

Sexual Orientation Disparities in Sexually Transmitted Infections: Examining the Intersection Between Sexual Identity and Sexual Behavior

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Abstract The terms MSM (men who have sex with men) and WSW (women who have sex with women) have been used with increasing frequency in the public health literature to examine sexual orientation disparities in sexual health. These categories, however, do not allow researchers to examine potential differences in sexually transmitted infection (STI) risk by sexual orientation identity. Using data from the National Longitudinal Survey of Adolescent Health, this study investigated the relationship between self-reported STIs and both sexual orientation identity and sexual behaviors. Additionally, this study examined the mediating role of victimization and STI risk behaviors on the relationship between sexual orientation and self-reported STIs. STI risk was found to be elevated among heterosexual-WSW and bisexual women, whether they reported same-sex partners or not, whereas gay-identified WSW were less likely to report an STI compared to heterosexual women with opposite sex relationships only. Among males, heterosexual-identified MSM did not have a greater likelihood of reporting an STI diagnosis; rather, STI risk was concentrated among gay and bisexual identified men who reported both male and female sexual partners. STI risk behaviors mediated the STI disparities among both males and females, and victimization partially mediated STI disparities among female participants. These results suggest that relying solely on behavior-based categories, such as MSM and WSW, may mischaracterize STI disparities by sexual orientation.

Keywords Sexual orientation · Sexual identity · Same-sex behavior · STIs · Victimization · Gender

Introduction

Several studies have documented elevated rates of both sexually transmitted infections (STIs) and STI risk behaviors among men who have sex with men/men who have sex with men and women (MSM/MSMW) and women who have sex with women/women who have sex with men and women (WSW/WSMW) compared to men and women who engage exclusively in opposite-sex sexual relationships (Bailey, Farquhar, Owen, & Mangtani, 2004; Bell, Ompad, & Sherman, 2006; Ciesielski, 2003; Fethers, Marks, Mindel, & Estcourt, 2000; Stall, Hays, Waldo, Ekstrand, & McFarland, 2000). The terms MSM and WSW, however, may eclipse differences in sexual health behaviors and outcomes that also vary by sexual orientation identity (Muñoz-Laboy, 2004; Young & Meyer, 2005). Recently, several studies have called for researchers to examine sexual identity in conjunction with sexual behavior in order to more fully understand how STI disparities are distributed across the population by sexual orientation (Malebranche, 2008; Meyer & Wilson, 2009; Moradi, Mohr, Worthington, & Fassinger, 2009; Young & Meyer, 2005). To be sure, sexual behaviors are critical for understanding the spread of STIs, but behaviors do not occur in a social vacuum. Rather, they occur between persons with self-determined sexual orientation identities that may be differentially related to STI risk factors, such as victimization, in addition to STI risk factors related to sexual behaviors. Using nationally representative data, this study systematically investigated how STI risk varied at the intersection of both identity and behavior.

A large body of evidence has established that sexual orientation is multidimensional and cannot be characterized by simple dichotomies (Bauer & Jiram, 2008; Diamond, 2008; Laumann, Gagnon, Michael, & Michaels, 1994; Moradi et al., 2009; Yon-Leau & Muñoz-Laboy, 2010). As a result of this increasingly complex understanding of sexual orientation, the term “sexual minority” has been employed with greater frequency to capture a

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diverse population of individuals whose sexual identity, behavior, and attraction do not reflect a completely heterosexual orientation. The use of “sexual minority” as a single label for a heterogeneous population, however, has been criticized for being too broad and possibly leading to generalizations about a diverse population that are inaccurate (Moradi et al., 2009; Nakamura, Semple, Strathdee, & Patterson, 2011). To be sure, conflating sexual identity with behavior is problematic: Much research has established that identity and behavior often do not perfectly align (Bauer & Jairam, 2008; Laumann et al., 1994; Nakamura et al., 2011; Reback & Larkins, 2008; Wells, McGee, & Beautrais, 2011; Yon-Leau & Muñoz-Laboy, 2010). For example, using the National Health and Nutritional Survey 2001–2006, Xu, Maya, and Markowitz (2010) showed that just over 7% of women reported a same-sex sexual relationship, of which 50% reported a heterosexual identity, 32% identified as bisexual, and 18% identify as gay or lesbian. Using the same data, Xu, Sternberg, and Markowitz (2010) showed roughly 5% of males reported a same-sex relationship, of which 40% identified as heterosexual, 22% identified as bisexual, and 38% identified as gay. Few studies, however, have examined how the confluence of both of these dimensions of sexual orientation may shape STI disparities by sexual orientation.

