. The impact of multiple minority identities including race and ethnicity on SMW's use of preventive health care requires further investigation (Bowleg, Huang, Brooks, Black, & Burkholder, 2003). Some research has shown that race and ethnicity have important interactive effects with sexual identity and that SMW of color have experiences with SRH and related care that are unique to the intersection of their gender, sexual orientation, race, and/or ethnicity (Agénor et al., 2016; Muzny, Harbison, Pembleton, & Austin, 2013; Muzny, Austin, Harbison, & Hook, 2014a; Reed, Miller, Valenti, & Timm, 2011; Reed, Miller, & Timm, 2011; Szymanski & Meyer, 2008). Specifically, African American SMW have been shown to experience racism and heterosexism in health care settings (Szymanski & Meyer, 2008), have unique expectations and desires about childbearing and parenting (Reed et al., 2011; Reed et al., 2011), and often have different patterns of sexual risk behaviors during adolescence and young adulthood (Bostwick, Hughes, & Everett, 2015a; Champion, Wilford, Shain, & Piper, 2005; McCauley et al., 2015a; Muzny et al., 2013; Muzny et al., 2014a; Sweet & Welles, 2012).

Theoretical Framework

Intersectionality Theory

This study was informed by Intersectionality theory. First coined by Kimberlé Crenshaw, Intersectionality posits that experiences of inequality are driven by multiple

forms of oppression and discrimination that are not experienced in isolation but rather intersect at unique locations on various axes of power (Bradford & van Wagenen, 2012; Crenshaw, 1989; Crenshaw, 1991). That is, an individual's experience of their racial identity, class, gender, disability status, and other characteristics, and the systems of privilege or oppression that reflect those identities, occur simultaneously and cumulatively, not in isolation from each other. The theory describes how inequalities are the result of the intersection of these broad structures and institutions with individual identities. Structures of privilege and oppression include sexism, racism, heterosexism, and classism, among others. Figure 1 shows a visual model of intersectionality and the various axes of power that intersect to create experiences of inequality at different social locations of differential power. In this analysis we did not measure all the variables depicted in this figure, but did include variables that represent genderism (masculinity and femininity scales), racism (race/ethnicity), eurocentrism (race/ethnicity), educationalism (education level), ageism (age), and classism (education level, income), and we consider sexism by using a sample of all women.

While technically every individual experiences the intersection of multiple forms of identity, scholarship guided by Intersectionality has been committed to examining and describing experiences of those in marginalized or relatively oppressed groups (Bowleg, 2012). Crenshaw and other early scholars of intersectionality specifically studied the intersections of race, class, and gender to understand how the experiences of Black women in the U.S., were erased by mainstream feminist and anti-racist politics and work (Crenshaw, 1989). More recently, scholars have applied this theory to sexual and gender

minority groups, specifically using the theory to approach understandings of Black sexual minority women's lives (Agénor et al., 2016; Bowleg, 2012; Moore, 2012).

Application to the Current Study

Intersectionality theory diverges from many theories and models typically used in public health and health care research as it does not identify specific variables to measure or relationships to test. Intersectionality scholars have pointed out that the theory was not developed to predict any health related behavior or outcome (Bowleg, 2012). However, this can be seen as both a challenge and opportunity for researchers to creatively incorporate concepts from Intersectionality into their research. In a widely cited article, Lisa Bowleg states, “an intersectionality-informed stance...involves a natural curiosity and commitment to understanding how multiple social categories intersect to identify health disparity” (2012). In this study, we used the major tenets of the theory to drive the formulation of research questions, to inform the inclusion of variables related to identity as well as experiences of discrimination, and to guide our interpretation of results. Our overall aim is to uncover more information about what unique sets of experiences and identities may be driving disparities in cervical cancer screening and STI testing among SMW. We included variables measuring not only race and ethnicity, age, multiple components of social and economic class, sexual identity and sexual behavior, but also experiences of discrimination in health care settings, internalized homophobia, and outcomes related to trauma from experiences of marginalization including sexual and physical victimization, childhood abuse, and early age at first drinking.

Intersectionality theory also informed our analytical methods and interpretations of results. Decision tree modeling is an inherently intersectional approach as it uses the

interactions between multiple variables to predict a specific outcome. In contrast to regression models, in which interaction terms have to be individually added, decision trees iteratively split data to reveal specific interactions between independent variables that predict the outcome (Neville, 1999). We also approached our interpretation and discussion of findings from this intersectional “stance,” considering how individual variables may reflect multiple aspects of experience or risk.

Specific Aims

Chapter 2 of this dissertation is an integrative review of existing literature on cervical cancer screening among SMW, with the aim of reviewing published literature that examines cervical cancer screening among SMW for evidence of the impact of other health care experiences on screening. Chapters 3 and 4 of this dissertation employ two different quantitative approaches to examine the relationship between obstetric history and past-year cervical cancer screening and STI testing within the previous 5 years through secondary analysis of existing data. We achieved this objective through two specific aims:

Aim 1. To examine the association between obstetric history and past year cervical cancer screening among a community sample of SMW while accounting for relevant covariates, including variables related to demographics, socioeconomic position, sexual minority status, sexual history and other prognostic indicators that have been shown to affect multiple health outcomes among SMW (see Appendix).

Aim 1a. To examine the above associations with the outcome of STI testing within the previous 5-8 years.

Aim 2. To employ classification tree modeling to identify subgroups of SMW who are less likely to report past-year cervical cancer screening based on obstetric history and variables related to demographics, socioeconomic position, sexual minority status, sexual history and other prognostic indicators that have been shown to affect multiple health outcomes among SMW (see Appendix).

Aim 2a. To identify subgroups of SMW who are more and less likely to report STI testing within the previous 5-8 years based on classification tree modeling.

Data Source and Human Subjects Considerations

Parent Study: The CHLEW Study

We used existing data from the Chicago Health and Life Experiences of Women (CHLEW) Study, which is a longitudinal study of SMW in the Midwestern U.S. The first wave of CHLEW data collection was initiated in 2000 and used community sampling techniques to recruit a diverse sample of lesbian women. These techniques included advertising in local newspapers, on Internet list serves, on flyers posted in churches and bookstores, and networking at formal and informal social events and through social networks. The CHLEW Study team targeted recruitment to SMW who are typically underrepresented in studies of lesbian health, such as older (>50 years old) and younger (<25 years old) women, racial and ethnic minorities, and those with lower educational attainment.

The original CHLEW sample of 447 SMW included only those who identified as exclusively or mostly lesbian at recruitment, although some of these participants indicated a bisexual or other sexual orientation at later interviews. At the third wave of data collection (between 2010 and 2012), 354 of the original participants were re-

interviewed, for a response rate of 79%, and an additional sample of 336 women was also recruited using modified respondent-driven sampling methods. This new sample targeted bisexual women, as well as younger and racial and ethnic minority women. The Wave 3 sampling method also utilized participant “seeds” who had relevant connections in the community (Heckathorn, 1997; Heckathorn, 2002). In turn, each new participant was invited to recruit others into the study, limited to three per participant to limit over-recruitment from a particular social network. The current analysis included all women who were surveyed at Wave 3 and were ages 21-65, for a total sample size of 663. STI screening was defined as screening within the previous 5 years for participants recruited at Wave 3 of the parent study, and within the previous 5-8 years for participants who had been previously surveyed.

Human Subjects Considerations

The CHLEW Study team received approval from the Institutional Review Board at the University of Illinois at Chicago at each wave of data collection. All CHLEW Study personnel received 20-25 hours of training in field interviewing techniques as well as sensitivity training for issues such as sexual orientation, substance use, and sexual experiences that are included in the CHLEW questionnaire. These trained interviewers contacted eligible participants to schedule interviews at a place of the participant’s choosing, and obtained informed consent during their face-to-face meeting with participants. Data were collected using computer-assisted interview techniques, with potentially sensitive sections of the interview completed privately by participants. The CHLEW study team also prepared a distress protocol for any participant who became upset or disturbed by the interview questions. This protocol included contacting local

police for a well-being check if Study personnel perceived that the participant was in imminent danger or contacting the Primary Investigator who is an experienced mental health Registered Nurse or a co-Investigator who is a Clinical Psychologist for less immediate concerns. This protocol has never been utilized for CHLEW Study participants but will remain in place for future data collection waves. In addition, all participants were given lists of local agencies and mental health and crisis hotlines before beginning the interview.

Because the current analysis uses existing data, participants were not exposed to additional risk from direct participation. Certain topics that the CHLEW Study as well as the current analysis cover are especially sensitive. Many sexual minority individuals do not disclose their sexual orientation in some or any aspects of their lives. As a result of continued social stigma, disclosing one's sexual minority status can have multiple potential negative ramifications in individuals' lives. Therefore, maintaining the privacy of CHLEW participants is especially important. For the current study, concerns about privacy and data protection were addressed. CHLEW data were de-identified prior to sharing, and were then sent through and stored on secure networks and were password-protected. Only the current study personnel had access to the data. The Institutional Review Board at the University of Pennsylvania approved this secondary data analysis.

Key Study Concepts

Sexual Minority Women

In this dissertation, the term "sexual minority" is used to describe individuals whose sexual identity is anything besides heterosexual (Fenway Health, 2010). Sexual minority women cannot be considered a homogenous group; racial identity, ethnicity, socioeconomic

background, and other aspects of identity also deeply impact health and health behaviors and vary widely within the population of SMW. Although SMW are not a homogenous group, nonheterosexual individuals across identities do share some common experiences and social exposures. Therefore, the present study includes and refers to many subgroups of SMW, and analyses considers individual sexual identities and histories.

Additionally, some SMW are transgender women, or women who were born with typically male anatomy and physiology. These women face unique and substantial barriers to maintaining health and seeking health care (Grant et al., 2011; Institute of Medicine, 2011), but they generally do not require cervical cancer screening. Transgender men or transmasculine people are more likely to have a cervix and require cervical cancer screening. However, these individuals face substantially different barriers to receiving quality health care and are likely to have different experiences of seeking cervical cancer screening (Agénor et al., 2016; Grant et al., 2011; McClain, Hawkins, & Yehia, 2016; Peitzmeier, Reisner, Harigopal, & Potter, 2014). The present study includes only cisgender SMW.

Sexual Orientation

While the term “sexual orientation” is commonly used to identify a fixed, unidimensional attribute of an individual, sexuality is in fact multifaceted, and an individual’s sexuality may be fluid and change over the lifespan (Ellison & Gunstone, 2009). Social scientists have proposed three components of sexual orientation as distinct but sometimes related domains of sexual and social life; attraction or desire, behavior, and identity. *Sexual attraction* or *desire* refers to what group(s) of others with whom an individual wishes to engage in sexual activity. *Sexual behavior*, often assessed retrospectively, refers to the sexual or romantic encounters an individual has had over their lifetime. *Sexual identity* refers to the

way individuals think about, represent, or describe their sexuality to others; terms like “heterosexual,” “straight,” “gay,” “lesbian,” and “bisexual” refer to sexual identity. There is some evidence that younger generations are experiencing increased fluidity in terms of sexual attraction, behavior, and identity, which may indicate various levels of risk of sexual orientation-related disparities at different points in their lives (Katz-Wise & Hyde, 2015; Savin-Williams & Cohen, 2015; Vrangalova & Savin-Williams, 2012).

Importantly, a particular sexual identity does not necessarily imply corresponding sexual attraction or behavior (Ellison & Gunstone, 2009). For example, some lesbian-identified women may feel attracted to mostly other women but have multiple male sexual partners over their lifetime, and other lesbian women may have only ever had sexual attraction, behavior, and identity oriented toward other women. These identities also carry significant political and social implications and thus should be considered important social and political expressions of self. Sexual identity groups have historically functioned to create politically organized communities of marginalized sexual and gender minority individuals (Gamson, 1995). The political and social implications of identifying as a sexual minority may also dictate the degree to which or the contexts in which individuals feel able to express the sexual identity they recognize for themselves. One study in the United Kingdom, for example, found that 75% of bisexual people described their sexual identity differently depending on who they were with (Ellison & Gunstone, 2009).

Sexual Health Screening

In this study, sexual health screening is conceptualized as a behavioral component of sexual health that relies on both individual decision-making and behaviors as well as health provider behaviors, health system factors, and social influences. Screening can be

defined as “systematic application of a test or enquiry to identify individuals at sufficient risk of a specific disorder to warrant further investigation or direct preventive action, amongst persons who have not sought medical attention on account of symptoms of that disorder” (Wald, 2001). In this study, sexual health screening is comprised of cervical cancer screening via Pap test and STI testing. Both cervical cancer screening and STI testing are recommended to begin at relatively early ages compared to other health screening (e.g. breast and colorectal cancer), are related to an individual’s sexual behavior and experience, and require relatively invasive testing procedures that may cause physical and psychological discomfort for many individuals. However, the motivations for seeking screening for cervical cancer and STIs may be different, so distinct factors may be associated with each type of sexual health screening. This dissertation focuses on cervical cancer screening as its primary outcome of interest and examines STI testing secondarily to compare the impact of obstetric history on these two screening practices.

Obstetric History

“Obstetric history” is a multifactorial concept that can include many components of reproductive health but is more specific to pregnancy related history than reproductive history. In this study, it is quantitatively defined as an individual’s history of pregnancy, birth, and elective termination. Because gravida and parity are known to be linked to risk for cervical and other gynecologic cancers (American Cancer Society, 2016), these factors may have an effect on whether providers recommend screening for SMW. Reproductive health is can be “entry point” into the health care system for many women (Agénor et al., 2014b). A current or previous pregnancy may signal a health care provider to recommend cervical

cancer screening, STI screening may be a routine part of prenatal or intrapartum care, and health systems may have mandatory screening prompts in place. For instance, one Australian study found that SMW seeking fertility services received mandatory cervical cancer screening before any fertility treatment (Curmi, Peters, & Salamonson, 2014; Curmi, Peters, & Salamonson, 2015). Additionally, unplanned pregnancies and terminations may be associated with sexual health screening in unique ways at the level of health care encounters or systems. In clinical contexts, obstetric history also typically includes more detailed data about pregnancy outcomes (e.g. preterm labor, stillbirth, etc.) and menstrual history. While these components of obstetric history may also be related to sexual health screening, they are not included in analyses due to data limitations.

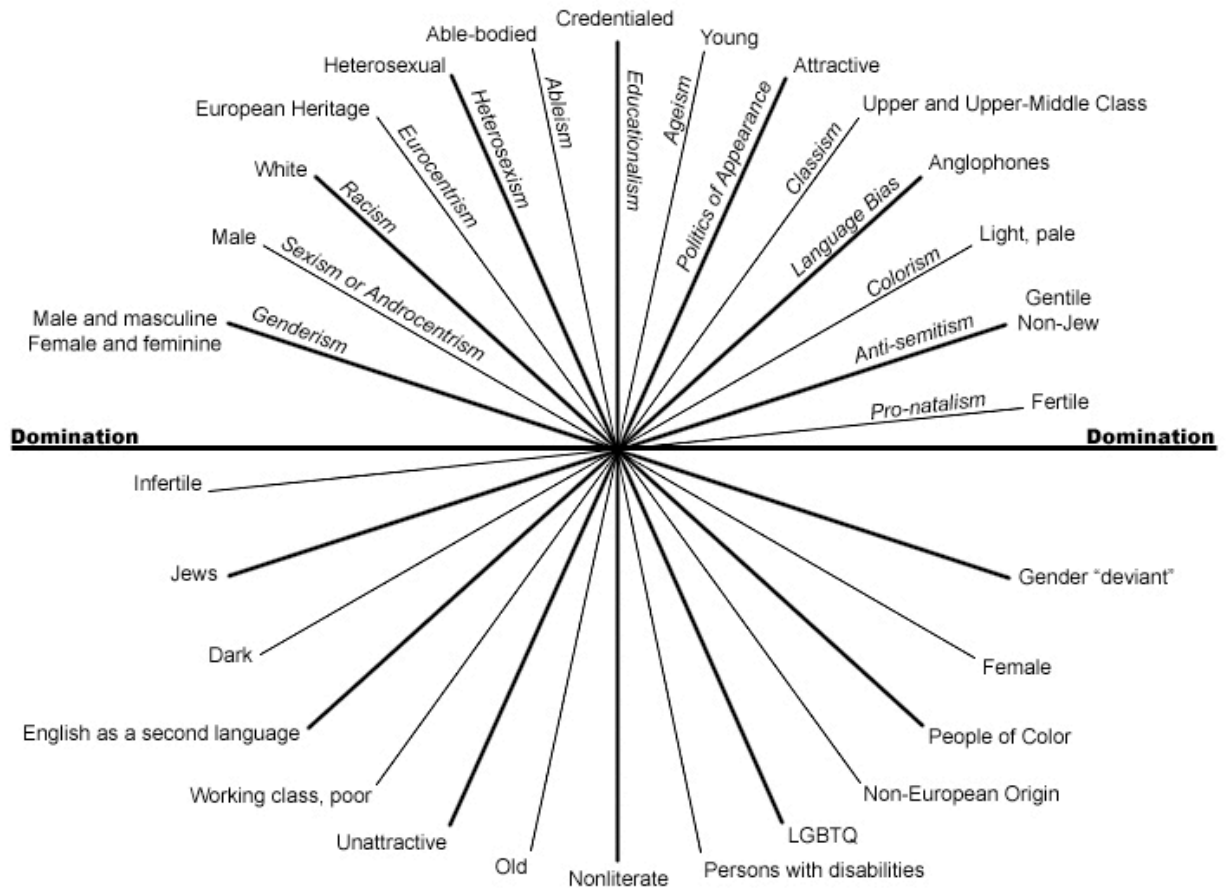
Significance of the Study

The 2011 IOM report on the health of LGBT people emphasized that; “it has been an ongoing challenge for researchers to collect reliable data from sufficiently large samples to assess the demographic characteristics of LGBT populations” (Institute of Medicine, 2011). Identifying true probability samples of sexual minorities has been difficult due to the lack of sexual orientation questions on large national surveys and the US census. This study utilized a relatively large data set with diverse participants, and therefore offers contextualized information about relationships between sexual identity, obstetric history, and cervical cancer screening than previous studies.

This study fills a critical gap in the existing literature by examining whether obstetric history drives the uptake of cervical cancer screening and secondarily STI testing among SMW. This study reflects the diversity in the population of SMW, and undertakes a nuanced approach to both sexuality and obstetric history among SMW. The

long-term goal of this research is to understand factors that drive cervical cancer screening among SMW in order to develop interventions and build systems that continue to reduce cervical cancer rates in marginalized populations and reduce disparities. Increased understanding of how obstetric history impacts sexual health screening can advance the science on the SRH of SMW by increasing understanding of how various aspects of SRH are associated. This study also helps identify opportunities for intervention development as well as advancing clinical practice to ensure that clinicians are knowledgeable about the sexual health screening needs of SMW.

Figure 1. A visual model depicting multiple intersecting axes of privilege and oppression that can create inequalities among individuals and have been examined by Intersectionality theory, borrowed from Kathryn Pauly Morgan’s chapter “Describing the Emperor’s New Clothes: Three Myths of Educational (In)equality” (1996). Identities falling closer to the top of the diagram tend to experience more privilege than those falling closer to the bottom of the diagram.



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CHAPTER 2:
CORRELATES TO CERVICAL CANCER SCREENING AMONG SEXUAL
MINORITY WOMEN: AN INTEGRATIVE REVIEW OF HEALTH CARE
EXPERIENCES

Introduction

Cervical cancer screening is a vital tool in maintaining the sexual and reproductive health (SRH) of populations. Cervical cancer was a leading cause of death among women in industrialized nations as recently as the 1940s (NIH, 1996). Since the development of the Papanicolaou test (Pap test) in the 1950s, it has dramatically declined in prevalence where screening services are widely available. However, as with many other innovations and advancements in health care, disparities in cervical cancer screening among various populations persist by race, class, region, and sexual orientation (Beavis, Gravitt, & Rositch, 2017; E. Ward et al., 2004). Sexual minority women (SMW) are those that identify as lesbian, gay, bisexual, or other nonheterosexual identities. Findings from studies examining rates of cervical cancer screening among SMW in the U.S have been inconsistent, with some studies finding lower rates than among heterosexual women and some finding no differences (Brown & Tracy, 2008b; Clark et al., 2009; McElroy et al., 2015; Waterman & Voss, 2015).

Multiple disparities in health outcomes and health care access affect SMW (Institute of Medicine, 2011), and are largely believed to result from the social and economic consequences of living with a stigmatized minority sexual identity and experiences of discrimination within the health care system (Li, Matthews, Aranda, Patel, & Patel, 2015; Macapagal, Bhatia, & Greene, 2016; Mattocks et al., 2015; Meyer, 1995; Meyer, 2003). Disparities in SMW's access to and use of cervical cancer screening should be understood in the context of their overall experiences with health and health care, and SRH care specifically. Specifically, SRH services are essential to maintaining

the overall health of individuals and preventing disease (U.S. Department of Health and Human Services, 2017b).

Over the past decade, investigators have documented increasing rates of pregnancy and childbearing among SMW. A number of investigators have demonstrated that unplanned pregnancy is common among SMW, even those who identify as lesbian or gay (Charlton et al., 2013; Everett, McCabe, & Hughes, accepted; Everett, McCabe, & Hughes, 2016; Herrick et al., 2013; Saewyc et al., 2008). Additionally, reproductive science, policies, and social norms evolve, women in same-sex relationships have more options for seeking formal fertility services (Chapman et al., 2012; Yager et al., 2010) and are using novel family-building strategies to achieve their childbearing desires and plans (Reed et al., 2011; Reed et al., 2011). Investigators have also measured rates of contraceptive use (Agénor et al., 2016; Agénor, Krieger, Austin, Haneuse, & Gottlieb, 2014c; Charlton et al., 2013), HPV vaccination (P. L. Reiter & McRee, 2015), and STI testing and diagnosis among SMW (Arbeit, Fisher, Macapagal, & Mustanski, 2016; Bostwick et al., 2015a; Mullinax, Schick, Rosenberg, Herbenick, & Reece, 2016).

Purpose

The main purpose of this integrative review was to synthesize published literature on cervical cancer screening among SMW and evaluate evidence of the impact of other health care experiences on cervical cancer screening. These other health care experience variables included pregnancy and childbearing history, contraceptive use, HPV vaccination, STI testing, receipt of regular primary care, relationships with providers, and experiences of discrimination in health care settings. We included studies that examined

cervical cancer screening among SMW, whether or not they measured or analyzed any other health care experience variables.

In this review, we defined SMW as those who identify as lesbian, gay, bisexual, or other nonheterosexual identities as well as those who report any sexual activity with women. Although we agree with Young and Meyer's (2004) assertion that simple behavioral categories do not capture the complete sociopolitical experience of those with minority sexual *identities*, because investigators define sexual orientation in a variety of ways, we include this behavioral definition in an effort to cover the broadest range of relevant literature. We limit our search and discussion to studies of cisgender women (those whose gender identity aligns with the sex they were assigned at birth).

Transgender women are not likely to have a cervix or need screening for cervical cancer. Transgender men may need cervical cancer screening but are likely to have significantly different experiences with SRH care than cisgender SMW (Grant et al., 2011; McClain et al., 2016; Peitzmeier et al., 2014). Although further study and better understanding of this population is needed, it is beyond the scope of the current review.

Previous Literature Reviews

Two previous literature reviews shed light on patterns of cervical cancer risk and screening among SMW. Brown and Tracy (2008b) used the cancer disparities grid to “summarize the evidence in support of the thesis that lesbians represent an overlooked health disparity group across cancers and along the cancer continuum” (p. 1011). Their review confirmed that several risk factors for cervical cancer aggregate among lesbians, including smoking, overweight and obesity, early sexual debut, multiple sexual partners, and no use of oral contraceptives. They also found that SMW were less likely to be

screened for cervical cancer despite their potentially increased risk. Based on findings from their review, Brown and Tracy (2008b) concluded that patient-provider communication, having a regular primary care provider, education and income level, age, insurance status, and previous experiences of sexual-orientation-related discrimination had been associated with cervical cancer screening rates in previous studies. Importantly, even among SMW with high levels of education and insurance, trust and open communication with providers remained important as a predictor of higher screening rates.

Waterman and Voss (2015) reviewed the literature with a focus on rates of cervical cancer screening among SMW. Based on literature published between 2000 and 2013, the authors found that lesbian women in the U.S. reported annual cervical cancer screening rates between 48% and 81% in various study samples. In 2010, the Centers for Disease Control and Prevention (CDC) reported of 83% screening in the general population of women (Centers for Disease Control and Prevention, 2012). The authors also noted that the majority of lesbian participants across all studies included in their review were white and college educated. This limitation is present in much of the literature regarding cancer screening among SMW, limiting the generalizability of findings.

Other work has documented correlates of cervical cancer screening in the general population or among heterosexual women. Plourde, Brown, Vigod, and Cobigo (2016) conducted a literature review to evaluate the “contextual factors associated with uptake of breast and cervical cancer screening” in the general population. The authors concluded that provider recommendations for Pap tests, high communication scores for provider,

and the presence of quality improvement programs at facilities were associated with receipt of Pap tests. An earlier literature review by Newmann and Garner (2005) demonstrated the existence of racial and socioeconomic disparities in cervical cancer screening rates, including conflicting evidence on the impact of race/ethnicity on cervical cancer screening. They also found that “socioeconomic deprivation,” measured differently across studies, was consistently associated with screening disparities. The only health care or provider-related factor they examined was provider gender, finding that women providers tended to report performing more cervical cancer screening than men. These findings emphasize how provider and health care related factors impact cervical cancer screening among SMW.

Materials and Methods

Literature search

Using the search terms described in Figure 1, we searched PubMed, CINAHL, and PsychInfo databases for research articles published between 2000 and 2017 that included measures of sexual orientation or behavior and cervical cancer screening. We included studies published since 2000 because previous reviews of this literature, published in 2008 and 2015, did not focus on factors related to health care experiences. The first author conducted the database search, reviewed article titles and abstracts for relevance, and reviewed all relevant articles.

Articles employing any study design were included if they: 1) were published in English between January, 2000 and March, 2017; 2) assessed sexual identity or the sex/gender of sexual partners of female participants; 3) included cervical cancer screening as a main outcome; and 4) sampled from residents of the U.S. We limited our

review to studies of U.S. populations because of both the specific sociopolitical environment related to sexual minority status as well as the unique structure of the U.S. health care system, which impacts access to preventive care. We excluded articles that 1) reported on non-US samples, 2) included HPV vaccination as an outcome but not HPV testing or Pap testing, or 3) were not data-based research reports (e.g., expert opinions, policy recommendations, editorials). Based on these criteria, a total of 21 articles were identified.

Data evaluation approach

We followed Torraco's (2005) guidelines for an integrative literature review on a new or emerging topic. These guidelines include conceptualizing the topic, clearly describing how the review was conducted, and critical analysis of the reviewed literature. This review technique is specifically useful for reconstructing a research topic with new conceptual understanding; in this case, we reconstruct the phenomenon of cervical cancer screening among SMW in the context of previous experiences with health and health care. We documented characteristics of each study including approach, sampling strategy and sample size, methods, major findings, and recommendations in Table 1. We also documented how authors defined and measured sexual orientation, cervical cancer screening, and any other aspects of experiences with health care. We synthesized the literature by outlining a recommended research agenda based on our findings (Torraco, 2005). Following these guidelines, we critiqued the literature by evaluating its strengths and contributions as well as deficiencies, omissions, inconsistencies, missing or incomplete aspects of the phenomenon, and populations that are poorly represented in the literature.

We first summarize studies in which no variables related to health care experiences besides cervical cancer screening were measured. We then summarize studies in which investigators measured health care experience factors but did not directly analyze them with respect to their cervical cancer screening outcome. Finally, we present summaries of study findings—both quantitative and qualitative—that included health care experience factors in the analyses of cervical cancer screening.

Results

Description of the Studies

Our search identified 135 articles for review. From these, a total of 20 studies, three qualitative and 17 quantitative, met all inclusion criteria (see Figure 1). Two articles reported findings from the same data set so we discuss findings from these as one study. Quantitative sample sizes ranged from 165 to 95,096; some samples included only SMW and some were population-based probability samples. All studies used participant self-report of Pap test for cervical cancer screening, though there was variation in how the studies defined their Pap test outcome. Measurement strategies for sexual orientation or sexual history also varied, as did variables related to health care experiences. Table 1 summarizes key aspects of each study, and Table 2 summarizes the health care experience variables found to be associated with cervical cancer screening in these studies.

Cervical Cancer Screening as the Only Health Care Experience Variable

Four studies did not include other measures of health care experiences besides cervical cancer screening. Three of these studies did not control for or report the impact of any factors other than sexual orientation on cervical cancer screening. Aaron and

colleagues (2001) collected data from 1,010 lesbian women in the Pittsburgh area and compared their findings to those from the CDC's 1998 Behavioral Risk Factor Surveillance System (BRFSS) study. Results showed no difference in whether participants had ever received a Pap test, but found that lesbian-identified women were less likely than women in the general population to have had a Pap test within the past 2 years. Two reports of the Boston Lesbian Health Project II (Grindel et al., 2006; S. J. Roberts et al., 2004) included rates of annual Pap testing in a sample of 1,139 lesbian-identified women across the U.S. In this sample 53% of participants reported having annual Pap tests; 60% of participants younger than 20 years had never had a Pap test (current guidelines recommend that screening begin at age 21; guidelines at the time of this study recommended that screening begin 3 years after sexual initiation or age 21) (ACS, 2015). McElroy, Wintemberg, and Williams (2015) used data from the 2011 Missouri County-Level Survey, which included 30,123 women who identified as heterosexual, lesbian, or bisexual. They found no sexual identity differences in ever having a Pap test or in the time since last Pap test.

Clark and colleagues (2009) measured demographic variables, but not health care experience variables. The authors analyzed data from the Cancer Screening Project for Women, a targeted and respondent driven sample of 603 legally unmarried women aged 40 to 75 years old in Rhode Island. They measured sexual orientation by asking participants about the genders of their sexual partners. After controlling for demographic characteristics, risk behaviors such as smoking and heavy alcohol use, family history of cancer, and number of reported barriers to screening, gender of participants' partners was not a significant predictor of screening.

Health Care Experience Variables Co-measured with Cervical Cancer Screening

Two further quantitative studies included variables related to health care experiences but did not analyze the impact of these variables on the relationship between any aspect of sexual orientation and screening. Nevertheless, findings from these studies are valuable because they reveal patterns in experiences with health and health care among SMW. Agénor, Austin, Kort, Austin, and Muzny (2016) surveyed women attending the Jefferson County Department of Health STD clinic in Birmingham, Alabama, 165 of whom reported having had sex with at least one female partner in the past year. The investigators included measures of both sexual identity and sexual behavior. Lesbian-identified women were less likely to have been screened for cervical cancer than bisexual women, and women with only female partners were less likely to have been screened than women with both male and female partners. One third of this sample had a previous abnormal Pap test, and only 6% was currently using hormonal contraception. Lesbian-identified participants were less likely than bisexual participants to have received a Pap test in the past 3 years, to have ever been pregnant, and to have ever been tested for HIV.

Marrazzo, Koutsky, Kiviat, Kuypers, and Stine (2001a) recruited a community-based sample of 248 women who have sex with women (WSW) in Seattle, Washington. Ten percent of study participants had been told by a provider that they did not need Pap tests because they were not sexually active with men. Participants also reported negative experiences with Pap tests and not knowing where to receive Pap testing as barriers to screening. The research team recruited WSW in Seattle, Washington through advertisements in community gathering places, newspaper and magazine articles, and

referral from clinicians in the community. The investigators also invited all participants' partners to enroll. They reported that "most" participants "responded to posted advertisements in community venues or were referred by a friend," though they only queried 80 of their total 248 participants about recruitment source, and couples made up 41% of the study sample. While these recruitment strategies are common among studies of SMW, this study included a high rate of recruitment from friend or partner referral and did not describe any steps used to prevent high recruitment from a single social group or community. These data, therefore, may be biased in unknown ways.

Health Care Experience Variables as Correlates of Cervical Cancer Screening

Quantitative studies. Ten studies included at least one health care experience factor in analyses of the relationship between sexual orientation and cervical cancer screening. Three of these studies' samples included SMW and heterosexual women. Using data from the 2006-2010 National Survey of Family Growth (NSFG) Agénor, Krieger, Austin, Haneuse, and Gottlieb (2014c) found that receiving STI counseling, testing, or treatment in the past year significantly increased the odds of past year Pap test across sexual orientation groups. Additionally, receiving contraception services in the past year significantly increased odds of past year Pap test among heterosexual and bisexual women, and ever being pregnant increased odds only among heterosexual women.

Charlton and colleagues (2014) analyzed data from the 2005 Growing Up Today Study (GUTS), a sample of 18-25-year-old women (N=3821) from a longitudinal cohort of U.S. adolescents who are the children of participants in the Nurses' Health Study II. After adjusting for sociodemographic factors, sexual history, constructs from the Health

Belief Model, and use of hormonal contraceptives, lesbian-identified participants were less likely to intend to get a Pap test in the next year compared to “completely heterosexual” participants. Together, less positive health beliefs and less hormonal contraceptive use explained 29% of the disparities in intention to get a Pap test and 42% of the disparities in Pap test utilization across sexual orientation groups.

Matthews, Brandenburg, Johnson, and Hughes (2004) analyzed a sample of 824 lesbian, heterosexual, and bisexual women in Chicago, New York, and Minneapolis/St. Paul. In this sample, being heterosexual increased the odds of both "routine" and annual cervical cancer screening. Across sexual orientation groups, not seeing a health care provider annually decreased the likelihood of ever having a Pap test, and having a history of an abnormal Pap test and annual health care visits increased odds of both "routine" and annual screening.

Boehmer, Miao, Linkletter and Clark (2012) combined data from the 2001, 2003, 2005 and 2007 California Health Interview Survey (CHIS) for a total of 95,096 women participants. They found that among participants younger than 50 years old, lesbian women had lower odds of receiving past-year Pap tests than heterosexual women, and both lesbian and bisexual women had greater odds of a past year emergency room visit than heterosexual women. However, neither prevalence of past year regular physician visits nor ever having colon cancer screening differed significantly across sexual orientation groups. When they controlled for health insurance status, bisexual women had higher rates of Pap tests and regular physician visits than heterosexual women. These investigators controlled for race, education level, household income, and nativity of participants but did not report the impact of these variables.

The remaining seven studies included samples of SMW only in their analysis of at least one health care experience factor. Reiter and McRee (2015) and Tracy, Schluterman, and Greenberg (2013) used samples from the “LGB Specialty Panel,” a panel of 30,000 lesbian, gay, and bisexual individuals who previously participated in a study conducted by Harris Interactive and who consented to be re-contacted for future research. Reiter and McRee (2015) evaluated rates of screening in the previous 3 years among 418 lesbian and bisexual women aged 21 to 26. Participants who had not been screened were asked why, and lack of provider recommendation was a frequently cited reason (13%). Having a recent “routine checkup,” having had at least one dose of the HPV vaccine, and having disclosed sexual orientation to healthcare providers each increased the odds of having been screened. Tracy, Schluterman, and Greenberg (2013) used the health belief model to test perceived risk, benefits and barriers to screening, and screening practices among 1,006 lesbian women. Non-routine screeners reported lack of physician referral, not having a doctor, and lack of insurance as the top three reasons for not having routine screening. Correlates to screening included disclosing sexual orientation to providers and receiving a provider recommendation for Pap testing.

Youatt and colleagues (2017) conducted a web-based survey of young lesbian/gay, bisexual, and “other” nonheterosexual women (ages 21-24). The authors recruited young women via promotions in online and in-person LGBTQ groups and organizations and through Facebook advertising. They examined the impact of disclosure of one’s sexual orientation identity (or being “out”) to physicians on use of preventive sexual health services including Pap testing, STI testing, and HPV vaccination. In univariate regressions, being out to one’s provider, “other” nonheterosexual identity,

white race, Hispanic/Latina ethnicity, health insurance, younger age of sexual onset, and more lifetime male sexual partners were associated with higher rates of Pap testing. In the multivariate regression analysis, being out to one's provider, lesbian identity, white race, and increasing numbers of male sexual partners were associated with higher rates of Pap testing. Being out to providers was also significantly associated with HPV vaccination but not with STI testing in multivariate models. The authors did not test relationships between STI testing, Pap testing, and HPV vaccination.

Two studies used print media to recruit samples of SMW. In 2000, Diamant, Schuster, and Lever included surveys in mailed copies of *The Advocate Magazine*, a national gay and lesbian magazine. They analyzed data from 6,935 lesbians in the U.S. who completed and returned surveys. Having a regular provider or site for medical care and disclosing sexual orientation to providers were associated with Pap testing within the past 2 years (Diamant, Schuster, & Lever, 2000b). A decade later Tracy, Lydecker, and Ireland (2010) recruited lesbians through advertisements in Baltimore-area newspapers and magazines that targeted sexual minority communities. They found that nonroutine screeners perceived greater sexual orientation-related discrimination in health care than routine screeners.

Johnson, Mueller, Eliason, Stuart, and Nemeth (2016a) recruited 226 lesbian and bisexual women and "transgender people with a cervix" for participation in an online survey. Analyses found that various health care experience factors were significant in predicting routine Pap testing in univariate models, including feeling welcomed in health care settings, good experiences with previous Pap tests, being out to providers, and less perceived discrimination in health care. In multivariate analyses, recommendation for Pap

test from a provider and satisfaction with one's health care provider were associated with routine screening, and experiences of discrimination based on gender expression were associated with nonroutine screening. Finally, Eaton and colleagues (2008b) recruited 275 women at a gay pride festival in Atlanta, Georgia and measured perceived prevalence and risks for human papillomavirus (HPV) infection as well as cervical cancer screening practices. Having a previous abnormal Pap test was associated with a greater total number of Pap smears over the lifetime but was not associated with increased odds of past year Pap testing.

Qualitative studies. All three qualitative studies examined the experiences of SMW seeking and receiving cervical cancer screening. In each of these studies, themes related to health care experiences emerged from the data. Johnson, Nemeth, Mueller, Eliason, and Stuart (2016) interviewed 20 lesbian or bisexual women or transgender people with a cervix. Themes related to health care experiences included experiences of stigma or unsafe health care environments, not having a regular primary care provider, and being dissatisfied with previous health care or providers. Two of these studies were of high quality, providing detailed descriptions of data collection, analysis, and reporting processes, and thick description of findings with meaningful examples from participants. The third qualitative study (Johnson et al., 2016) did not identify a qualitative approach or describe the data analysis process in sufficient detail. Additionally, only a single investigator coded, or analyzed, the qualitative data.

Agénor, Bailey, Krieger, Austin, and Gottlieb (2015a) recruited 18 African-American lesbian, bisexual, and queer women to participate in four focus groups in Boston and Cambridge, Massachusetts. The most salient theme emerging from these data

was patient-provider communication. This theme included four sub-themes, all related to previous experiences in health care. The health care provider's "style and demeanor;" encountering heteronormative assumptions in care; experiencing heterosexism, racism, and classism in health care; and the provider's own professional and socio-demographic background were each important factors identified by participants as facilitating or impeding cervical cancer screening. Finally, Clark, Bonacore, Wright, Armstrong, and Rakowski (2003) conducted four focus groups with "women who partner with women" and "women who partner with men" in their Cancer Screening Project for Women study. These data indicated that lack of acknowledgment of sexual orientation identity and relationships, fear of discrimination in healthcare settings, and nonconforming gender expression or identity among study participants were barriers to screening. Participants shared that better relationships with providers, including explicit inquiry and acknowledgment of their relationships and identity, would increase their use of screening services.

Discussion

Trends in the Data

Four of the 20 studies included in this review did not include any health care experience factors besides cervical cancer screening itself. Those studies aimed to document rates of screening among SMW and to compare them with rates among women in the general population. Evidence of significant disparities in screening based on sexual orientation continues to be mixed, with two studies finding no difference between SMW and heterosexual women (Clark et al., 2009; McElroy et al., 2015) and two finding some

sexual-orientation-related disparity (Aaron et al., 2001; Grindel et al., 2006; S. J. Roberts, 2015).

The evidence does suggest, however, that there are significant variations in the correlate to screening within the SMW population. For example, three studies found that bisexual women and women with both male and female partners reported higher rates of Pap testing than lesbian women and women who reported only female sex partners (Agénor et al., 2016; Charlton et al., 2014; Marrazzo et al., 2001a). SMW who had disclosed their sexual orientation to their providers overwhelmingly had better screening rates (Clark et al., 2003; Diamant et al., 2000b; P. L. Reiter & McRee, 2015; Tracy et al., 2013). However, this finding should be interpreted carefully as many SMW continue to experience and fear discrimination from providers based on their minority sexual identity. One study in this review also suggested that some providers still misunderstand SMW's need for cervical cancer screening (Marrazzo et al., 2001a). However, this study was published over 15 years ago and therefore may not represent current knowledge of SMW's health care needs among providers.

Previous studies have demonstrated that provider recommendations, good communication, and comfort with providers are associated with increased screening rates in the general population (Newmann & Garner, 2005; Plourde et al., 2016). This review suggests that the same factors are associated with screening among SMW. Additionally, high proportions of SMW have experienced or fear discrimination from health care providers, compromising their ability to communicate effectively with providers (Calabrese, Meyer, Overstreet, Haile, & Hansen, 2015; Institute of Medicine, 2011; Mattocks et al., 2015; Thorburn & Bogart, 2005). That sexual minority women also

report lower rates of those health care factors that have been shown to increase screening, such as hormonal contraception, pregnancy related care, and other SRH services, is of particular importance. Given that SMW may be less likely to have had these experiences, they may also experience fewer opportunities to be offered cervical cancer screening (Agénor et al., 2016; Agénor et al., 2014c; P. L. Reiter & McRee, 2015).