Among males, elevated STI risk among MSM compared to MSW has been well documented (Ciesielski, 2003; Stall et al., 2000; Stall & Purcell, 2000). Studies have also found differences within the MSM population based upon whether participants report exclusively same-sex partners or both sex partners (Dodge, Jeffries, & Sandfort, 2008; Jeffries & Dodge, 2007; Nakamura et al., 2011) with results suggesting that MSMW have an elevated risk of reporting an STI compared to MSM (Prahbhu, Owen, Folger, & McFarland, 2004; Zule, Bobashev, Wechsberg, Costenbader, & Coomes, 2009). Few studies, however, have examined how STI risk varies at the intersection of identity and behavior. Some research has suggested that gay-MSM report more sexual partners and a higher prevalence of HIV than heterosexual-MSM (Wolitski, Jones, Wasserman, & Smith, 2006; Xu, Sternberg, et al., 2010). Zellner et al. (2009) examined differences in self-reported STIs and STI risk by behavior and identity among Latinos and found that, compared to heterosexual-MSW, heterosexual-MSM were more likely to report unprotected sex and had been diagnosed with an STI, but there were no significant differences in bisexual-MSMW and gay-MSM’s likelihood of reporting an STI compared to heterosexual-MSW.

Compared to males, the literature on female same-sex behavior is considerably smaller. This is, in part, due to the fact that heteronormative ideas about what “counts” as sex are often limited to penis-to-vaginal or penis-to-anus penetration (Moradi et al., 2009). The existing literature, however, suggests WSW/WSMW have higher rates of STI diagnosis and higher rates of engagement in several STI risk indicators, including intravenous drug use, exchanging sex for money, more lifetime sexual partners, and unprotected opposite-sex relationships, compared to

women who have exclusively male partners (Bailey et al., 2004; Bauer, Jairam, & Baidoobonso, 2010; Fethers et al., 2000; Rosario, Meyer-Bahlburg, Hunter, & Gwadz, 1999; Reisner et al., 2010; Scheer et al., 2002).

Research on the intersection between sexual identity and behavior is limited and inconclusive for the female population. Some research has suggested that STI risk among WSW/WSMS does not vary by sexual orientation identity (Bell et al., 2006), while other work has found that among WSW/WSMW populations, lesbian identified women may have a lower STI risk than heterosexual-identified women (Koh, Gómez, Shade, & Rowley, 2005; Kral, Lorvick, Bluthenthal, & Watters, 1997; Xu, Maya, et al., 2010).

STI risk may vary by both sexual identity and behavior, not only because of differences in sexual behaviors between groups, but also, in part, due because of differences in exposure to victimization. Sexual behavior often takes place in private, but sexual identities are often made public. A sexual minority identity may “flag” gay, lesbian or bisexual identified persons as targets for victimization. Indeed, several studies have shown that gay, lesbian, and bisexual persons experience higher rates of physical and sexual victimization in both adolescence and in adulthood (Austin, Roberts, Corliss, & Molnar, 2008; Doll et al., 1992; Herek, Gillis, & Cogan, 1999; Jun et al., 2010; Roberts, Austin, Corliss, Vandermorris, & Koenen, 2010; Saewyc et al., 2006), which, in turn, are associated with increased STI risk in young adulthood (Haydon, Hussey, & Halpern, 2011; Raj, Silverman, & Amaro, 2000; Thompson, Potter, Sanderson, & Malbach, 1997; Wilson & Widom, 2009). Conversely, it may be more proximate STI risk behaviors, such as the type of sexual activities engaged in, condom use, or the number or sexual partners that drive STI disparities, irrespective of sexual orientation identity. The pathways through which STI risk is shaped warrant further investigation.