Overall Quality of the Literature

Studies included in this review were generally of high quality given the sampling challenges in research with sexual minorities (Institute of Medicine, 2011). However, some studies did not describe their sampling strategy thoroughly or used convenience samples. This resulted in relatively homogenous samples; participants were overwhelmingly white and well educated except where specific strategies were used to recruit either exclusively African American participants (Agénor et al., 2016; Agénor, Potter, & Austin, 2015) or racially/ ethnically diverse sample (Matthews et al., 2004; P. L. Reiter & McRee, 2015). Ten out of the 17 quantitative studies included samples that were more than 75% white. Given the ubiquitous effects of minority race and ethnicity on health care access and outcomes in the U.S. (Smedley, Stith, & Nelson, 2003; Williams, Priest, & Anderson, 2016; Williams & Purdie-Vaughns, 2016) there is very little evidence that can be generalized to nonwhite SMW.

Seven studies used state-level data that included either participants' sexual identity or gender of sexual partners. Most investigators acknowledged that their samples were not nationally representative. Only two of these studies discussed the specific state-level policies that may have affected health care experiences and resources for SMW in those states (Clark et al., 2009; McElroy et al., 2015). Also of concern is the fact that

many of the studies in this review collected data more than 10 years ago. The social position of sexual minorities has been rapidly changing over the previous several decades, and these rapid changes may have important effects on experiences in health care and health outcomes among sexual minority communities (Gates, 2013).

Limitations of this Review

Several limitations of this review should be noted. First, we may not have identified all previously published literature on health care experiences including cervical cancer screening among SMW. The major foci of this review, including SMW, cervical cancer screening, and health care experiences, are all broad concepts that may be referred to or indexed in various ways by different authors. In all three databases we used a broad array of search terms in order to mitigate this possibility (e.g. “lesbian,” “gay,” “bisexual,” “sexual minorit*,” “LGBT,” and “queer”), but there may be existing research that used other terminology and therefore was not identified in our search. Additionally, we only searched three databases for publications. While these are the most likely to include relevant literature, there may be existing research that are not available through PubMed, CINAHL, or PsychInfo databases.

Second, we limited inclusion to studies of U.S. populations. While the context of the U.S. health care system is important for understanding experiences of health care, the social context of having a minority sexual identity may be similar in other countries. This international literature may include some relevant findings but was excluded from this analysis. Finally, the integrative review method used does not include extracting and aggregating the data used in previous studies as would a meta-analysis. Meta-analysis techniques may be especially valuable when reviewing existing literature on this

relatively hard to reach population (Institute of Medicine, 2011), especially because many of the studies included in this review analyzed state-level data which could be combined for a more representative sample of SMW. However, inconsistencies in measuring sexual orientation, identity, and behavior, as well as measurement strategies for cervical cancer screening, would compromise these comparisons and these techniques are not employed in the integrative review methods used here.

Gaps in the Literature and Recommended Research Agenda

The results of this review provide preliminary evidence that variables related to experiences in health care are important in predicting SMW's use of cervical cancer screening services. However, several important gaps in the literature remain. First, investigators must make more concerted efforts to recruit samples that are more diverse in terms of specific sexual orientation and gender of sexual partners as well as race, ethnicity, education levels, income, immigration status, and other factors. SMW who are also members of other marginalized groups are likely to face unique challenges in seeking health care and may be subject to more social and economic consequences related to their sexual orientation (Bowleg et al., 2003; Bradford & van Wagenen, 2012; Moore, 2012).

Additionally, pregnancy and childbearing history and its impact on future health care utilization has not been adequately studied in this population. Since reproductive planning and pregnancy-related care is an important point of entry into health care for many women (Agénor et al., 2014c), it represents an important opportunity to recommend and facilitate cervical cancer screening and other preventive care for SMW who have otherwise avoided health care.

Third, future studies should examine the types of practice and practice characteristics where SMW seek care. This review points to the importance of open communication with providers and feelings of safety within health care settings in promoting cancer screening among SMW. Little is known about where SMW seek care and what specific characteristics of providers and health care settings improve SMW's experiences in care. Many urban cities have clinics specifically targeted to sexual and gender minority populations and these clinics are typically characterized by models of care that actively value the experiences and points of view of these communities (McClain et al., 2016). Sexual minority women who reside in more rural communities may not have access to these population-targeted clinics. However, there is scarce literature about SMW seeking care at these clinics versus more general practices, or how SMW make decisions about where to seek care.

Finally, all studies in this review used cross-sectional designs to understand cervical cancer screening practices among SMW. In addition, although some studies evaluated "routine" screening or counts of Pap tests over time, they tended to rely on self-report and therefore findings may be impacted by recall bias. Longitudinal studies would help identify more clearly how aging, significant life events, relationship changes, and other factors influence SMW's use of cervical cancer screening and other preventive care across the lifespan.

Figure 1. Flowchart of study selection process.

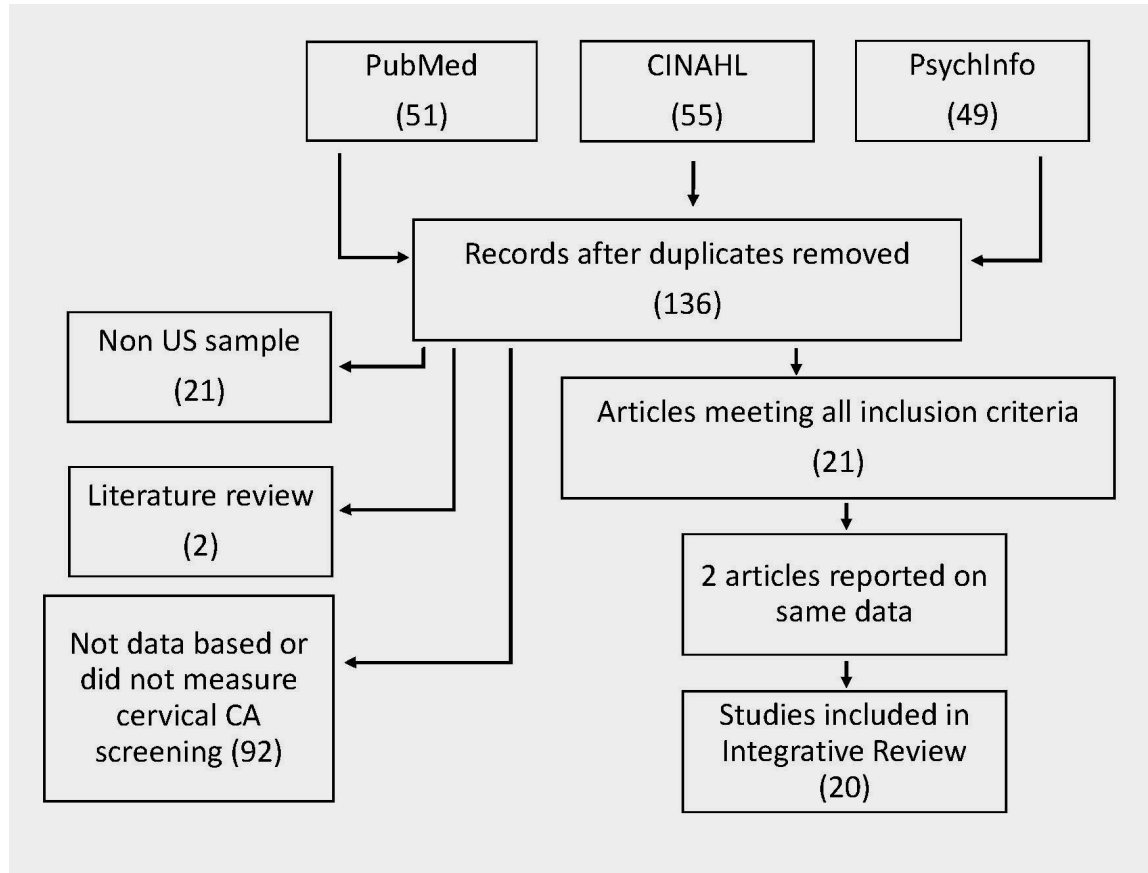


Table 1. Summary of Studies Included in Review. Studies measure factors associated with cervical cancer screening among SMW, focusing on health care utilization related factors.

Author, Year	Title	Design and Sample	Sexuality Variable	Screening Variable	Quality Evaluation	SO/Demographic Variables of Significance	Utilization Variables Measured
Cervical Cancer Screening as the Only Health Care Experience Variable							
Aaron, Markovic, Danielson, Honnold, Janosky, & Schmidt, 2001	Behavioral risk factors for disease and preventive health practices among lesbians.	Lesbian women in Pittsburgh area using "a variety" of sampling techniques (N=1,010); quant survey compared to CDC's 1998 Behavioral Risk Factor Surveillance System (BRFSS) results.	Identity: Homosexual; lesbian; gay	Ever pap test; Within past 2 years pap test	89% white, well-educated sample. Unclear sampling techniques.	No difference in ever pap test, lesbian women less likely to have Pap test within past 2 years than BRFSS participants.	None
Clark, Rogers, Armstrong, Rakowski, Bowen, Hughes, & McGarry, 2009	Comprehensive cancer screening among unmarried women aged 40-75 years: Results from the cancer screening project for women.	Targeted and respondent driven sampling of legally unmarried women in Rhode Island Women ages 40-75 years old (N=603)	Combined items to WPW and WPM.	"On time" screening = at least 2 pap tests ever, ≤3yrs since most recent pap test, and <3 years between two most recent tests	Sexuality groups convoluted; no power to test for differences between women who partner with women and men vs. with women only. RI is not generalizable to U.S.	Controlled for demographics, health behaviors, first-degree relatives with cancer, and number of reported barriers to screening: no differences across gender of partners.	None

Grindel, McGehee, Patsdaughter, & Roberts, 2006	Cancer prevention and screening behaviors in lesbians.	Snowball sample of 1,139 lesbians in U.S. Quant survey.	Only lesbians included (no variable).	Frequency of Pap test: never; more than q5 years; q3-5 years; q2 years; q1 year, q3-6 months	Frequency of Pap test measure does not allow for changes over the lifespan. Only sampled lesbians, no data on sexual history, 74% white.	None	None
Roberts, Patsdaughter, Grindel, & Tarmina, 2004	Health related behaviors and cancer screening of lesbians: Results of the Boston lesbian health project II.		Only lesbians included (no variable)	Time since last Pap test: <1 year; 1-2 years; 3-4 years; >4 years; never.		Group younger than 20 years old had 60% never rate, group 20-29 years old had 10% never rate.	None
McElroy, Wintemberg, & Williams, 2015	Comparison of lesbian and bisexual women to heterosexual women's screening prevalence for breast, cervical, and colorectal cancer in Missouri.	Telephone survey of Missouri women (N=30,123).	Lesbian; Bisexual; Heterosexual	Ever Pap test. Time since last Pap test: within previous 2 years; more than 2 years ago.	88.6-92.8% white sample. "Other" sexualities reported but excluded.	None (no difference in screening rates by SO)	None

Health Care Experience Variables Co-measured with Cervical Cancer Screening							
Agénor, Austin, Kort, Austin, & Muzny, 2016	Sexual orientation and sexual and reproductive health among African American sexual minority women in the U.S. south.	Women attending Jefferson County Department of Health Sexually Transmitted Disease clinic in Birmingham, AL who reported sex with at least one female partner in past year (N=165)	SO: lesbian; bisexual; heterosexual; questioning; unsure (only analyzed lesbian, bisexual). Behavior in past year: female only; male only; both.	Pap test within past 3 years	Thorough SO and behavior measures, focused on under-studied population	Lesbian women less likely to report screening than bisexual women. Women with only female partners less likely to report screening than women with male and female partners.	Bisexual women more likely to have been pregnant (71% vs 42%). 6% overall were currently using hormonal contraceptives. Bisexual women more likely to have been HIV tested (99% vs 87%).
Marrazzo, Koutsky, Kiviat, Kuypers, & Stine, 2001	Papanicolaou test screening and prevalence of genital human papillomavirus among women who have sex with women.	Community sample of women reporting sex with ≥ 1 woman in past year. from Seattle, WA (N=248)	Ever sex with male partner. Past year sex with male partner. Number of male and female sex partners.	Never Pap test. Number of Paps in past 5 years. Time since last Pap. Age at first Pap. Any abnormal Pap.	Did not measure SO. Did not control for demographics. Mostly coupled, white, well-educated sample.	Never sex with men less likely to have ever Pap test, had fewer Paps in past 5 years, longer time interval between last Paps, and older age at first Pap. Reasons for not being screened were no insurance and belief that they did not need Paps if not sexually active with men.	No analysis of other predictors of Paps. 10% were told by providers that they did not need Paps. Reasons for not getting screened including previous negative experiences with Paps and not knowing where to get one.

Health Care Experience Variables as Correlates of Cervical Cancer Screening							
Quantitative Studies							
Agénor, Krieger, Austin, Haneuse, & Gottlieb, 2014	Sexual orientation disparities in Papanicolaou test use among US women: The role of sexual and reproductive health services.	2006-2010 NSFG data (N=9,581 women aged 21 to 44)	SO: heterosexual; bisexual; lesbian. Sex of sexual partners in past year: male only; female only; both; none.	Pap test in past 12 months	Large nationally representative sample, some racial diversity (61% white), nuanced SO measures.	Black race, <high school educational attainment, all incomes lower than 300% of federal poverty level, being uninsured all associated with lower odds of pap testing.	Past year contraception services (among hetero and bi women), past year STI counseling, testing, or treatment (among all women), ever pregnant (among heterosexual women) all associated with higher odds of Pap testing.
Charlton, Corliss, Missmer, Frazier, Rosario, Kahn, J. & Austin, 2014	Influence of hormonal contraceptive use and health beliefs on sexual orientation disparities in Papanicolaou test use.	18-25-year-old women in the 2005 Growing Up Today Study (GUTS) data (N=3,821). GUTS is a longitudinal cohort of US adolescents who are the children of NHS II participants.	From sexual identity and gender of sex partners, created 5 categories: Completely heterosexual with no same sex contact; completely heterosexual with same-sex contact; mostly heterosexual; bisexual; lesbian.	Pap test intention (5 point Likert scale from extremely likely to extremely unlikely). Past year Pap test.	Large, nationally representative sample, used multi-level measure of SO. 93% white sample, 94% hetero or "mostly hetero," all children of nurses who may have higher health care use.	Controlling for demographics, sexual history, Health Belief Model constructs, and hormonal contraceptive use, lesbians less likely to intend to get a Pap test in the next year compared to heterosexuals. Less positive beliefs and less hormonal contraceptive use explained some of disparity in Pap test intention and Pap test utilization.	Hormonal contraception use (did not report regression coefficient but lesbians were less likely to have used it).

Matthews, Brandenburg, Johnson, & Hughes, 2004	Correlates of underutilization of gynecological cancer screening among lesbian and heterosexual women.	Multisite Women's Health Study. Snowball/convenience sample of women in Chicago, New York, and Minneapolis/St. Paul (N=824).	Items about sexual attraction and past year behavior: collapsed into lesbian; heterosexual; bisexual.	"Adherers" =annual; "Routine" =q3yrs; "Never" =never	Did not describe sampling techniques clearly. Relatively diverse sample.	Younger, lower income decreased likelihood of ever Pap test. Heterosexual women had increased odds of "routine" and annual screening.	Not seeing a provider annually decreased odds of ever screening. History of abnormal Pap and annual provider visits increased odds of "routine" and annual screening.
Boehmer, Miao, Linkletter, & Clark, 2012	Adult health behaviors over the life course by sexual orientation.	California Health Interview Survey from 2001, 2003, 2005 and 2007. Quant surveys (N= 95,096 women)	Heterosexual; Gay; Lesbian; Bisexual	Cervical cancer screening in past year.	Large sample, only representing CA. ~50% white.	Controlling for race, education, household income, and nativity, lesbian women had lower odds of past year Pap tests.	Past year ED visit (lesbian and bisexual women had greater odds than hetero women). Past year physician visits and ever colon cancer screening did not differ across SO groups.
Diamant, Schuster, & Lever, 2000	Receipt of preventive health care services by lesbians.	Survey printed in copies of The Advocate Magazine, lesbians from US included in this analysis (N=6,935)	Only lesbians included (no variable)	Pap test within 1 and 2 years	Large sample but 88% white. Only included lesbian-identified women.	Age ≥ 50 , graduate or professional school, annual income $> \$50,000$, history of vaginal intercourse without protection, history of at least one STD were associated with past 2 years Pap test.	Having regular provider or site for medical care, disclosing SO to provider were associated with pap test within past 2 years.

Eaton, Kalichman, Cain, Cherry, Pope, Fuhrel, & Kaufman, 2008	Perceived prevalence and risks for human papillomavirus (HPV) infection among women who have sex with women.	Women who reported sex with ≥ 1 woman in past year approached at a “gay pride festival” in Atlanta (N=275). Quant survey.	Heterosexual; Bisexual; Gay	Ever pap test. Pap test within past year. Total number of Pap tests.	SO and behavior measures may obscure differences.	Perceived HPV prevalence mediated association between HPV risk perception and history of abnormal Pap. History of abnormal Pap moderated relationship between perceived risk and prevalence.	Previous abnormal Pap smear increased total number of lifetime Pap smears.
Johnson, Mueller, Eliason, Stuart, & Nemeth, 2016	Quantitative and mixed analyses to identify factors that affect cervical cancer screening uptake among lesbian and bisexual women and transgender men.	Convenience sample of lesbian and bisexual women and transgender men via web questionnaire (N=226)	Lesbian woman; Bisexual woman; Transgender person “with a cervix” (did not disaggregate in analyses)	“Routine” = Pap test in past three years. “Nonroutine” = >3 years since last Pap test.	Most participants were routine screeners, white, college educated, urban, employed, insured, married or partnered, and had incomes $> \$50,000$.	In multivariate model, health insurance and knowledge about cervical cancer screening recommendations distinguished between routine and nonroutine screeners.	In multivariate model, provider recommended Pap test, discrimination based on gender expression, and satisfaction with health care provider distinguished between routine and nonroutine screeners.
Reiter & McCree, 2015	Cervical Cancer Screening (Pap Testing) Behaviours and Acceptability of Human Papilloma Virus	Lesbian and bisexual women ages 21-26 from the LGB specialty panel of Harris Interactive (N=418)	Lesbian; Bisexual	Pap test within last 3 years	Large bisexual sample.	Reasons for not getting Pap test including cost, embarrassment, believing it was not necessary. Older age and	Reasons for not getting Pap test including lack of provider recommendation. Having a routine checkup, having had at least one dose of HPV

	Self-Testing Among Lesbian and Bisexual Women Aged 21-26 Years in the USA					health insurance, increased odds of Pap test. Hispanic identity decreased odds.	vaccine, disclosed SO to healthcare provider all increased odds of having been screened.
Tracy, Lydecker, & Ireland, 2010	Barriers to cervical cancer screening among lesbians.	Lesbian women in Baltimore area recruited by LGBT magazine distribution (N=225). Quant survey.	All lesbian women (no variable).	"Routine" = Pap test in past 24 months. "Nonroutine" = no Pap test in past 24 months	Convenience sample from magazine distribution, mostly white, high education levels. Only included lesbian women.	Nonroutine screeners perceived greater susceptibility to cervical cancer, more barriers and fewer benefits to screening, and were less knowledgeable about screening guidelines than routine screeners. After controlling for age, race, and education, only knowledge, benefits, and barriers remained significant.	Nonroutine screeners reported greater healthcare discrimination related to SO.
Tracy, Schluterman, & Greenberg, 2013	Understanding cervical cancer screening among lesbians: A national survey.	Lesbian women ages 21-26 from the LGB specialty panel of Harris Interactive (N=1,006)	Only "gay" or "lesbian" included (not a variable)	"Routine" =21–30 yrs. old with past year Pap test or if they were ≥30 yrs. old with Pap test within the past 24	Large national sample but largely white. Only included people who self-identified as gay or lesbian.	Routine screeners were more likely to have graduated college, working full-time, married or living with a partner, report an income over \$50,000, and have	Non-routine screeners cited lack of physician referral, not having a doctor, lack of insurance as top three reasons. Correlates to screening including being out to providers, providers recommending Paps.

				months.		health insurance than non-routine screeners. Correlates to screening including thinking of not getting Paps as a risk factor, more perceived benefits and fewer barriers.	
Youatt, Harris, Harper, Janz, & Bauermeister, 2017	Sexual Health Care Services Among Young Adult Sexual Minority Women.	Web-based survey through online LGBTQ list serves, flyers in gay friendly venues and organizations, Facebook advertisements (N=285)	Lesbian; bisexual; other non-heterosexual identities	Ever Pap test	Largely white, well-educated, urban sample. Asked nuanced SO/behavior items and disclosure item.	White race, health insurance, and higher number of male sex partners were associated with Pap test use. Black and other race, bisexual and other SO decreased odds of receiving Pap test.	Being out to provider was associated with Pap test use. Recent health care and regular provider were not significant in the multivariate model.
Qualitative Studies							
Agénor, Bailey, Krieger, Austin, & Gottlieb, 2015	Exploring the cervical cancer screening experiences of Black lesbian, bisexual, and queer women: The role of patient-provider communication.	Purposive sampling, four focus groups of 18 Black lesbian, bisexual, and queer women in Boston and Cambridge. Qualitative descriptive study with thematic analysis by inductive and deductive coding.	Lesbian; Bisexual; Queer	Defined qualitatively	Named approach and method, rich description of analysis, double coding and discussion of rigor.	Participants balanced wanting to avoid Paps because of discomfort with knowing they were receiving lower quality care.	Major theme was patient-provider communication including provider style and demeanor; heteronormative assumptions; heterosexism, racism, classism; provider background.

Clark, Bonacore, Wright, Armstrong, & Rakowski, 2003	The Cancer Screening Project for Women: Experiences of women who partner with women and women who partner with men.	4 focus groups of a total of 28 WPW and WPM (no women who partnered with both men and women agreed to participate). Qualitative analysis of constructs.	WPW; WPM	Defined qualitatively	No women who partner with men and women. Did not evaluate screening practices. Did not identify qualitative approach, method, or analysis techniques in detail.	Barriers to screening including pain, body image/negative reactions to bodies by technicians or providers.	Barriers to screening including lack of SO identity acknowledgment, fears of discrimination about gender identity, lack of insurance. Better relationships with providers and better inquiry about relationships would increase screening.
Johnson, Nemeth, Mueller, Eliason, & Stuart, 2016	Qualitative study of cervical cancer screening among lesbian and bisexual women and transgender men.	Convenience sample (N=20) of LBQ women (16) and transgender men (4) via web questionnaire and phone interview. Qualitative inquiry with inductive and deductive content analysis.	"Females between the ages of 21 and 65 who identified with a SO other than heterosexual and transgender people with a cervix"	"Routine" = Pap within past 3 years	Did not name qualitative approach, no double coding, poor description of analysis techniques. Combined transgender men and LGB women.	Themes included: "contextual characteristics" (stigma and safety of health care environment), "individual characteristics" (knowledge, peer support, distrust in healthcare, insurance, SES, and regular PCP), "health behaviors" (provider behavior and competence), and "outcomes" (completion and results of pap test, health maintenance, cancer diagnosis, and satisfaction with care).	

Note. Abbreviations are defined as follows: sexual orientation (SO); primary care provider (PCP); lesbian, gay, bisexual, transgender, and queer (LGBTQ); women who partner with women (WPW); women who partner with men (WPM).

Table 2. Summary of Health Care Experience Factors in Reviewed Studies.

Health Experience Factor	Studies
Use of contraception	Agénor et al, 2016 Agénor et al, 2014 Charlton et al, 2014
History of pregnancy	Agénor et al, 2016 Agénor et al, 2014
Any STI treatment/counseling	Agénor et al, 2014
Having a regular provider or annual visits	Diamant, Schuster, & Lever, 2000 Matthews et al, 2004 Reiter & McRee, 2015 Tracy et al, 2013
Provider recommended Pap test	Marrazzo et al, 2001 Johnson et al, 2016b Reiter & McRee, 2015 Tracy et al, 2013
Communication/relationship with provider	Agénor et al, 2015 Clark et al, 2003 Johnson et al, 2016b
Disclosed sexual orientation to provider	Clark et al, 2003 Diamant, Schuster, & Lever, 2000 Reiter & McRee, 2015 Tracy et al, 2013
History of abnormal Pap test	Eaton et al, 2008 Johnson et al, 2016a Matthews et al, 2004
Received HPV vaccine	Reiter & McRee, 2015
Previous discrimination or unsafety in health care	Agénor et al, 2015 Clark et al, 2003 Johnson et al, 2016a Johnson et al, 2016b
Not knowing where to go	Marrazzo et al, 2001
Previous good or bad Pap test experiences	Johnson et al, 2016b Marrazzo et al, 2001 Tracy et al, 2010

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CHAPTER 3:
ASSOCIATION OF OBSTETRIC HISTORY AND CERVICAL CANCER
SCREENING IN A COMMUNITY SAMPLE OF SEXUAL MINORITY WOMEN

Introduction

While cervical cancer was once the leading cause of death among women in the United States, the development of the Papanicolaou test (Pap test) has decreased cervical cancer mortality by 50% since the 1930's and represents one of the 20th century's greatest public health achievements (NIH, 1996). Based on the United States Preventive Services Task Force (USPSTF) recommendations, all people with a cervix are at risk for cervical cancer and thus should be screened regardless of sexual history, sexual orientation, or gender identity (USPSTF, 2012). However, little is known about how screening rates may vary across sexual orientation groups, and what correlates might lead to screening among sexual minority women (SMW), or those who identify as lesbian, gay, bisexual, or other nonheterosexual identities.

Sexual minority women face various health-related disparities compared to the general population, including lower access to and utilization of health care services due to personal and structural barriers to seeking care (Cochran, 2001; Institute of Medicine, 2011; Ponce, Cochran, Pizer, & Mays, 2010). Several studies have shown that some groups of SMW report lower rates of cervical cancer screening than their heterosexual counterparts (Agénor et al., 2014a; Agénor et al., 2014b; Charlton et al., 2011; Charlton et al., 2014; Institute of Medicine, 2011) as well as lower rates of STI testing (Bauer & Welles, 2001; McCauley et al., 2015b; Mullinax et al., 2016). The mechanisms driving these disparities are not well understood, although some research suggests that both providers and SMW may believe they are not susceptible to HPV or other STIs because they are not having sex with men (Charlton et al., 2014; Eaton et al., 2008a; Tracy et al., 2010; Tracy et al., 2013). However, this research tends to overlook the experiences of

bisexual women, and research demonstrates that most lesbian women have had sexual encounters with men (Diamant, Schuster, McGuigan, & Lever, 1999; Mustanski et al., 2013). HPV has also been shown to be transmissible between female partners (Anderson et al., 2014; Moszynski, 2009). In fact, SMW may be at an increased risk for cervical cancer compared to their heterosexual peers, as some risk factors tend to aggregate in this population including earlier age at sexual debut, lower rates of oral contraceptive use, and higher rates of smoking (Brown & Tracy, 2008b).

Additionally, “cues to screening” common for heterosexual women may be missing in SMW populations (Agénor et al., 2016; Agénor et al., 2014b; Eaton et al., 2008a; Johnson et al., 2016a; P. L. Reiter & McRee, 2015). These cues may include the seeking and receipt of other types of sexual and reproductive health care, such as hormonal contraceptives, pregnancy or termination care, and fertility services. Sexual minority women may have experienced pregnancy under various circumstances, including the use of assistive reproductive technologies (ARTs) (Bos, van Balen, & van den Boom, 2003; Chabot & Ames, 2004; Marina et al., 2010), consensual sexual intercourse with males, or as the result of sexual assault and rape, for which SMW may be at increased risk (Friedman et al., 2011).

Aims and Hypotheses

This study aimed to examine the association between obstetric history and two sexual health screening outcomes (cervical cancer screening within the previous year and STI testing within the previous 5 years) in a community sample of SMW in the Midwestern U.S. We will account for relevant potential covariates including variables related to demographics, socioeconomic status, sexual minority status, sexual history, and

other prognostic indicators for multiple health outcomes. We hypothesize that SMW who have sought care for other sexual and reproductive health needs including pregnancy-related care may have had more opportunities to seek or be offered cervical cancer screening. Therefore, obstetric history may be important in predicting which groups of SMW report recent screening. As a secondary aim for comparison, we examine associations between obstetric history and STI testing among the same sample.

In this study obstetric history is defined as an individual's gravida (total number of pregnancies), parity (total number of live births), history of any unplanned pregnancies, and history of elective termination as four distinct variables. Screening refers to the "identification of unrecognized disease or defects by means of tests, examinations, or other procedures that can be applied rapidly" (WHO, 2016).

Literature Review

Many studies have examined what factors are associated with cervical cancer screening in the general population of women. In a literature review, Newmann and Garner (2005) found conflicting evidence on the impact of race and ethnicity on cervical cancer screening, with White women more likely to report that they have regular access to primary health care, but Black women more likely to report cervical cancer screening specifically. They also found that "socioeconomic deprivation," while measured differently across studies, was consistently associated with screening disparities. The investigators also found that providers who were women tended to report performing more Pap tests than providers who were men. Most of the studies in their review explained this difference as a component of communication and comfort level with providers (Newmann & Garner, 2005).

More recent studies have confirmed these patterns. For example, Doescher and Jackson (2009) examined data from the 1994 and 2004 Behavioral Risk Factor Surveillance System (BRFSS) for urban-rural differences in Pap testing. In their analysis, they confirmed several well-known risk factors for missing screening, such as low socioeconomic status (SES) and advanced age. There was no significant difference in rates between urban and rural women when accounting for sociodemographic variables. However, for some groups, such as those with low educational attainment, rural disparities were pronounced (Doescher & Jackson, 2009). In another study of 2012 BRFSS data, being non-Hispanic White, Hispanic or Latino, Asian, Native Hawaiian or Other Pacific Islander, between younger than 44 or over 75 years old, having less than a high school education and an annual household income of less than a \$25,000, having never married, and residing in the Western U.S. reduced the likelihood of reporting ever having a Pap test (Miles-Richardson, Allen, Claridy, Booker, & Gerbi, 2017). More recently, Plourde, Brown, Vigod, and Cobigo (2016) conducted a literature review to evaluate the “contextual factors associated with uptake of breast and cervical cancer screening” in the general population. The authors concluded that provider recommendations for Pap tests, high communication scores for provider, and the presence of quality improvement programs at facilities were associated with receipt of Pap tests.

Fewer studies have examined correlates of screening among SMW, though some studies have demonstrated similar trends among SMW. Low socioeconomic status has been shown to be associated with low rates of cervical cancer screening (SES). While few studies have had sufficiently diverse samples to analyze the impact of race and

ethnicity on cervical cancer screening among SMW, one study found that Black race decreased rates of screening among SMW (Agénor et al., 2014b), and in a qualitative study of Black lesbian, bisexual, and queer women participants reported that encountering both heterosexism and racism in clinical encounters were significant barriers to returning for screening (Agénor et al., 2015a). Most studies of SMW use samples that are largely white, well educated, and predominantly coupled and lesbian-identified (Institute of Medicine, 2011). Fewer studies have examined bisexual women and racial and ethnic minority SMW (Bostwick et al., 2014).

Factors related to health care experiences have also been shown to impact cervical cancer screening among SMW. Studies have found that having a regular health care provider (Diamant et al., 2000a; Matthews et al., 2004; P. L. Reiter & McRee, 2015; Tracy et al., 2013), provider recommendation for Pap testing (Johnson et al., 2016a; Marrazzo et al., 2001a; P. L. Reiter & McRee, 2015; Tracy et al., 2013), and effective communication with health care providers (Agénor et al., 2015; Clark et al., 2003; Johnson et al., 2016a) may be associated with higher rates of cervical cancer screening among SMW. Disclosing one's sexual minority identity, or "coming out" to health care providers, has also been associated with higher rates of screening (Clark et al., 2003; Diamant et al., 2000a; P. L. Reiter & McRee, 2015; Tracy et al., 2013).

Methods

Sample and Procedures

We performed a secondary analysis of cross-sectional data from the third wave of the Chicago Health and Life Experiences of Women (CHLEW) Study, a 3-wave, 17-year, longitudinal cohort study of adult SMW in the Chicago area (collected between 2010 and

2012). CHLEW participants were initially recruited for study participation in 2000 using a broad range of community based recruitment techniques including advertisement in local newspapers, on Internet list serves, on flyers posted in churches and bookstores, networking at formal and informal social events, and through social networks. Other recruitment sources included clusters of social networks (e.g., formal community-based organizations and informal community social groups) and individual social networks. Recruitment was targeted to SMW who are typically underrepresented in studies of lesbian health, such as older (>50yrs) and younger (<25yrs) women, racial and ethnic minorities, and those with a high school education or less. The original sample of 447 SMW included only those who identified as exclusively or mostly lesbian at recruitment, although some of these participants indicated a bisexual or other sexual orientation at subsequent interviews. CHLEW recruitment also included only cisgender women, or women whose gender and biological sex “match” according to gender/sex based social expectations (Gender Equity Resource Center, 2014), though a few participants have altered their gender identity throughout the course of the study.

At the third wave of data collection (between 2010 and 2012), 354 of the original participants were re-interviewed, for a response rate of 79%. An additional sample of 336 women was also recruited using modified respondent-driven sampling methods with a focus on bisexual, younger, and racial and ethnic minority women. This sampling method utilized participant “seeds” who have relevant connections in the community (Heckathorn, 1997; Heckathorn, 2002). In turn, each new participant was invited to recruit others into the study, limited to three per participant to limit over-recruitment from a particular social network. Trained interviewers contacted eligible participants to

schedule interviews at a place of the participant's choosing, and obtained informed consent during their face-to-face meeting with participants. Data were collected using computer-assisted interview techniques. All women who were surveyed at Wave 3 and were ages 21-65 were included in the current analysis, for a total sample size of 663.

Human Subjects Considerations. Each wave of the CHLEW study was approved by the University of Illinois at Chicago's Internal Review Board. Individuals interested in participating in the CHLEW study were invited to call the project office and were screened by telephone. If eligible, a face-to-face interview time was set up with one of the CHLEW study's highly trained female interviewers. Following a review of the purpose and procedures of the study, participants signed a consent form, and were given a copy of the form for their own records. The interviewers received extensive training over a total of 20-25 hours in general field-interviewing techniques as well as study-specific training that included attention to potentially sensitive topics such as sexual orientation, substance use, and sexual experiences. Some sections of the interview (e.g., those related to sexual experiences), were completed in private by the participants. A distress protocol was in place for any participant who may have been emotionally upset or disturbed during the interview, though these protocols have not been used in any CHLEW interviews thus far. Regardless of individual experience during the interview, every CHLEW participant was given a referral list for local agencies and local and national hotlines of various types before beginning the interview. Approval for the current analysis was granted by the University of Pennsylvania Institutional Review Board.

Measures

Outcomes. The primary outcomes of interest were Pap testing within the past year, and STI testing within the previous five years. Pap testing was defined as participant self-report of screening within the year previous to their interview. At the time of interview consensus American Cancer Society (ACS) guidelines endorsed Pap testing yearly with conventional methods or every 2 years with “liquid-based Pap testing” for all women up to age 30, transitioning to Pap testing every 3 years only after 3 consecutive normal Pap tests (ACS, 2015). STI testing was defined as positive self-report of any STI testing within the previous 5 years for participants recruited at Wave 3, and since last interview for participants recruited at Wave 1 (between five and eight years).

Primary Predictor. The primary predictor of interest was the obstetric history of participants including a history of no pregnancies; any pregnancy but no reported birth or abortion; pregnancy and birth; pregnancy and abortion; and pregnancy, birth, and abortion.

Covariates. Several relevant covariates and moderators were considered in the analyses. These variables included measures of demographic characteristics including sexual orientation, age, race/ethnicity, and sexual role identity (a scale measure of masculinity and femininity), as well as measures of socioeconomic status, factors related to sexual minority status, sexual history, and other prognostic indicators for multiple health outcomes. Participants were asked, “Which one of the categories you chose do you most identify with?” and their responses were used to designate their race/ethnicity group. Participants who answered that they identified most with multiple racial or ethnic groups or with none of them were placed in an “other” category.

Participants' identification with the constructs of masculinity and femininity were measured using the Sex Role Identity Scale adapted by Mustanski and colleagues, which was found to have an internal consistency (α) of 0.901 among gay men (Mustanski, 2009). We also used a scale measure of Internalized Homonegativity, or the process by which sexual minority individuals internalize negative social messages or stereotypes about sexual minority individuals or groups and incorporate these messages into their own self-image. This scale has been found to have an internal consistency of 0.71 among SMW (Herek, Cogan, Gillis, & Glunt, 1997). All variables are defined more specifically in the Appendix.

Data Management and Analysis

All CHLEW data were de-identified, shared through secure email, and results of analysis were password protected and stored on secure networks. The study team reviewed the data, created binary outcome indicator variables from multiple items about cervical cancer screening and STI testing, and the categorical obstetric history variable from multiple items about pregnancy history. Distributions of all variables were reviewed, and some multinomial categorical variables based on quartiles were created from continuous measures including income and number of lifetime sex partners.

We first assessed the distribution of variables (Table 1). Then we used a backwards manual stepwise logistic regression approach to build regression models for each of the two outcomes. First, simple univariate logistic regression models for Pap testing and STI testing were produced to test whether obstetric history and other potential covariates were independently associated with the two sexual health screening variables. Then we generated a multivariate logistic regression model that included the primary

predictor (obstetric history) and any other covariates that were significant at $p \leq 0.20$ in the individual logistic regression models. We tested variables for collinearity, and when variables were collinear, the variable with the higher significance (i.e. lower p-value) in univariate models was included in the subsequent multivariate model. These included multiple measures of socioeconomic status such as income and health insurance status. To reach the final model, variables were removed individually on the basis of least significant until the final multivariate model included only those covariates that were significant at $p \leq 0.10$ as well as the primary predictor of obstetric history. Model assumptions were checked. The analysis was generated using SAS statistical analysis software Version 9.4 (copyright © 2013, SAS Institute Inc., Cary, NC, USA).

Results

Table 1 displays the demographic characteristics of the sample, as well as the distributions of the primary predictor variable (obstetric history) and the two outcomes (cervical cancer screening and STI testing). About half of participants reported no pregnancy history.

Cervical Cancer Screening via Pap Test

In univariate regressions, only sexual orientation (Wald χ^2 6.62, $p=0.0365$), age (Wald χ^2 5.63, $p=0.0176$), work status (Wald χ^2 6.05, $p=0.0484$), and health insurance status (Wald χ^2 3.99, $p=0.0458$) were significant at $p \leq 0.05$ with past year Pap testing. The multinomial obstetric history variable was not significantly associated with past year Pap testing overall (Wald χ^2 7.37, $p=0.1176$), but reporting pregnancy with birth and abortion was significantly associated with past year Pap testing (Wald χ^2 4.31, $p=0.0379$).

In the final multivariate regression model (Table 2), the odds of having received a Pap test in the previous year did not differ significantly across obstetric history. However, among those who reported histories of pregnancy, women with history of birth *and* abortion were almost twice as likely as those with no reported pregnancy to report a pap test (OR 1.77, $p = 0.0484$). Participants with a history of pregnancy, but neither births nor abortions also had about a 1.8-fold increase in the odds of having received a Pap test but this was significant only at trend level (OR 1.84, $p = 0.0976$). No other obstetric history groups had significantly different odds of having received a Pap test than the reference group. Overall comparison also showed no significant difference in the odds of having received a Pap test by the race/ethnicity of participants (Wald χ^2 6.56, $p = 0.0873$). However, there was a 1.6-fold increase in the odds of having received a Pap test among Black/African-American participants compared to White participants (OR 1.61 $p=0.02$). Hispanic/Latina participants also had an increased likelihood of having received a Pap test (OR 1.461), although this was only significant at trend level ($p = 0.0823$).

Both health insurance status and age were significantly associated with the odds of having received a Pap test in the final model. The odds of having received a Pap test within the previous year among participants with health insurance coverage were 1.7-fold that of participants without health insurance (OR 1.72, $p = 0.0033$). Additionally, for every year increase in age, the odds of having received a Pap test in the previous year decreased by about 2% (OR: 0.979, $p = 0.0025$).

Sexually Transmitted Infection Testing

In univariate regressions, sexual orientation (Wald χ^2 53.19, $p<0.0001$), race/ethnicity (Wald χ^2 33.54, $p<0.0001$), age (Wald χ^2 65.09, $p<0.0001$), femininity

score in the Sexual Role Identity Scale (Wald χ^2 10.25, $p=0.0014$), income (Wald χ^2 53.23, $p<0.0001$), education level (Wald χ^2 16.58, $p=0.0009$), health insurance status (Wald χ^2 7.60, $p=0.0058$), Internalized Homonegativity score (Wald χ^2 4.66, $p=0.0308$), being out to providers (Wald χ^2 4.85, $p=0.0276$), being in a committed relationship (Wald χ^2 6.32, $p=0.0119$), number of male and total sex partners (Wald χ^2 13.09, $p=0.0003$; and Wald χ^2 31.76, $p<0.0001$, respectively), age at sexual debut (Wald χ^2 19.20, $p<0.0001$), and adult sexual victimization (Wald χ^2 13.80, $p=0.0002$) were all significantly associated with STI testing at $p \leq 0.05$. The multinomial obstetric history variable was not significantly associated with STI testing overall (Wald χ^2 4.28, $p=0.3689$).