In summary, how STIs are distributed across the population at the intersection of both sexual identity and sexual behavior remains unclear, despite evidence that STI risk varies by both indicators. Moreover, the targeted sampling of high-risk WSW and MSW populations may provide a biased picture of STI risk among persons who engage in same-sex sexual behaviors (Meyer & Wilson, 2009; Moradi et al., 2009). This study used data from the National Longitudinal Adolescent Health and investigated (1) disparities in self-reported STIs by both sexual orientation identity and behavior-based markers of sexual orientation and (2) the mediating role of victimization and sexual risk behaviors on STI disparities.

Method

Participants

This study used data from Waves III and IV of the National Longitudinal Study of Adolescent Health (Add Health). The

initial Add Health sample was drawn from 80 high schools and 52 middle schools, with unequal probability of selection, throughout the United States (Harris et al., 2009). Wave IV of the Add Health survey, collected between 2007 and 2008, located 92.5% of the original sample and interviewed 80.3% of the eligible participants whose ages ranged from 24 to 34 years. The sample used in this study was restricted to participants who reported at least one incident of oral, anal, or vaginal intercourse ever, and at least one male or female sexual partner. The sample excluded individuals who reported that they were “not sexually attracted to either males or females,” participants who responded “don’t know” to the sexual identity question, and participants that did not have full information for all the covariates included in the analysis. These restrictions resulted in a total sample of 7,392 female participants (94.0% of the Wave IV female sample) and 6,323 male participants (91.2% of the Wave IV male sample).

Measures

Sexual Identity-Behavior Subgroups

The measure of sexual identity-behavior subgroups incorporated two survey items.

Participants were asked to choose “the description that best fits how you think about yourself: 100% heterosexual (straight), mostly heterosexual (straight), but somewhat attracted to your own sex; bisexual, that is, attracted to men and women equally; mostly homosexual (mostly gay), but somewhat attracted to the opposite sex; or 100% homosexual (gay).” Participants were also asked, “Considering all types of sexual activity, with how many male partners have you ever had sex?” and “Considering all types of sexual activity, with how many female partners have you ever had sex?” From these two questions, five mutually exclusive variables for women¹ and six mutually exclusive variables for men were created: 100% heterosexual and have only engaged in opposite-sex sexual relationship(s) (Heterosexual-WSM/MSW); 100% heterosexual and have ever engaged in same/both-sex sexual relationship(s) (Heterosexual-WSMW/MSMW); mostly heterosexual or bisexual and have only engaged in opposite-sex relationship(s) (Bisexual-WSM/MSW)²; and mostly heterosex-

¹ Only one female participant reported never having had an opposite-sex sexual relationship, therefore, all women who reported a gay or mostly gay identity were categorized as one group. Sensitivity analyses excluding this participant did not significantly alter the results; thus, this participant was included in this category.

² Sample size limitations required that some identity categories be collapsed. Preliminary analyses showed that STI risk among mostly heterosexual participants was statistically different from 100% heterosexual identified participants, but did not statistically differ from bisexual identified participants. Similarly, mostly gay and 100% gay-identified participants did not report statistically difference STI risk odds ratios and were also collapsed to provide more stable coefficient estimates. There were only 11 cases of 100% gay or mostly gay participants reporting opposite-sex only sexual relationships; therefore, these cases were excluded from the analysis.

ual or bisexual and have ever engaged in same/both-sex sexual relationship(s) (Bisexual-WSMW/MSMW).³ For women, one variable was created that identified women who reported a gay or mostly gay identity and have engaged in same-sex sexual relationship(s) (Gay-WSMW, $N = 133$). Among males, 56% of the 100% gay or mostly gay identified participants reported only having had same-sex sexual relationship(s) and 44% reported both same- and opposite-sex sexual relationship(s). Thus, two categories were created: gay-MSM (Gay-MSM, $N = 94$) and gay-MSMW (Gay-MSMW, $N = 75$).