In the final multivariate regression model including obstetric history (Table 3), overall comparison did not demonstrate that the odds of reporting STI testing in the previous 5 years differed significantly across obstetric history categories (Wald χ^2 1.45, $p=0.8353$), and no individual obstetric history categories had significant impacts on reporting STI testing.

Other demographic variables including sexual orientation, race/ethnicity, age, and income level, were significantly associated with the odds of reporting STI testing within the previous 5 years. STI testing differed across sexual orientation groups overall (Wald χ^2 17.76, $p=0.0001$). There was a 3-fold increase in the odds of having been screened for STI's among bisexual women as well as women with other sexual orientations compared to lesbian women (OR 3.13, $p=0.0002$; and OR 3.30, $p=0.0224$, respectively). STI testing also differed significantly across race/ethnicity groups overall (Wald χ^2 21.25, $p<0.0001$). The odds of Black participants having been screened for STIs were 3-fold that of white participants (OR 3.29, $p<0.0001$) and the odds among participants of other racial

and ethnic groups were 3.8-fold that of white participants (OR 3.75, $p=0.0189$). While not statistically significant, the odds among Hispanic/Latina participants were also higher than for whites (OR 1.49, $p=0.1354$). For every one-year increase in age, odds of having been screened for STIs in the previous 5 years decreased by about 7% (OR 0.934, $p<0.0001$). Overall comparison demonstrated that the odds of having received STI testing in the previous 5 years also differed significantly across income level categories (Wald χ^2 11.89, $p = 0.0078$). This difference was largely driven by the difference between participants with an annual income of \$75,000 or more and those with an annual income below \$15,000. The odds among participants with the highest annual incomes were less than half those of participants with the lowest incomes (OR 0.413, $p = 0.0043$).

The number of lifetime sex partners reported by participants also significantly impacted the odds of having received STI testing overall (Wald χ^2 39.52, $p<0.0001$). The odds of having received STI testing among those with 7 to 11 lifetime sex partners were 1.7-fold that of those with 0 to 6 partners (OR 1.73, $p = 0.0469$). Among those with 12 to 20 partners, odds were 3.7-fold that of those with 0 to 6 partners (OR 3.73, $p<0.0001$), and among those with at least 21 sex partners (greater than 20), odds were more than 6-fold that of those with 0 to 6 partners (OR 6.07, $p<0.0001$).

Discussion

Overall, obstetric history as measured in this analysis was not associated with the odds of either past year Pap test or STI testing within the previous 5 years. However, participants who reported pregnancy, birth, *and* abortion histories were more likely to report past year Pap testing than those with no pregnancy history. While our measures of pregnancy and birth were binary and did not account for gravida and parity, this may

suggest that more complicated reproductive health histories or multiple pregnancies may increase the odds of receiving cervical cancer screening while a single pregnancy does not. It is also possible that these results reflect a Type II error, or that there is a time-sensitive effect of obstetric history on screening that we were not able to measure.

Due to the high level of diversity in the sample, we were able to detect differences across race/ethnicity groups in both cervical cancer screening and STI testing, with racial and ethnic minority SMW, specifically Black/African American SMW, more likely to have been screened for cervical cancer and tested for STIs. In this case, increased rates of sexual health screening among racial and ethnic minorities may reflect providers' assumptions about the sexual orientation or sexual behaviors of their patients based on their race or ethnicity. Various studies have demonstrated that unconscious racial bias impacts providers' assumptions about the number of sex partners patients have as well as the provider's willingness to prescribe preventative sexual health treatment (Calabrese, Earnshaw, Underhill, Hansen, & Dovidio, 2014; Thorburn & Bogart, 2005). Assumptions about sexual risk and therefore indications for cervical cancer screening and STI testing may be different about African American SMW than about white SMW. This finding may be evidence of a "reverse disparity," or an instance in which an otherwise marginalized group seems to receive better care or have better health outcomes but are still experiencing unconscious bias or discrimination. Similar reverse disparities have been documented among patients with end stage renal disease, where African American patients seem to have better survival rates, and major depressive disorder, where racial and ethnic minorities seem to bear lower disease burden than whites (Gurmankin, Polsky, & Volpp, 2004; Newsome et al., 2006; Williams et al., 2007). Alternatively, these

differences may be a reflection of differences in health seeking behavior, driven by community-based norms around screening or other factors (Charlton et al., 2014; Eaton et al., 2008a; Tracy et al., 2010; Tracy et al., 2013).

Measures of socioeconomic status appeared in both models. While health insurance status was independently significantly associated with Pap testing, annual income was associated with STI testing, with those who reported incomes greater than \$75,000 per year less than half as likely as those with incomes lower than \$15,000 to report STI testing. This may reflect greater levels of sexual and reproductive autonomy among women with higher socioeconomic status (Hallfors, Iritani, Miller, & Bauer, 2007; Halpern et al., 2004). Relatively high rates of exchanging sex for money and other risky sexual behaviors have been found among SMW (Fethers, Marks, Mindel, & Estcourt, 2000; Matthews et al., 2013) that are likely to increase among SMW with low incomes. This trend may also reflect unconscious bias towards low-income individuals among providers. Providers may assume that lower income women are more likely to be at risk for STIs and therefore screen poor patients more frequently despite the fact that STI testing is a standard of care in sexual and reproductive health.

Previous research has described how race, socioeconomic class, and gender all overlap and relate to insurance status in the United States (Gonzales & Blewett, 2014; Gonzales & Ortiz, 2015). Health insurance status may be directly related to cervical cancer screening and not STI testing as a result of the availability of free STI testing in the Chicago area, specifically at clinics that target sexual and gender populations. These programs are funded in part by government led initiatives and can mitigate the impact of racial and class disparities in health insurance status (CDC, 2013). Cervical cancer

screening, according to our analysis, is more directly dependent on insurance coverage. However, federal Title X funding has made low- and no-cost cervical cancer screening available in many clinics and increased funding as well as awareness of these programs may increase screening rates among populations who are under- or uninsured (U.S. Department of Health and Human Services, 2017a).

Participants' specific sexual orientation as well as the number of lifetime sexual partners also only remained in the model predicting STI testing, with bisexual and other sexual orientation women and women with more sexual partners more likely to have been tested for STIs. If these participants were out to their provider, this finding may again reflect providers' assumptions that lesbian women have low or no risk for STIs and cervical cancer (Charlton et al., 2014; Eaton et al., 2008a; Tracy et al., 2010; Tracy et al., 2013). It also supports previous findings that women who have sex with both men and women (in this study, bisexual women) and those with higher numbers of sexual partners have increased incidences of STIs (Lindley, Kerby, Nicholson, & Lu, 2007; Muzny, Austin, Harbison, & Hook, 2014b). A higher number of lifetime sexual partners did not increase the odds of having received a Pap test despite the fact that most cervical cancer is caused by HPV, an STI. Poor understanding of the complexity of sexuality and sexual behavior among healthcare providers will only further support these incorrect assumptions. Our findings confirm that SMW are not a homogenous group in terms of sexual behavior and risk. Mitigating these misunderstandings may be an important target of public and healthcare provider education about the risks of cervical cancer across groups of SMW.

Study Limitations

The findings of this study should be interpreted in the light of the following limitations. One limitation of this study is the use of only cross sectional data. We were unable to determine the temporality of several aspects of participants' history including their obstetric history. For example, we did not evaluate time since first or last pregnancy, though the impact of pregnancy related care on sexual health screening is likely to diminish over time. Additionally, there may be instances in which a reported pregnancy occurred after the reported Pap test or STI test.

We were unable to include other aspects of obstetric and gynecological history in our analysis, such as whether pregnancies were planned or desired, whether participants had received Gardasil®, the vaccine that prevents many types of HPV, or whether participants had been diagnosed with other gynecologic conditions that would likely impact their use of these two sexual health screening behaviors. These aspects of women's obstetric and gynecological history are likely to impact their experiences with sexual and reproductive health care and therefore their likelihood of receiving cervical cancer screening and STI testing.

Recommendations for Future Study

Studies using longitudinal data and evaluating the effects of age in sexual health screening will be important in understanding the complex associations among obstetric history, cervical cancer screening, and STI testing. Using longitudinal methods, temporal relationships between previous health experiences and future care seeking behaviors can be analyzed. Future studies should also test the moderating effect of age on the relationship between obstetric history and sexual health screening. Importantly, more

complete health history data such as plannedness of pregnancies, diagnosis of reproductive illnesses or conditions, and the use of contraceptives are important to illuminate which specific aspects of health history drive or limit screening. The quality and experience of sexual and reproductive health care encounters will likely influence whether an individual returns for routine preventive care.

Future study should also investigate patterns in SMW's choices about where to seek healthcare. While some sexual minority communities have poorer access to healthcare that is safe and affirming, others, specifically those who reside in urban environments, may seek care at clinics that specifically cater to sexual and gender minority populations. Providers at these clinics may be more comfortable inquiring about sexual identity and behavior separately, and be more knowledgeable about SMW's risks and screening needs. Discussion about sexual health and planning for disease prevention are likely to be different experiences for SMW at these clinics than in other primary or reproductive health care settings.

Finally, future research should employ frameworks that explore the various ways multiple marginalized identities and overlapping systems of oppression can impact the health of SMW, such as Intersectionality theory. In this study, we were able to show that race and ethnicity as well as socioeconomic position are very likely to have direct and powerful impacts on cervical cancer screening and STI testing among SMW. To develop effective interventions, research must begin to look at sexual orientation and identity as one of many intersecting components of individuals' lives that may influence their use of preventive health care.

Table 1. Demographic Characteristics of the Sample (N = 663).

Demographics		
Age	39.8 (Mean)	12.4 (SD)
	N	Percent (%)
Sexual Orientation		
Lesbian	462	69.7
Bisexual	154	23.2
Other	47	7.1
Race/Ethnicity		
White	237	35.8
Black/African American	242	36.5
Hispanic/Latina	157	23.7
Other	27	4.1
Education Level		
Less than high school	48	7.3
High School Diploma or Some College	280	42.3
Bachelor's Degree	150	22.7
Master's or Professional Degree	184	27.8
Income		
\$0-\$14,999	172	26.9
\$15,000-\$39,999	150	23.4
\$40,000-\$74,999	153	23.9
>\$75,000	165	25.8
Health Insurance Status		
No insurance	193	29.2
Any Insurance	469	70.9
Primary Predictor		
No Pregnancy History	368	55.5
Pregnancy Only	40	6.0
Pregnancy and Birth	62	9.4
Pregnancy and Abortion	119	17.9
Pregnancy, Birth, and Abortion	74	11.2
Outcomes		
Pap test		
Within previous year	386	58.2
Not within previous year	277	41.8
STI test	436	66.3
Within previous 5 years		
Not within previous 5 years	222	33.7

Table 2. Logistic Regression Model Showing the Odds of Participants Having a Pap Test Within the Past Year (n = 659).

Variable	Wald Chi-Square	p-value ^a	Odds Ratio	95% Confidence Interval	p-value ^a
Obstetric history	6.0222	0.1975	1.0		
No pregnancy (ref)			1.841	0.894, 3.787	0.0976
Pregnancy only			1.273	0.721, 2.247	0.4045
Abortion history			1.229	0.778, 1.942	0.3771
Birth history			1.767	1.004, 3.110	0.0484*
Birth and Abortion					
Race	6.5608	0.0873	1.0		
White (ref)			1.607	1.078, 2.398	0.02*
Black/A.A.			1.461	0.953, 2.241	0.0823
Hispanic/Latina			0.942	0.412, 2.154	0.8871
Other					
Has health insurance	8.6605	0.0033	1.0		
No (ref)			1.721	1.200, 2.486	0.0033*
Yes					
Age	9.1257	0.0025			
1 year increment			0.979	0.965, 0.993	0.0025*

^a: Each p-value column reports the p-value for the preceding column values. That is, the first p-value column refers to the chi square tests for each overall variable, and the second p-value column refers to the individual point estimates on which Odds Ratios are based.

Table 3. Logistic Regression Model Showing the Odds of Participants Having Any STI Testing in the Previous 5 Years (n = 635).

Variable	Wald Chi Square	p-value ^a	Odds Ratio	95% Confidence Interval	p-value ^a
Obstetric history	1.4508	0.8353			
No pregnancy (ref)			1.0		
Pregnancy only			1.556	0.598, 4.084	0.3645
Abortion history			1.079	0.504, 2.313	0.8441
Birth history			1.303	0.727, 2.338	0.3740
Birth and Abortion			1.037	0.517, 2.083	0.9181
Sexual Orientation	17.7625	0.0001			
Lesbian (ref)			1.0		
Bisexual			3.131	1.723, 5.688	0.0002*
Other			3.297	1.185, 9.174	0.0224*
Race/Ethnicity	21.2539	<0.0001			
White (ref)					
Black/A.A.			1.0	1.884, 5.455	
Hispanic/Latina			3.286	0.883, 2.505	<.0001*
Other			1.487	1.243,	0.1354
			3.751	11.318	0.0189*
Age	45.8901	<0.0001			
1 year increment			0.934	0.916, 0.953	<.0001*
Annual Income ^b	11.8938	0.0078			
\$0-\$14,999 (ref)			1.0		
\$15,000-\$39,999			0.784	0.431, 1.429	0.4273
\$40,000-\$74,999			0.957	0.520, 1.759	0.8864
>\$75,000			0.413	0.225, 0.757	0.0043*
Number of sex partners ^b	39.5206	<0.0001			
0-6 (ref)			1.0	1.007, 2.954	
7-11			1.725	2.117, 6.587	0.0469*
12-20			3.734	3.291,	<.0001*
≥21			6.072	11.200	<.0001*

^a: Each p-value column reports the p-value for the preceding column values. That is, the first p-value column refers to the chi square tests for each overall variable, and the second p-value column refers to the individual point estimates on which Odds Ratios are based.

^b: Variables measuring annual income and the number of reported lifetime sex partners were divided into quartiles based on sample distribution.

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CHAPTER 4:
SEXUAL HEALTH SCREENING AMONG SEXUAL MINORITY WOMEN:
A DECISION TREE ANALYSIS

Introduction

Within the past decade, the National Academy of Medicine (NAM), United States (U.S.) Department of Health and Human Services (HHS), and the National Institutes of Health (NIH) have each made recommendations for research that focus on sexual-orientation-related health disparities (Institute of Medicine, 2011; Public Interest Directorate, 2012; U.S. Department of Health and Human Services, 2014). The National Institute for Minority Health and Health Disparities (NIMHD) has also recently formally designated sexual and gender minorities a health disparity population (NIMHD, 2016).

Sexual minority women (SMW) are those who identify as lesbian, gay, bisexual, queer, or other non-heterosexual identities. In the U.S. these individuals face various health disparities and have lower rates of preventative health care, including cervical cancer screening (Agénor et al., 2014a; Agénor et al., 2014c; Charlton et al., 2011; Charlton et al., 2014; Institute of Medicine, 2011; Matthews et al., 2004). Investigators have consistently explained sexual orientation-related disparities as effects of the stigma associated with minority sexual identities. This includes social stigma that may increase health risks, and health-care-specific stigma that affects access to and quality of care (Meyer, 1995; Meyer, 2003). However, SMW are not a homogenous population and evidence suggests that SMW with multiple marginalized identities (e.g. SMW who are nonwhite, low SES or have low education levels) face unique challenges (Agénor, Bailey, Krieger, Austin, & Gottlieb, 2015b; Agénor, Muzny, Schick, Austin, & Potter, 2017; Bowleg et al., 2003; Calabrese et al., 2014; Calabrese et al., 2015; Szymanski & Meyer, 2008; B. D. M. Wilson, Okwu, & Mills, 2011).

The American Cancer Society (ACS) (2015) specifies that anyone with a cervix should be screened regularly for cervical cancer regardless of sexual history, orientation, or identity. However, several studies have demonstrated that SMW are less likely to be screened for cervical cancer than their heterosexual counterparts (Agénor et al., 2014c; Charlton et al., 2011; Charlton et al., 2014; Institute of Medicine, 2011). While the mechanisms driving these disparities are not clear, investigators have theorized that healthcare providers may assume that SMW are at little or no risk for cervical cancer and that a lack of “cues to screening” may decrease screening rates (Eaton et al., 2008a; Johnson et al., 2016a; Tracy et al., 2010).

However, most SMW, including lesbian women, have had sexual encounters with males (Diamant et al., 1999; Mustanski et al., 2013), and human papillomavirus (HPV), the cause of most cervical cancer, can be transmitted through female-to-female contact (Anderson et al., 2014; Moszynski, 2009). Seeking care for other kinds of sexual and reproductive health needs, including pregnancy, may act as a “cue” or opportunity for cervical cancer screening among SMW (Agénor et al., 2014b; Agénor et al., 2015a; Charlton et al., 2014; P. L. Reiter & McRee, 2015). Therefore, SMW who have experienced pregnancy and its possible outcomes may have higher rates of cervical cancer screening. Importantly, the impact of these potential “cues to screening” may vary among groups of SMW with different sexual histories, racial and ethnic identities, educational achievement, and economic resources (Agénor et al., 2015b; Bowleg et al., 2003; Calabrese et al., 2014; Miles-Richardson et al., 2017).

Review of Literature and Gaps in the Research

Various factors related to health care experiences, including provider recommendation for screening and patient-provider communication, have been shown to increase rates of cervical cancer screening in the general population (Plourde et al., 2016). Low socioeconomic status has also been associated with missed screening (Doescher & Jackson, 2009), and higher educational level, higher household income, employment, and having health insurance coverage have been found to be associated with higher screening rates (Coughlin, Leadbetter, Richards, & Sabatino, 2008). National data also show racial and ethnic disparities in use of cervical cancer screening, including higher rates of screening among Black/African American women than whites, but lower rates among Hispanic/Latina women and other racial and ethnic groups (Centers for Disease Control and Prevention, 2012; Newmann & Garner, 2005).

Previous literature has examined similar trends among SMW. Having a regular health care provider (Diamant et al., 2000a; Matthews et al., 2004; P. L. Reiter & McRee, 2015; Tracy et al., 2013), provider recommendation of Pap testing (Johnson et al., 2016a; Marrazzo et al., 2001a; P. L. Reiter & McRee, 2015; Tracy et al., 2013), reporting good communication with health care providers (Agénor et al., 2015; Clark et al., 2003; Johnson et al., 2016a), and disclosing one's sexual minority identity to health care providers have been associated with higher rates of screening (Clark et al., 2003; Diamant et al., 2000a; P. L. Reiter & McRee, 2015; Tracy et al., 2013). Few studies have evaluated the intersection of race and ethnicity and sexual orientation on cervical cancer screening. One study found that Black race decreased rates of screening among SMW (Agénor et al., 2014b), and in a qualitative study of Black lesbian, bisexual, and queer

women, participants reported that encountering both heterosexism and racism in clinical encounters were significant barriers to returning for screening (Agénor et al., 2015a). Analyses of race and ethnicity and other aspects of identity have been limited among SMW because of sampling issues. Representative samples of sexual minority populations are difficult to locate because it is unclear what proportion of the general population identifies as a sexual minority or engages in same-sex sexual behavior (Institute of Medicine, 2011). Most studies of SMW use samples that are largely white, well educated, and predominantly coupled and lesbian-identified (Institute of Medicine, 2011). Few studies have examined bisexual women and racial and ethnic minority SMW (Bostwick et al., 2014).

Additionally, few studies have examined correlates of STI testing among SMW. Sampling issues have also limited our understanding of how intersections of identity impact STI testing among SMW. The limited existing evidence suggests that bisexual women and women who report sex with both male and female partners are more likely to seek STI testing than lesbian women or heterosexual women (Bostwick, Hughes, & Everett, 2015b; Kerr, Ding, & Thompson, 2013; Lindley et al., 2007). One recent study found that Black SMW were more likely than white counterparts to have been tested for STIs (Mullinax et al., 2016).

Theoretical Foundation

Intersectionality theory, developed from Black feminist scholarship and introduced by Kimberlé Crenshaw, proposes that multiple aspects of identity intersect to create unique forms of discrimination (Crenshaw, 1991). This theory proposes that individual characteristics or identities such as gender, race, sexual orientation, and class are intricately

linked with structures of power (Bowleg, 2012; Bradford & van Wagenen, 2012). The theory also stresses that various components of identity and the privilege or marginalization that accompanies them do not act additively or hierarchically, but actually intersect in unique ways among individuals with multiple marginalized identities (Crenshaw, 1991). Previous researchers have used the intersectionality perspective specifically to study Black SMW, as they constitute a population with multiple marginalized identities and may experience various forms of institutionalized sexism, racism, and homophobia (Bowleg et al., 2003; Bradford & van Wagenen, 2012).

Intersectionality theory informs the current study in several ways. Major gaps in the literature related to the impact of race and ethnicity on cervical cancer screening persist (Agénor et al., 2016). Challenges with sampling and representativeness of samples limit our ability to generalize findings of many studies of SMW to nonwhite populations. Most studies of SMW women have focused on white, middle and upper class lesbian women and have not examined the ways that individual components of identity intersect to drive disparities in cervical cancer screening. This study addresses those gaps by utilizing intersectionality theory and decision tree analysis (see Analytical Approach) in a racially diverse sample.

Aims

This study aims to identify subgroups of SMW who are more and less likely to have been screened for cervical cancer screening according to ACS guidelines based on variables related to demographics, socioeconomic position, sexual minority status, sexual history, aspects of obstetric health history, and other prognostic indicators. We

secondarily aim to identify subgroups of SMW who are more and less likely to have received recent sexually transmitted infection (STI) testing.

Methods

Sample

The Chicago Health and Life Experiences of Women (CHLEW) Study is a 3-wave, 10-year, longitudinal cohort study of adult SMW in the Chicago area. The CHLEW sample is significantly diverse in terms of race, ethnicity, age, and education compared to previous studies of SMW and cervical cancer screening (Brown & Tracy, 2008c; Waterman & Voss, 2015). We performed a secondary analysis of data from the third wave of the CHLEW Study, collected between 2010 and 2012. The original CHLEW recruitment strategy, beginning in 2000, involved a broad range of community based techniques including advertisement in local newspapers, on Internet list serves, on flyers posted in churches and bookstores, networking at formal and informal social events, and through social networks. The CHLEW research team also utilized clusters of social networks such as formal community-based organizations and informal community social groups and individual social networks to increase enrollment. Recruitment was targeted to subgroups of SMW who are typically underrepresented in research, such as older (>50yrs) and younger (<25yrs) women, racial and ethnic minorities, and those with a high school education or less. The CHLEW research team targeted recruitment to women who identified as exclusively or mostly lesbian, although some of these participants have indicated a bisexual or other sexual orientation at subsequent interviews.

At the third wave of data collection (between 2010 and 2012), 354 of the original 447 participants were re-interviewed, for a response rate of 79%, and an additional sample of 336 women was recruited using modified respondent-driven sampling methods with a focus on bisexual, younger, and racial and ethnic minority women. For this new sample, researchers used participant “seeds” who had relevant connections in the community (Heckathorn, 1997; Heckathorn, 2002), who were invited to recruit others into the study, limited to three per participant to limit over-recruitment from a particular social network. Trained interviewers scheduled interviews at a place of the participant’s choosing, and data were collected using computer-assisted interviews. All women who were surveyed at Wave 3 and were ages 21-65 were included in the current analysis, for a total sample size of 663.

Ethical considerations and data management. The University of Illinois at Chicago’s Institutional Review Board approved the CHLEW study at each wave of data collection, and the Institutional Review Board at the University of Pennsylvania approved this secondary data analysis. CHLEW interviewers received 20-25 hours of training in general field-interviewing techniques as well as study-specific training on potentially sensitive topics including sexual orientation, substance use, and sexual experiences. Participants completed sections of the interview that addressed potentially sensitive subjects in private. Interviewers obtained informed consent during their face-to-face meeting with participants after a review of the purpose and procedures of the study. CHLEW participants were given a copy of the signed consent form for their own records. All CHLEW data are de-identified and stored and shared through secure networks. During CHLEW interviews, a distress protocol was in place for any participant who

became emotionally upset during the interview. Before each interview, every CHLEW participant received a referral list of local agencies that respond to crisis and local and national hotlines of various types. For the current study, the research team received de-identified CHLEW data shared through secure email. Data are password protected and stored on the University of Pennsylvania School of Nursing's secured research network.

Measures

Outcomes. The primary outcome of interest in this study was self-report of cervical cancer screening via Pap test within one year prior to interview. Although current ACS guidelines recommend cervical cancer screening every 3-5 years beginning at age 21, at the time of the Wave 3 interviews, consensus guidelines endorsed annual Pap testing for women or every 2-3 years after three consecutive normal Pap tests (ACS, 2015). As a secondary outcome, we measure self-report of any STI testing within approximately five years before interview. Participants recruited at Wave 3 reported STI testing within the previous 5 years, and participants recruited at Wave 1 reported testing since their last interview (ranged from five to eight years).

Potential Predictors. We included 26 potential covariates in the analysis. These variables included measures of demographic characteristics including sexual orientation, age, race/ethnicity, and sexual role identity (scale measures of both masculinity and femininity), as well as measures of socioeconomic position, factors related to sexual minority status, sexual history, obstetric history including pregnancy, birth, and elective termination, and other variables that have been shown to be prognostic indicators for multiple health outcomes among SMW. We generated the list of potential variables by reviewing the existing literature and CHLEW study data. Concepts from intersectionality

theory also informed the inclusion of variables that reflect potential marginalization, such as experiences of discrimination in health care settings and the Internalized Homonegativity Scale. We derived some potential covariates from relevant published and validated measures used by the CHLEW study. The Sex Role Identity Scale measures an individual's identification with masculinity and femininity. The CHLEW study used the scale adapted by Mustanski and colleagues, which was found to have an internal consistency (α) of 0.901 (Mustanski, 2009). Internalized Homonegativity measures the extent to which sexual minority people have internalized negative social messages or stereotypes about sexual minority people and incorporated these messages into their own self-image (Herek et al., 1997). This scale has previously been found to have an internal consistency of 0.71 among SMW. All variables and measurement strategies are defined more specifically in the Appendix.

Analytical Approach

The study team reviewed the data, created binary outcome indicator variables from multiple items about cervical cancer screening and STI testing, and created the categorical obstetric history variable from multiple items about pregnancy history. Distributions of all variables were assessed and some multinomial categorical variables based on quartiles were created from continuous measures including income and number of lifetime sex partners.

Decision tree modeling, or recursive partitioning, was used to identify subgroups of SMW in the sample who were more and less likely to report cervical cancer screening within one year and to report STI testing within the previous 5-8 years. We generated a decision tree for each of the two sexual health screening outcomes, inputting all potential

predictors and covariates (see Appendix) into each model. Decision trees are effective, nonparametric, predictive models that allow us to test multiple higher-order interactions. In contrast to regression models, in which interaction terms have to be individually added, decision trees iteratively split data based on the outcome variable, revealing interactions between multiple predictor variables (Neville, 1999), making it appropriate for study framed by Intersectionality theory. We used decision tree analysis specifically to analyze how individual characteristics intersect to predict cervical cancer screening and STI testing.

We used R software version 3.3.1 for this analysis (R Core Team, 2013). The software recursively split the data into groups that became more homogenous in the outcome variable with each split. Decision tree programs choose optimum splits in data from a large number of possible splits based on the inputted variables (JMP, 2015). The splits use one predictor variable at a time and each subsequent split is determined by minimizing an adjusted p-value that considers the different ways splits can occur. Splits in continuous or count predictor variables are determined by the software at the location that performs the best split in the outcome variable (e.g. participant age can be split at any age that differentiates the outcome variable effectively). The “root node” of the decision tree displays the distribution of the outcome variable in the entire data set and identifies the first variable by which the data were split. Each subsequent “node” displays the outcome variable distribution in its subset of data and the next splitting variable. “Terminal nodes” display the outcome distribution in final subgroups for which further splits would not improve prediction. The proportion of participants in terminal nodes

with the outcome of interest (in this case, missing cervical cancer screening) can be interpreted as the accuracy of that terminal node.

To prevent overfitting of the model, the R software developed the tree using 80% of the data as a “training set,” and held out 20% of the data as a “test set.” The “test set” is used to evaluate the performance of the decision tree model based on multiple statistics. The tree was considered complete and no further splits were performed when further splitting would not improve the overall misclassification rate of the tree. Because decision tree modeling is a nonparametric approach, traditional statistical power analyses do not apply.

Results

Distributions of Key Variables

Table 1 displays the distributions of key demographic variables in the sample, as well as both outcome variables.

Cervical Cancer Screening via Pap Test

Variables included in the decision tree model. Figure 1 displays the decision tree model predicting past year Pap test use. A total of 11 of the possible predictor variables predicted whether participants received a Pap test within the previous year (see Table 2). Since these variables were selected by the decision tree generating software, we consider that, among the inputted variables (see Appendix), these are important in predicting the Pap test outcome.

Overall decision tree model performance. Table 3 reports the overall performance of the decision tree model. These statistics are based on the “test set” of data, comprised of 20% of all participant data. The decision tree model had a 56%

accuracy predicting the Pap test outcome (CI: 0.475, 0.650). The model's specificity was 72% (0.7179, CI [0.6047, 0.8141]), and sensitivity was 35% (0.3455, CI [0.2224, 0.4858]). The positive predictive value (PPV) of the model was 61% (0.6087, CI [0.5510, 0.6635]), while the negative predictive value (NPV) of the model was 46% (0.4634, CI [0.3420, 0.5893]).

Individual participant profiles. The decision tree model allows us to identify specific profiles of SMW that may be at increased risk of missing recommended Pap testing with relatively good accuracy in individual terminal nodes. Most participants (67%) who were age 60 or above did not receive a Pap test in the previous year. Two highly accurate terminal nodes predicted subgroups that did not receive Pap testing; among white, insured participants younger than 60 years old who began drinking before the age of 14, those who came out at age 22 or later were highly likely to have not received a Pap test in the previous year (85% of these participants) (Figure 1). Within the same group, those who came out at an age younger than 22 but who reported obstetric histories that included elective termination were also highly likely to not have received a Pap test in the previous year (84% of these participants).

Two terminal nodes also predicted specific groups of SMW who had high rates of Pap testing within the previous year. Participants who were younger than 60, who began drinking later than age 14, and who came out earlier than age 16 were screened at a high rate (74%). Participants who were younger than 28 years old, began drinking after age 14, came out at or after age 16, who reported more than 7 sexual partners, and who reported that their income was either not enough to meet basic needs, or more than

enough to meet basic needs were also highly likely to report being screened in the previous year (79%).

Sexually Transmitted Infection Testing

Variables included in the decision tree model. The decision tree software selected 10 of the potential predictor variables in the model predicting STI testing (see Table 4). Based on their inclusion in the model, these variables can be considered important in predicting the STI testing outcome among all the variables inputted (see Appendix).

Overall decision tree model performance. Table 5 reports the overall performance of the decision tree model of STI testing, again based on the “test set,” comprised of 20% of all participants. The model had an overall accuracy of 70% (0.6957, CI [0.6029, 0.778]). The model’s specificity was 59% (0.5909, CI [0.3669, 0.6754]) and the model’s sensitivity was 76% (0.7606, CI [0.6929, 0.8725]). The PPV of the model was 75% (0.7500, CI [0.7031, 0.8201]) and the NPV of the model was 60% (0.6047, CI [0.4369, 0.6779]).

Individual participant profiles. The decision tree model predicting STI testing within the previous 5-8 years also allowed us to identify specific profiles of SMW that may be more or less likely to receive STI testing with relatively good accuracy. Women who were younger than 42 years old and reported at least one male sex partner were highly likely to have received STI testing in the previous 5-8 years (84%). This subgroup made up 45% of the “training set” data (36% of the total sample). Women who were 42 years or older, nonwhite, and began drinking earlier than age 14 were also highly likely to have been tested (81%). Those who were 42 years or older, non-white, began drinking

after age 14, and had a graduate degree made up the subgroup with the highest rate of STI testing within the previous 5-8 years (92%). One terminal node also displays relatively good accuracy in identifying participants who had not been screened; 81% of those who were 42 years or older, white, and reported fewer than 34 total lifetime sex partners had not been tested for STIs within the previous 5-8 years.

Discussion

Overall Model Performance

The decision tree model predicting Pap test use had relatively low accuracy. This suggests that the set of potential covariates did not adequately explain patterns of receiving cervical cancer screening in this diverse sample of SMW, and that investigators should explore other potential correlates of cervical cancer screening among SMW. These may include factors related specifically to sexual minority status, such as previous poor experiences in health care, low perception of risk for cervical cancer, or elevated discomfort with the Pap test procedure. This model had good sensitivity, indicating the model's ability to identify those who did receive Pap testing, and that the predictors in the model are important in identifying those individuals. However, the relatively low specificity indicates that the model was not able to identify those who did not report past year Pap testing with high accuracy. This is a meaningful shortcoming of this model, since public health interventions designed to increase screening should target those most likely to miss recommended screening.

The decision tree model predicting STI testing had better accuracy than the model predicting cervical cancer screening, suggesting that the inputted variables predicted patterns in STI screening among SMW more accurately than they predicted cervical

cancer screening. Reasons for seeking each of these sexual health screening services are likely distinct. Individuals are likely to seek STI testing when they are experiencing symptoms or have had a recent unprotected sexual encounter. In contrast, symptoms typically are not the primary driver of Pap testing, but rather regular screening should prevent the development of symptomatic HPV infection or precancerous lesions. Therefore, our findings confirm that there are unique and as yet unidentified factors that may better predict cervical cancer screening among SMW.

Factors Influencing the Use of Sexual Health Screening

Several variables emerged from the decision trees that reflect intersecting components of identity and social position that influence individuals' use of sexual health screening. Despite overall low accuracy of the Pap test model, we consider the variables that did appear important in predicting Pap testing among the larger group of proposed variables. For example, race/ethnicity appeared in both models and intersected with income level and age. In addition, variables that have not appeared in previous studies of sexual health screening using more traditional analyses emerged from our analysis. Variables reflecting participants' age at coming out, age at their first alcoholic drink, and experiences of sexual victimization all appeared in the decision tree model predicting Pap test use. Previous research has shown that SMW tend to be younger when they begin drinking (Corliss, Rosario, Wypij, Fisher, & Austin, 2008; Everett, Talley, Hughes, Wilsnack, & Johnson, 2016; Gilmore et al., 2014a; Parks & Hughes, 2005; Parks & Hughes, 2007; S. M. Wilson, Gilmore, Rhew, Hodge, & Kaysen, 2016) and initiate sexual activity (Goldberg & Halpern, 2017; Timm, Reed, Miller, & Valenti, 2013). These factors increase some long-term health risks and are likely to impact individuals' use of

health care services over the lifespan. Additionally, SMW have been shown to be at higher risk for sexual assault than heterosexual women and these experiences may explain some of the risk of hazardous drinking in SMW (T. Hughes, McCabe, Wilsnack, West, & Boyd, 2010; T. L. Hughes, Johnson, Steffen, Wilsnack, & Everett, 2014).

Our results also confirm previous findings that sexual identity development and disclosure in childhood or early adolescence may be associated with other outcomes later in life (Corliss, Cochran, Mays, Greenland, & Seeman, 2009; Rotheram-Borus & Fernandez, 1995). In our model predicting Pap test use, the age that participants came out appeared twice, with splits at age 14 and 22 years old. The presence of this variable may indicate that the age at which some SMW develop and disclose their sexual orientation predicts sexual health screening behaviors. The appearance of these variables in the tree suggests a need to trace nuanced patterns of development and the age at various milestones among SMW in order to understand their use of sexual and reproductive health care.

While we cannot evaluate the specific effect size of participants' obstetric or pregnancy history, this variable did appear in the Pap test decision tree. Previous studies have found that pregnancy history may impact screening behavior among SMW (Agénor et al., 2016; Agénor et al., 2014c). Our findings suggest that experiences with pregnancy and reproductive health may operate differently in different women's lives in terms of impacting future cervical cancer screening. The impact of obstetric history seems to be related to patterns of certain life events and overall sexual risk, but could be related to the context, timing, plannedness, or other circumstances of pregnancies.

Specific Subgroups Identified

The Pap test decision tree did identify a few specific groups of SMW who were less likely to report screening with good accuracy in the terminal nodes, reflecting the primary goal of this analysis. First, women over age 60 in the sample were not likely to have been screened (67%). While this older age group may consist of participants who had multiple previous normal Pap tests (i.e. not recommended for further annual testing), or who have had hysterectomy including removal of the cervix, this finding may also reflect assumptions that older sexual minority women are not at risk for HPV or cervical cancer. Women in this age group were not eligible to receive the HPV vaccine, which first became available in 2006 for women younger than age 26, making screening especially important for these women. Research focusing on aging within sexual minority communities has been limited, though investigators are beginning to recognize the unique needs and risks among sexual minorities as they age (Fredriksen-Goldsen & Muraco, 2010). The relative invisibility of aging sexual minority individuals may contribute to low rates of health care seeking in this population.

Another highly accurate terminal node that identified participants not likely to have been screened points to the significance of early drinking (younger than age 14) and racial/ethnic identity. Early drinking has been shown to be a significant predictor of future alcohol use patterns and multiple health outcomes among SMW and may be related to minority stress or traumatic life events (Parks, 1999; Parks & Hughes, 2005; Parks & Hughes, 2007). Sexual minority women in this sample who started drinking before the age of 14, were nonwhite, and older than age 42 were also highly likely to have been tested for an STI. Additionally, the intersection of relatively privileged race

and insurance status with early drinking and older age of coming out drove down cervical cancer screening rates in this sample. Coming out is a complicated process that requires repeated and ongoing disclosure of one's sexual orientation to multiple individuals and in multiple settings. Some previous research has shown that coming out can have very different consequences across racial and ethnic groups (Aranda et al., 2015).

Intersectionality theory explains how these multiple components of identity and experience intersect in unique ways, based on individual positions of power and interactions with larger structures of power within society, to drive health inequities. Racial and ethnic identity in the U.S. overlap with multiple socioeconomic indicators as well as with access to health care services (Jackson, Williams, & VanderWeele, 2016; Williams et al., 2016; Williams & Purdie-Vaughns, 2016). Therefore, while race/ethnicity appears in both models as a variable that helps predict each screening outcome, it actually acts as a proxy for a confluence of factors including economic status and opportunity, experiences of bias and discrimination, and social mobility. As Dorothy Roberts puts it, "Today...[race] is less directly tied to discrimination, yet it remains part of a complex legal apparatus that enforce racial inequality in the education, economic, political, criminal justice, and health care systems" (D. Roberts, 2011, p. 19).

Among the same group of participants—those who were under 60 years old, white or "other" race, insured, and began drinking before age 14—participants who "came out" *before* age 22 and reported an obstetric history that included elective termination were also very unlikely to have received a Pap test in the previous year. Our model suggests that the specific context of pregnancy related experiences is likely to impact future health care seeking in different ways for different women. Elective

termination, for example, is likely related to experiences of unplanned pregnancy, which may function very differently than planned pregnancies in the lives of SMW. One previous study of a portion of the CHLEW sample found that participants who reported unintended pregnancies had higher rates of depressive symptoms and risk for hazardous drinking (Everett et al., 2016). Unfortunately, women with unintended pregnancies may also have greater risk of contracting STIs including HPV and therefore cervical cancer screening may be especially important in this population.

Study Limitations

This study had several notable limitations. Our decision tree model predicting Pap test use had low overall accuracy, limiting our ability to draw conclusions based on this particular set of variables. However, our findings imply that investigators should continue to look for other factors that may drive regular cervical cancer screening among SMW. Also, our measure of cervical cancer screening does not reflect newer screening guidelines, which recommend Pap testing every 3 years or a combination of Pap and HPV testing every 5 years for low-risk women. Additionally, while the CHLEW sample is significantly age- and race-diverse, it is not a representative sample and therefore we cannot generalize our findings to the national population of SMW. For instance, the CHLEW sample is comprised of women who are “out” as sexual minorities and reside in the Chicagoland area. Patterns of preventative sexual health care usage are likely to be different among SMW living in more rural and other geographic areas and who have not disclosed their minority sexual identity. Additionally, we included all participants between ages 18 and 65, reflecting cervical cancer screening guidelines from the ACS (2015) and United States Preventative Services Task Force (USPSTF) (2012). However,

older women in this age group may be more likely to have had a total hysterectomy, making Pap testing unnecessary.

We were not able to measure patterns of cervical cancer screening over time, or to evaluate the temporality of events in women's lives. For example, while we theorize that women who came out at later ages may have stopped seeking screening after coming out, we were not able to directly connect those events using cross-sectional data. Both primary and secondary outcomes in this study reflect screening at one time point in participants' lives. While one cross sectional measure of screening can act as a proxy for use of Pap testing, regular and repeated screening is crucial for preventing cervical cancer. This limitation highlights the complexity of measuring the receipt of specific preventive health care services such as cervical cancer screening; these recommendations are and should be tailored to individuals based on their unique health status and risk.

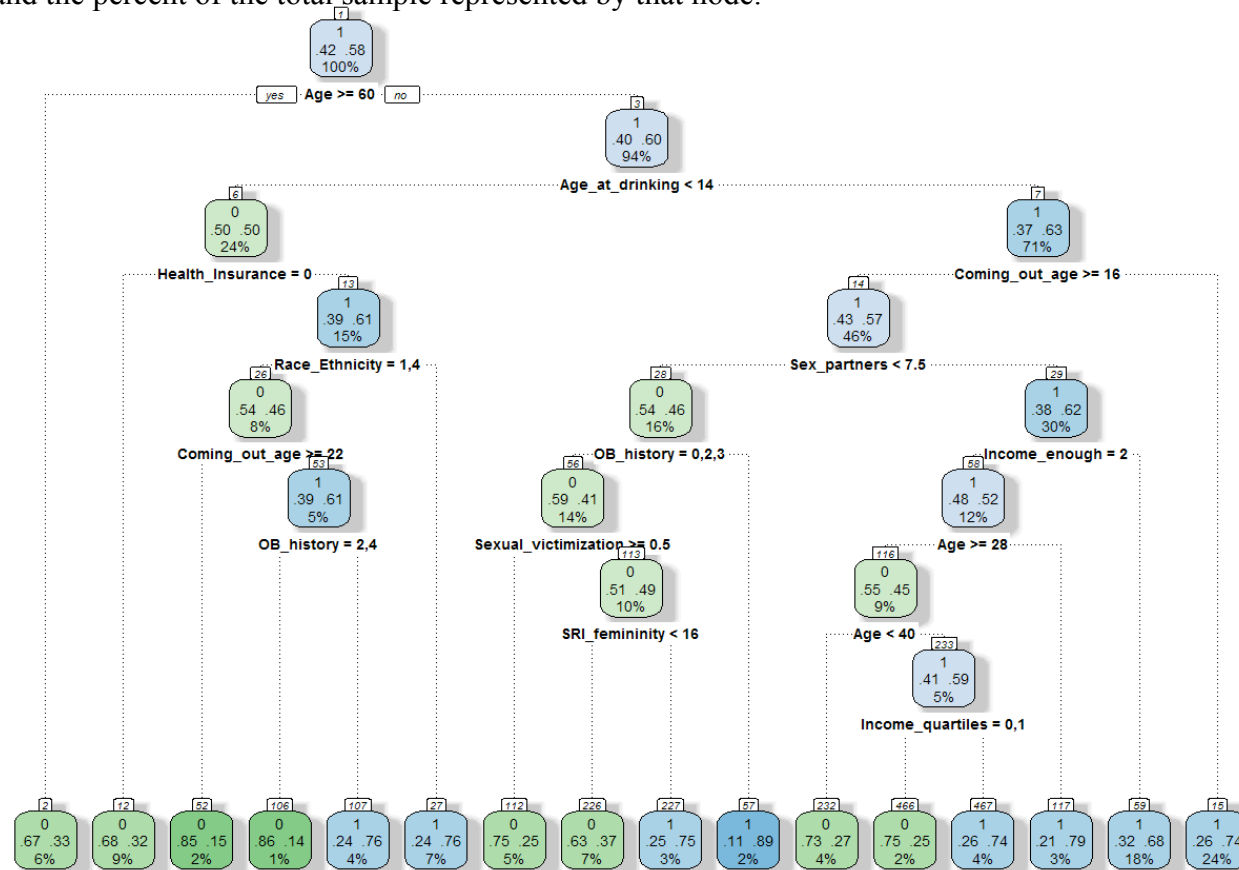
Recommendations for Future Study

Future studies should examine Pap test use among SMW longitudinally, and in the context of other life events and health maintenance behaviors. This study provides further evidence that SMW's ages at and experiences with coming out are important in predicting future health, and specifically how these experiences may significantly impact use of preventative sexual and reproductive health care. Similarly, patterns of drinking and other substance use across the lifespan should be included in future studies of sexual and reproductive health among SMW. Investigators should also aim to understand what drives or prevents preventative health care services seeking among SMW. Previous experiences of discrimination and discomfort in health care settings as well as access to

affirming and welcoming health care settings are both likely to influence how SMW make decisions about seeking preventative care.

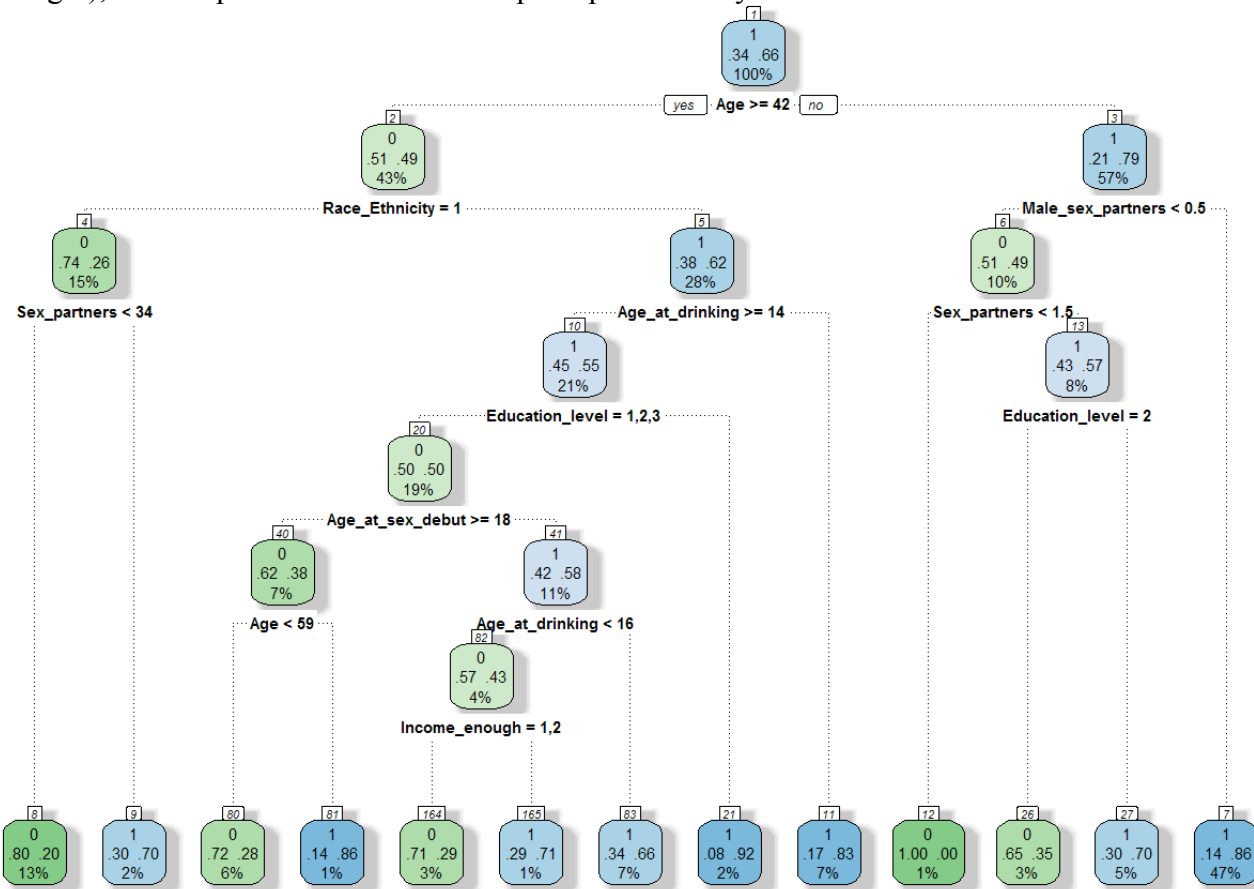
Future studies should also gather data on contextual details of where and when SMW seek cervical cancer screening as well as provider-level factors. Recent studies of the general population of women have shown that provider recommendation is highly correlated with receiving a Pap test and that some neighborhood- and health system-level factors also predict whether women receive Pap testing (Plourde et al., 2016). Further studies will help investigators understand how diverse SMW conceptualize and make decisions about cervical cancer screening and STI testing. Importantly, future study should focus on targeting diverse samples in terms of race/ethnicity, socioeconomic status, age, and specific sexual orientation to further illuminate how multiple minority identities intersect in SMW's lives to impact their health.

Figure 1. Decision tree model predicting Pap testing within the previous year, representing 80% of the sample. Each node displays the outcome it predicts (0= no screening, 1= screening), the proportion of participants in that node with the predicted outcome (0 on the left, 1 on the right), and the percent of the total sample represented by that node.



Note: Decision tree models are interpreted based on both their overall performance in predicting the outcome accurately as well as individual terminal nodes that predict the outcome for specific subgroups of data.

Figure 2. Decision tree model predicting STI testing within the previous 5-8 years, representing 80% of the sample. Each node displays the outcome it predicts (0= no screening, 1= screening), the proportion of participants in that node with the predicted outcome (0 on the left, 1 on the right), and the percent of the total sample represented by that node.



Note: Decision tree models are interpreted based on both their overall performance in predicting the outcome accurately as well as individual terminal nodes that predict the outcome for specific subgroups of data.

Table 1. Sample Characteristics and Distributions of Key Variables (N=663).

Demographics	N	Percent (%)
Age	39.8 (Mean)	12.4 (SD)
Sexual Orientation		
Lesbian	462	69.7
Bisexual	154	23.2
Other	47	7.1
Race/Ethnicity		
White	237	35.8
Black/African American	242	36.5
Hispanic/Latina	157	23.7
Other	27	4.1
Education Level		
Less than high school	48	7.3
High School Diploma or Some College	280	42.3
Bachelor's Degree	150	22.7
Master's or Professional Degree	184	27.8
Income		
\$0-\$14,999	172	26.9
\$15,000-\$39,999	150	23.4
\$40,000-\$74,999	153	23.9
>\$75,000	165	25.8
Health Insurance Status		
No insurance	193	29.2
Any Insurance	469	70.9
Outcomes		
Pap test		
Within previous year	386	58.2
Not within previous year	277	41.8
STI test		
Within previous 5-8 years	436	66.3
Not within previous 5-8 years	222	33.7

Table 2. Distributions of Variables Included in Pap Test Decision Tree Model.

Variables Included in Decision Tree Model	N	%
Health insurance (yes)	469	70.9
Race		
White	237	35.8
Black/African American	242	36.5
Hispanic/Latina	157	23.7
Other	27	4.1
Income enough to meet basic needs		
Not enough	261	39.6
Enough	251	38.1
More than enough	147	22.3
Obstetric history		
No pregnancy	368	55.5
Pregnancy only	40	6.0
Pregnancy and birth	62	9.4
Pregnancy and abortion	119	18.0
Pregnancy, birth and abortion	74	11.2
Adult sexual victimization	327	49.3
	Mean	(SD)
Age at interview	39.8	12.4
Age began drinking	16.8	3.9
Age of coming out	19.5	8.1
Number of lifetime sex partners	17.1	19.6
Sex role identify: Feminine	12.8	4.9

Table 3. Performance of the Decision Tree Model Predicting Past Year Pap Test.

<i>Statistic</i>	<i>Value</i>
Root node error	0.41887
Accuracy	0.5639
95% CI	(0.4753, 0.6497)
P-Value [Acc > NIR]	0.73210
Sensitivity	0.7179
95% CI	(0.6047, 0.8141)
Specificity	0.3455
95% CI	(0.2224, 0.4858)
Positive Predictive Value	0.6087
95% CI	(0.5510, 0.6635)
Negative Predictive Value	0.4634
95% CI	(0.3420, 0.5893)

Note. In this model, Sensitivity represents the proportion of participants that were correctly identified in the model as having received Pap testing. Specificity represents the proportion of participants that did not receive a Pap test in the previous year and were correctly identified in the model. Positive predictive value is the proportion of participants who actually received Pap testing out of all those identified as having received Pap testing in the model. Negative predictive value of the model is the proportion of participants who actually did not receive Pap testing out of all those identified as not having received Pap testing in the model. The p-value represents the probability that the model accuracy is higher than the no information rate.

Table 4. Distributions of Variables Included in STI Test Decision Tree Model

Variables Included in Decision Tree Model	Mean	SD
Age at interview	39.8	12.4
Age at sexual debut	16.9	4.2
Age of coming out	19.5	8.1
Number of lifetime male sex partners	7.6	13.6
Number of lifetime sex partners	17.1	19.6
Age began drinking	16.8	3.9
	N	%
Education level		
<high school	48	7.3
high school or some college	280	42.3
bachelor's degree	150	22.7
master's or professional degree	184	27.8
Number of lifetime sex partners (quartiles)		
0-6	178	26.9
7-11	157	23.7
12-20	166	25.0
≥21	162	24.4

Table 5. Statistics Describing Performance of the Decision Tree Model Predicting STI Testing Within the Previous 5-8 Years.

<i>Statistic</i>	<i>Value</i>
Root node error	0.36475
Accuracy	0.6957
95% CI	(0.6029, 0.778)
P-Value [Acc > NIR]	0.04988
Sensitivity	0.7606
95% CI	(0.6929, 0.8725)
Specificity	0.5909
95% CI	(0.3669, 0.6754)
Positive Predictive Value	0.7500
95% CI	(0.7031, 0.8201)
Negative Predictive Value	0.6047
95% CI	(0.4369, 0.6779)

Note. In this model, Sensitivity represents the proportion of participants that were correctly identified in the model as having received Pap testing. Specificity represents the proportion of participants that did not receive a Pap test in the previous year and were correctly identified in the model. Positive predictive value is the proportion of participants who did actually receive Pap testing out of all those identified as having received Pap testing in the model. Negative predictive value of the model is the proportion of participants who actually did not receive Pap testing out of all those identified as not having received Pap testing in the model. The p-value represents the probability that the model accuracy is higher than the no information rate.

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CHAPTER 5:
GENERAL CONCLUSION

Study Overview

The purpose of this secondary analysis was to explore associations between obstetric history and both cervical cancer screening and sexually transmitted infection (STI) testing among a community sample of diverse sexual minority women (SMW) in the Chicago area. We first conducted an integrated review of the published literature for existing evidence of this relationship and other health care related correlates of cervical cancer screening among SMW (Chapter 2). We then used data from the third wave of the Chicago Health and Life Experiences of Women (CHLEW) study to develop logistic regression models of past year cervical cancer screening and STI testing within the past 5-8 years that included participants' obstetric history as the primary predictor variable (Chapter 3). Finally, informed by Intersectionality theory, we developed decision tree models predicting past year cervical cancer screening and STI testing within the previous 5-8 years to identify subgroups of SMW who were more and less likely to be screened, using 26 predictor variables of theoretical interest including obstetric history (Chapter 4). In this chapter, we summarize the major findings of the study and review implications for clinical practice, policy, and future research stemming from this work.

Major Findings

Obstetric History

The overall primary predictor of interest in this study was participants' obstetric history. Previous research has documented that SMW have a wide variety of experiences with pregnancy including both planned and unplanned pregnancies (Chapman et al., 2012; Charlton et al., 2013; Herrick et al., 2013; Tornello et al., 2014; Yager et al., 2010). Additionally, some studies have suggested that aspects of reproductive history, including

pregnancy, contraceptive use, and HPV vaccination may be important in predicting the use of sexual health screening among groups of SMW (Agénor et al., 2016; Agénor et al., 2014c; Charlton et al., 2014; P. L. Reiter & McRee, 2015). Seeking reproductive health services may act as an “entry point” to preventive sexual health care for SMW who face multiple barriers to that care. However, whether there is a direct impact of obstetric history on sexual health screening remains unknown.

Our obstetric history variable included measures of any pregnancy, childbirth, and elective abortion. In our final regression model of cervical cancer screening, obstetric history overall was not associated with cervical cancer screening or STI testing. Only one obstetric history category—those who reported at least one pregnancy with both birth and abortion—was individually associated with a higher likelihood of reporting cervical cancer screening. This finding may suggest that multiple and varying experiences with obstetric health care may impact cervical cancer screening more than a single type of experience. However, we did not have detailed information about the context of the pregnancies, births, and elective abortions reported by participants, which are likely to drive the impact of these experiences on sexual and reproductive health care seeking.

Our decision tree analysis suggested that obstetric history may be important in predicting cervical cancer screening among some subgroups of SMW, including those over 60 years old and those younger than 60, who began drinking before age 14, had health insurance, were white or “other” race, and came out after age 22. The obstetric history variable split the data differently in two separate subsamples of participants, confirming that experiences with obstetric health and health care impact different SMW in unique ways. Overall, our findings suggest that the relationship between pregnancy

and childbearing history and preventive sexual health care such as cervical cancer screening should be studied further for its role in driving future sexual health screening among SMW. Specifically, unplanned pregnancy and elective abortion may be important predictors of cervical cancer screening among SMW. These experiences and their impact on sexual health screening behaviors remain understudied in this population.

Race, Ethnicity, and Multiple Minority Status

Our findings illustrate the value of using intersectionality theory to understand cervical cancer screening among SMW. Intersectionality theory describes the ways that inequalities are driven by the intersection of multiple aspects of identity that reflect broader structures of relative privilege and oppression. The theory posits that the effects of multiple factors including race, ethnicity, class, gender, and sexual orientation, are cumulative and simultaneous, rather than additive (Bowleg et al., 2003; Bradford & van Wagenen, 2012; Crenshaw, 1989; Crenshaw, 1991). Our decision tree models revealed some novel pathways that predicted which participants were less likely to have received past year Pap testing. These pathways are based on the intersection of several variables and in our models included race/ethnicity, age, and specific sexual orientation, all of which can reflect various levels of privilege or oppression. Intersectionality theory consistently emphasizes the powerful impact of race and ethnicity on individual lives (Bowleg, 2012; Moore, 2012).

Sexual minority women of color may experience “triple jeopardy” due to experiences of marginalization based on their gender as women, race as nonwhite, and sexual orientation as nonheterosexual (Bowleg et al., 2003). Our findings similarly suggest that these women are likely to experience sexual and reproductive health and

health care differently than white SMW. However, in both regression and decision tree models, Black SMW were more likely than their white counterparts to have received past year cervical cancer screening, even controlling for insurance status as we did in the regression model. This may represent evidence of a “reverse disparity,” or a situation in which an otherwise marginalized group seems to receive care that is more adherent to current guidelines than the more privileged group (Gurmankin et al., 2004; Powe, 2006).

There are several possible contextual and provider-level explanations for this “reverse disparity.” It is possible that variations in social norms about Pap and STI testing in different racial and ethnic communities drive these differences (Reed et al., 2011). Racial and ethnic minority SMW may also perceive themselves to be at greater risk for STIs including human papilloma virus (HPV), and therefore at greater risk for cervical cancer. It is also possible that as one result of marginalization, racial and ethnic minority SMW may actually be at greater risk of both HPV and other STIs than their white counterparts and therefore appropriately seek screening more consistently and often (Champion et al., 2005; Lindley et al., 2007; Lindley, Barnett, Brandt, Hardin, & Burcin, 2008; McCauley et al., 2015b; Tornello et al., 2014). While both sexual minority and racial minority groups may be less likely to have consistent health insurance that would cover cervical cancer screening (Buchmueller & Carpenter, 2010; Sohn, 2017), racial and ethnic minority participants in this analysis were more likely to report past year Pap testing than white participants. Insurance status was not a significant predictor in the regression or decision tree models predicting STI testing, which is widely available for free or low cost at health centers and STI-specific clinics, especially in urban areas (CDC, 2013). Clinics funded by federal Title X grants also provide low- or no-cost cervical

cancer screening and other preventive family planning services. Increased funding for such programs and improved public knowledge of these services may improve cervical cancer screening rates among uninsured and underinsured populations.

It is also likely that providers' assessment of patient risk impacts rates of screening among SMW; several studies have documented the importance of provider recommendation for Pap testing in this population (Johnson et al., 2016a; Marrazzo, Koutsky, Kiviat, Kuypers, & Stine, 2001b; P. L. Reiter & McRee, 2015; Tracy et al., 2013). Evidence demonstrates that health care providers display unconscious racial biases about sexual health and sexual risk (Calabrese et al., 2014; Thorburn & Bogart, 2005). Therefore, providers may be more likely to recommend Pap tests for racial and ethnic minority SMW based on their assumptions of increased sexual behavior and risk in these groups. While this study was not able to determine the specific causes of higher rates of Pap testing among racial and ethnic minority SMW, it did provide evidence that race and socioeconomic status—concepts highlighted by Intersectionality theory—are critical.

Age

Each of our two analyses revealed different age patterns in cervical cancer screening. The regression model assumed a linear relationship between age and cervical cancer screening and suggested that increasing age was associated with lower rates of cervical cancer screening. However, because the decision tree splits the data at the specific ages that have the highest impact on predicting the screening outcome, more nuanced patterns emerged from that analysis. Participants over 60 years old, for example, were highly unlikely to report past year Pap testing. Younger age groups interacted with income level and sexual history variables to predict screening.

Previous studies have also found that aging impacts the likelihood of receiving on-time cervical cancer screening among SMW (Brown & Tracy, 2008a; Diamant et al., 2000b; S. J. Roberts et al., 2004). Previous studies have shown that in the general population, older women and those with lower education and income levels are also less likely to be screened for cervical cancer (Doescher & Jackson, 2009; Plourde et al., 2016). Our decision tree analysis shed new light on the role of age in cervical cancer screening patterns among SMW. Our model demonstrates how screening patterns may change over the life course depending on income, work status, insurance status, and the age when other milestones, such as participants' age at first drinking and of disclosing their minority sexual identity, were reached. These milestones, which only or disproportionately affect SMW had an important role in predicting screening in our sample.

These findings suggest that complicated aging and cohort effects are likely acting on this population. As social stigma associated with sexual minorities changes and visibility of these populations increases, patterns of related life events for SMW may also be changing. For example, the age at which SMW decide to “come out,” which appeared in our decision tree model predicting past year Pap testing, may be different among younger SMW than among older SMW who faced higher levels of stigma and risk of social isolation when coming out (Mattocks et al., 2015; Parks & Hughes, 2007). Some research is also beginning to reveal growing trends of sexual fluidity and less strict identification with specific sexual identities such as “lesbian” among younger SMW (Everett et al., 2016). These patterns may reflect more fluid sexual behavior patterns as

well, impacting both perceived and actual risk and potentially screening behaviors among younger cohorts of SMW.

Life Course Risk Factors

Importantly, our findings identified that certain negative life experiences for which SMW are known to be at higher risk were important in predicting cervical cancer screening. For example, SMW have been shown to be at increased risk of early drinking (Drabble, Trocki, Hughes, Korcha, & Lown, 2013; Gilmore et al., 2014b; T. L. Hughes, 2003; Matthews et al., 2013; Parks & Hughes, 2005; Parks & Hughes, 2007; Talley, Hughes, Aranda, Birkett, & Marshal, 2014b; Wilsnack et al., 2008). Investigators have theorized that early drinking may act as a negative coping mechanism for early experiences of discrimination, isolation, or minority stress (Drabble et al., 2013; Keyes, Hatzenbuehler, & Hasin, 2011; Matthews et al., 2013; Meyer, 2003). In our model, we show that it may also predict receipt of sexual health screening. Women under 60, who started drinking after age 14, came out after age 16, had fewer than 8 sex partners, reported no pregnancy, pregnancy and birth, or pregnancy and abortion, and had experienced sexual victimization were not likely to report a past year Pap test. Sexual minorities are at greater risk for sexual victimization over their lifespan (T. Hughes et al., 2010; T. L. Hughes et al., 2014), and our findings present evidence that these experiences may affect future seeking of Pap tests and potentially other sexual health care services.

Our measure of experiences of discrimination in health care did not significantly explain sexual health screening in either analyses. In contrast, our review of previous literature suggested that experiences of discrimination as well as fear of discrimination in health care settings continue to play an important role in SMW's decisions about seeking

cervical cancer screening and preventive health care in general. It is possible that as the social milieu has evolved, fewer SMW are experiencing actual discrimination in health care settings, or that SMW fear discrimination less due to increasing social acceptance of sexual minorities. More SMW may also be seeking primary and preventive care at clinics that specifically target sexual minority communities and therefore do not experience discrimination in health care contexts. These potential evolving patterns in health care experiences warrant further study.

Briefly, this analysis provides evidence for the impact of complex intersections of identity and experience on sexual health screening outcomes. Our final regression model of Pap testing suggested that both having health insurance and having an otherwise marginalized racial or ethnic minority were associated with increased likelihood of screening. Our decision tree model identified some specific intersections of identity and experience that predicted low and high rates of screening. Race/ethnicity, income level, and age of participants intersected with participants' obstetric history, number of lifetime sex partners, age of coming out, age at first drinking, and history of sexual victimization to predict screening. Many of these associations are likely the results of risk related to the social, political, and economic consequences of having multiple marginalized identities and the impact of those experiences will continue to change rapidly as social norms around sexual identity continue to evolve.

Study Limitations

Secondary Data Analysis

Our analysis was limited to the variables and measurement strategies from the existing CHLEW survey. Several components of obstetric history that may be associated

with use of sexual health screening, such as experiences of planned and unplanned pregnancies, pregnancy complications and outcomes, circumstances of conception (e.g. in vitro fertilization, an opposite-sex relationship), type of provider (e.g. medical doctor, nurse midwife, lay midwife), and experiences of the care received, were not available and therefore not included in this analysis. Additionally, we have relatively limited information about the context of the screening outcomes, such as whether participants sought Pap smears and STI tests specifically or providers recommended them during visits, and the type of clinic or provider where participants received these tests (e.g., STI clinic, Planned Parenthood®, primary care provider, obstetrician-gynecologist, etc.). We defined both outcome variables as screening outcomes. However, by definition, screening only includes those individuals who have not experienced symptoms, and some CHLEW participants may have received STI testing as a response to symptoms. More detailed or nuanced data on SMW's reasons for presenting for STI testing would contribute to the development of interventions to optimize prevention and treatment in this population.

Our analysis also employed measures of Internalized Homonegativity and Sex Role Identity. The Sex Role Identity scale has not been sufficiently previously tested in samples of SMW and is a relatively simple measure of a complex set of phenomena related to gender identity and expression. Investigators continue to debate the most appropriate and meaningful ways to quantitatively measure these phenomena. While the Internalized Homonegativity scale did not appear in any final models, it is relatively well-studied and validated.

Study Sample

The sample used for these analyses was not representative of the national population of SMW. These data came from a community-based sample of SMW in one geographic region of the U.S. and therefore we cannot reliably generalize our findings to the entire population. However, this sample is a uniquely diverse sample of SMW in terms of age, race and ethnicity, education level, income, and sexual identities. This sample allowed us to draw some conclusions about diverse SMW that previous studies could not. However, our inclusion of participants between ages 18 and 65 may not have reflected the actual screening needs of some older women, who may have undergone total hysterectomy with removal of the cervix. Current ACS guidelines also recommend less frequent screening for older women who have had multiple normal Pap tests or are low risk (ACS, 2015). As with most other studies of SMW, we were also limited to a sample of SMW who are out, or who disclose their sexual orientation to some or all people in their lives. It may not be safe or desirable for some SMW to disclose their sexual orientation due to risk of discrimination or rejection from family, workplaces, or housing, but recruitment of these individuals for research is difficult because they are unlikely to frequent community organizations or businesses targeted to sexual minority communities. Nondisclosure of minority sexual identity has also been shown to be associated with increased health risks (Juster, Smith, Ouellet, Sindi, & Lupien, 2013) and therefore SMW who are not out may face more barriers to receiving high quality preventive health care such as cervical cancer screening.

Self-Reported Screening Measures

Measures of both sexual health screening outcomes in this study (past year cervical cancer screening and STI screening) were self-reported by participants. This measurement strategy may lead to measurement error including recall and response bias by the participants. However, several authors have defended the validity of self-report measures (Chan, 2009; Spector, 2006), and the CHLEW Study items aim to limit recall and response bias by wording questions in an open-ended format (e.g. “How long has it been since your last Pap smear?”). Our secondary outcome measure of STI screening within the past 5 years may also be less accurate for CHLEW participants recruited in the original 2000 sample. New participants recruited at Wave 3 were directly asked about screening within the previous 5 years. Participants who were originally recruited at Wave 1 were asked in Wave 3 if they had been screened since their last interview, approximately 7 years for most participants (2003-2010). This discrepancy may have undermined our ability to detect differences between groups who had and had not been tested for STIs (e.g. a new participant who was tested 6 years ago would have answered “no,” and a similar participant from the original cohort would have answered “yes”). However, because this variable measured any STI testing over a relatively long time period, this inconsistency likely did not reflect important differences between the participant groups.

Cross Sectional Analysis and Data Temporality

The cross-sectional nature of the data used in this study also represents a study limitation. While past year Pap test use represents a useful measure of current screening, regular screening over time is crucial to effectively preventing cervical cancer.

Longitudinal data on screening would have allowed us to more thoroughly evaluate cervical cancer screening as an outcome among SMW. We were also unable to explore how the timing of significant life events including sexual relationships and coming out may impact SMW's later use of sexual health screening.

Additionally, we did not have data on the timing of participants' obstetric histories. For example, if a participant reported a past year Pap test and one pregnancy, that pregnancy may have occurred after the Pap test. This study conceptualized sexual health screening as the outcome, and obstetric history as antecedents to that outcome. It is possible that experiences with sexual health screening and other sexual and reproductive health care (SRH) impact aspects of obstetric history or reproductive planning as well. Additionally, we could not examine how sexual identity may have changed over the participants' lifespans, which may have important effects on health and health care (Everett et al., 2016). We did measure the age at which participants first disclosed their sexual minority orientation, which appears in our decision tree models as a predictor of both Pap and STI testing. However, we could not measure the temporality of coming out with obstetric history or with participants' histories with sexual health screening experiences over time. Further study should aim specifically to map these milestones in the context of identity development and other life events.

Study Implications

Practice Implications

Results of this study suggest that certain obstetric history experiences may have a small effect on sexual health screening among SMW. Experiences of pregnancy or receiving related care did not significantly increase SMW's likelihood of receiving

recommended Pap testing, though participants with pregnancies ending in both birth and abortion did have higher rates of past year Pap testing. These findings suggest that clinicians should view encounters related to any aspect of SRH including pregnancy as opportunities for promoting regular preventive care and screening to SMW. This will require clinicians to gather thorough sexual health data from patients including both sexual identity and behavior (Cahill & Makadon, 2014). While sexual identity groups (i.e. lesbian, bisexual) may reflect some differences in actual risk of exposure to STIs, these sexual identity terms do not reliably indicate sexual risk. Specifically, clinicians may underestimate STI risk for lesbian-identified patients without a thorough sexual history.

Nursing, medicine, and other health professionals need increased and improved education about cervical cancer screening and STI testing for SMW. Our results confirm that many SMW were missing recommended sexual health screening according to previous guidelines and may continue to miss screening since current guidelines recommend longer intervals between Pap tests. All health care providers should be prepared to recommend and provide sexual health screening appropriately to this population. Changes and improvements in practice should begin in nursing and medical education programs, where curricula should cover basic information about the multiple aspects of human sexuality, health risks related to marginalization experienced by sexual minority communities, and strategies for combatting unconscious bias in clinical practice (AAMC, 2014). Opportunities for this education should continue in clinical practice environments and be supported by institutional policies and programs.

In addition, the development of clinical decision support tools for sexual health screening may improve the quality of care received by SMW, especially among SMW with multiple minority status. Automated reminders for clinicians would support clinicians in recommending cervical cancer screening for all people with a cervix and reduce human error in evaluating risk (Rothman, Leonard, & Vigoda, 2012). Decision support tools may have an even stronger impact on cervical cancer screening practices given current guidelines which shifted from annual screening to Pap testing every 3 years from age 21 to 29, and then Pap testing with HPV testing every 5 years from age 30 to 65 (ACS, 2015). Additionally, significant numbers of SMW have been diagnosed with HPV (P. Reiter & McRee, 2016), indicating HPV vaccination should be indicated and recommended for all young people. The vaccine protects against the types of HPV that most commonly cause cervical cancer. Since evidence suggests that SMW may have younger ages at sexual initiation (Brown & Tracy, 2008a; Goldberg & Halpern, 2017; Saewyc et al., 2008), widespread use of the HPV vaccine before sexual initiation may specifically benefit SMW.

Policy Implications

This study highlights the need for policies at institutional and governmental levels that support the provision of high quality and affirming care to SMW. While our measure of experiences of discrimination in health care settings was not significant in regression models, findings from multiple previous studies suggest that discrimination and fear of discrimination remains a significant barrier (Agénor et al., 2015b; Clark et al., 2003; Johnson et al., 2016; Johnson et al., 2016b). Health care institutions should implement robust nondiscrimination policies that specifically mention sexual orientation and gender

identity. The Human Rights Campaign (HRC) designates health care institutions “Leaders in LGBT Healthcare Equality” by evaluating such policies for both patients and employees using their Healthcare Equality Index (Human Rights Campaign, 2017). Institutions can utilize the components of this index to guide policy development. Clinical practice institutions should additionally increase the visibility of sexual minority individuals in brochures, patient education materials, advertisements, and physical signage. This can help signal to sexual minority patients that they are able to disclose their sexual orientation to health care providers and discuss sexual health concerns without fear of stigmatization or discrimination.

At the governmental level, health care legislation and programs should also support the provision of appropriate sexual health screening to populations of SMW and require institutions to adopt the nondiscrimination policies mentioned above. For example, the Affordable Care Act requires nondiscrimination on the basis of race, color, national origin, sex, age, or disability, and was interpreted to include sexual orientation and gender identity (U.S. Department of Health and Human Services, 2017c). Local and federal law should continue to support such nondiscrimination requirements.

Health insurance status was a significant predictor of past year Pap testing in our regression model. This finding supports the need for access to affordable health care, which is critical in ensuring the provision of multiple kinds of primary and secondary preventive care. Sexual minority populations specifically have been shown to have lower rates of health insurance coverage than their heterosexual counterparts (Buchmueller & Carpenter, 2010). This may be because many Americans are covered by employer-based health insurance plans and sexual minorities face increased economic instability and

discrimination in workplaces. Additionally, federally- and state-funded programs for STI prevention should incorporate free HPV testing along with HIV and other STI testing, with referral to appropriate services for further testing or treatment. Title X funding has been available since 1970 for the provision of family planning services and “related preventive health services” including Pap and STI testing (U.S. Department of Health and Human Services, 2017a). Continued appropriation of funds for Title X clinics is crucial for making these screening services available. Title X program priorities also include the identification of communities that may be at specific risk for negative sexual and reproductive health outcomes and may not be currently receiving adequate services, such as some groups of SMW. These programs have significantly increased access to life-saving cervical cancer screening and could target resources to SMW to increase screening among this population.

Research Implications

Primary longitudinal studies on sexual and reproductive health. This study demonstrates the need for future investigators to design primary studies that focus on the longitudinal sexual and reproductive health trajectories of SMW. Future research should focus on the impact of pregnancy and childbearing on utilization of health care services to confirm our findings that these histories do not significantly impact screening behavior. This research should specifically measure the context of pregnancies such as desiredness, plannedness, circumstances of conception, pregnancy outcome, and relationship status at the time of pregnancy. Studies should also examine the reproductive history of SMW in the context of their sexual orientation development and disclosure. Many SMW may have experienced pregnancy in the context of heterosexual

relationships before coming out. These experiences of pregnancy may have different impact on future SRH than planned or unplanned pregnancies in the context of same-sex relationships or after coming out.

Future research should examine the longitudinal trajectories of SRH among SMW including the effects of aging and generational differences and patterns in seeking and receiving relevant health care. Both aging and cohort effects likely impact this population's use of health care services across the lifespan and longitudinal analyses will help uncover the individual impacts of aging and generation. There have been relatively few studies of aging among SMW and there are major gaps in this literature (Hayman & Wilkes, 2016). Future research should also focus on how SMW make decisions about seeking care and where they receive health care services throughout their lives. Sexual minority women in major urban areas are more likely to have access to clinics that specifically target sexual minority populations. However, there is little evidence exploring how many SMW or how often SMW seek care at these locations or how they choose where to seek health care in general.

The overall poor performance of our decision tree models suggests that there may be as yet understudied variables that may be important in predicting whether SMW receive appropriate sexual health screening. Identifying these variables or experiences will require additional qualitative studies of diverse groups of SMW. Primary studies on this topic will reflect more detailed data specific to sexual and reproductive health histories and experiences. These studies should include data related to SMW's sexual identity development, especially in the context of increasing sexual identity fluidity and change over the life span among younger SMW (Everett et al., 2016).

Improved data collection. Our findings highlight the importance of consistent and clear measures of the various components of sexual orientation, including identity and behavior. As stated by Eliason, “different research questions might require different ways of defining a sample... We will probably always need to have a broad menu of sexuality and gender terms and measurements to draw from” (Eliason, 2014, p. 172). A recent analysis of national data found that estimates of HPV prevalence varied between sexual identity and sexual behavior groups, and depended heavily on how sexual orientation was operationally defined. The authors suggest that investigators include multiple measures of sexual orientation to help develop targeted prevention strategies (P. Reiter & McRee, 2016). However, inconsistent measurement of the components of sexual orientation across studies has made comparing findings across studies difficult (B. Ward, Dahlhamer, Galinsky, & Joestl, 2014). Although researchers generally agree that sexuality includes the three components of attraction, behavior, and identity, investigators have been inconsistent in which aspect(s) of sexuality they measure. This inconsistency as well as assumptions that SMW’s sexual behavior strictly “matches” their sexual identity has specifically limited the science of SMW’s reproductive health and histories. This study included variables representing both the identity and behavioral components of sexuality, allowing us to examine the effect of each component individually. Future studies of sexual health screening among SMW should include multiple measures of sexual orientation and interpret the unique impact of sexual identity and behavior on these outcomes.

Large national studies of representative samples of the population as well as the U.S. Census should consistently collect data related to sexual orientation and gender

identity so that disparities can be accurately tracked and understood. The U.S. Census Bureau recently announced that they would not include sexual orientation or gender identity data on the 2020 census despite significant congressional and public support for the addition of these items (Thompson, 2017). However, the U.S. Department of Health and Human Services (HHS) has begun to include these data in their National Health Interview Survey (NHIS), and other studies have added these questions as well. Nationally representative, longitudinal data on SMW will help researchers identify the most critical health research questions and develop effective interventions to advance the sexual and reproductive health of SMW.

Use of Intersectionality theory. Our findings support the use of Intersectionality theory in efforts to understand screening behaviors in marginalized and diverse populations such as SMW. Understanding the complex nature of the intersections of multiple axes of privilege and oppression will contribute to a greater understanding of the specific pathways to sexual health screening as well as preventive health behaviors in general, helping lead to effective and cost-effective interventions in a complex health system and society.

Conclusion

The unique study sample and novel analytical methods employed in this analysis have allowed us to begin to examine factors that drive sexual orientation-related disparities in sexual health screening. Examination of such factors is crucial to the development of effective interventions. The documentation of the health care experiences of SMW can contribute to the development of effective interventions to optimize the health of this significant, growing, and often vulnerable population.

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Appendix

Variable Table; all variables and related measurement strategies for analysis, including outcome variables, primary predictors related to obstetric history, and potential covariates.

Variable Category	Variable	Data Type	Range/Categories	Measurement Strategy
Outcomes: Sexual Health Screening	Cervical Cancer Screening within past year	Binary	Y/N	
	STI Testing within past 5-8 years	Binary	Y/N	
Primary Predictor	Obstetric History	Categorical	0 = never pregnant 1 = h/o pregnancy, no abortion, no birth 2 = h/o pregnancy, abortion, no birth 3 = h/o pregnancy, no abortion, birth 4 = h/o pregnancy, abortion, birth	
Covariates: Demographic	Sexual Orientation	Categorical	0 = Lesbian 1 = Bisexual 2 = Other	
	Race/Ethnicity	Categorical	1 = White/Caucasian 2 = Black/A.A. 3 = Hispanic/Latina 4 = Other	The racial or ethnic group with which the participant most strongly identifies
	Age at interview	Continuous	21-65	

	Masculine Sex Role Identity	Continuous, scale score	3-21	Total score on 3 masculinity 7-point Likert-scale items (How masculine are you, is your personality, do you appear to others) from adapted Sexual Role Identity Scale (Mustanski, 2009)
	Feminine Sex Role Identity	Continuous, scale score	3-21	Total score on 3 femininity 7-point Likert scale items (How feminine are you, is your personality, do you appear to others) from adapted Sexual Role Identity Scale (Mustanski, 2009)
Covariates: Socioeconomic Position	Annual Household Income	Categorical (quartiles)	0 = 0-\$14,999 1 = \$15,000-39,999 2 = \$40,000-74,999 3 = \$75,000+	
	Is income enough to meet basic needs?	Categorical	1 = not enough 2 = enough 3 = more than enough	
	Highest level of education completed	Categorical	0 = <high school 1 = high school or some college 2 = bachelor's degree 3 = graduate or prof. degree	
	Work status	Categorical	0 = Unemployed 1 = Working for pay 2 = Not working for other reason	
	Insurance Status	Binary	Any health insurance vs. none	

Covariates: Sexual Minority Status	Internalized Homonegativity	Continuous, scale score	0-5	Averaged responses from 10, 5-point Likert scale items measuring negative opinions of sexual minority identity or individuals (Herek et al., 1997)
	Experiences of Discrimination in healthcare (Krieger, 1999)	Binary	Ever vs. Never	Single item: How often have you experienced discrimination in how you were treated when you got care?
	Out to all health care providers	Binary	Y/N	
	Age of recognizing minority sexual identity	Continuous	Age at first recognition of minority sexual identity or desire	
Covariates: Sexual History	Current relationship status	Binary	0 = not in committed relationship 1 = in committed relationship	
	Total lifetime sexual partners	Continuous	0-203	
	Lifetime Sexual Partners	Categorical (quartiles)	0 = 0-6 1 = 7-11 2 = 12-20 3 = 21 or more	
	More than 1 lifetime male sexual partner	Binary	0 = none or 1 male sexual partner 1 = >1 male sexual partners	
	Age at sexual debut	Continuous	Age at first sexual activity with male or female partner	

Covariates: Prognostic Indicators	Childhood Sexual Abuse	Binary	Y/N	The participant felt they were sexually abused as a child
	Childhood Physical Abuse	Binary	Y/N	The participant felt they were physically abused as a child
	Adult Sexual Victimization	Binary	Any vs. None	Self-report of rape or any other kind of sexual abuse
	Age at first drinking	Continuous	Age at first alcoholic drink	