Correlation analyses between sexual orientation identities showed that, among women, bisexual ($r = .43, p < .001$) and gay ($r = .32, p < .001$) identities were positively associated with same-sex behavior and heterosexual identity ($r = -.53, p < .001$) was negatively associated with same-sex sex. Male correlation coefficients were similar: bisexual ($r = .31, p < .001$) and gay ($r = .61, p < .001$) identities were positively associated with same-sex sex and heterosexual ($r = -.64, p < .001$) identity was negatively associated with same-sex sex. While these coefficients were significant, they are far from perfect correlations, suggesting that same-sex sex does not necessarily predict a gay or bisexual identity.

Self-reported STIs

STI diagnosis was derived from a question that asked participants if a doctor, nurse, or other health professional had informed them that they have had a sexually transmitted infection.

Mediating Factors

Victimization was measured using a seven item scale that summed the answers to the following questions: (1) By the time you started 6th grade, how often had your parents or other adult caregivers slapped, hit or kicked you; (2) By the time you started 6th grade, how often had one of your parents or other adult caregivers touched you in a sexual way, forced you to touch him or her in a sexual way, or forced you to have sexual relations; (3) Excluding parents or caregivers, have you ever been forced in a physical or non-physical way to have any type of sexual activity against your will; (4) In the past 12 months, has someone pulled a knife or gun on you; (5) In the past 12 months, has someone shot or stabbed you; (6) In the past 12 months, has someone slapped, hit, choked, or kicked you; (7) In the past 12 months, were you beaten up? Because of a high number of missing values for childhood physical and sexual abuse, the summed scale was divided by the number of questions the participant answered; the scale ranged from 0 to 1 and had an alpha of .71. The scale was recoded

³ For clarity, mostly heterosexual and bisexual participants are referred to as “bisexual.” While in the case of this study these groups were not statistically different, it is important to note that these sexual identity labels are not perfect substitutes in all cases.

into a series of dummy variables that measured whether participant's score was less than .25 (referent); $\geq .25$ and $< .75$; or $\geq .75$.

Total number of partners was derived from the survey items in Wave IV that asked participants: "Considering all types of sexual activity, with how many male partners have you ever had sex?" and "Considering all types of sexual activity, with how many female partners have you ever had sex?" Anal sex was coded as a dichotomous measure derived from a survey question that asked participants "Have you ever had anal intercourse? (By anal intercourse, we mean when a man inserts his penis into his partner's anus or butt hole)." Participants who reported having had anal intercourse were coded as yes (1) and those who did not were the reference category (0).

Several other variables were tested and excluded from the analysis. Condom use was not included as a risk factor due to the phrasing of the condom-use item on the Add Health Survey. Only participants who reported an opposite-sex sexual relationship in the last 12 months were asked "In the past 12 months, did you or your partner use any of these methods for birth control or disease prevention: condoms (rubbers)." The question did not ask about consistency, and may exclude women who engaged exclusively in same-sex sex or participants who did not have sex in the previous 12 months. Supplementary analysis that included this condom use question revealed that it was not significantly associated with self-reported STIs nor did it mediate the relationship between sexual orientation and STIs.⁴ Other variables tested and excluded because they did not mediate the relationship between sexual orientation and STI risk included commercial sex, drug use in the previous 12 months, age at first sex, and number of one-time sexual partners.

Controls

This study included controls for race/ethnicity, age, education, and marital status. Age was coded as a continuous variable and ranges from 24 to 32. Race/ethnicity was coded non-Hispanic white (referent), non-Hispanic black, Hispanic, Asian, or other race. Education was coded as less than high school degree, high school degree, some college or college graduate (referent). Marital status measured whether a participant reported ever being married (yes = 1, no = referent). Because there are known differences in rates of health care utilization and STI testing by sexual orientation (Aaron et al., 2001; Cochran et al., 2001; Wolitski et al., 2006), this study also controlled for both of these factors. STD testing measured whether at Wave III of the survey⁵ participants had been tested to at least one sexually transmitted disease in the past 12 months (yes = 1, no = referent). Health care utilization measures whether participants have had a routine

checkup in less than one year (referent), one year to less than two years, or 2 years or more.

Procedure

All analyses were conducted separately for male and female participants and used the survey commands in Stata 11.0 to correct for Add Health's complex sampling frame. Descriptive statistics were examined for self-reported STIs and all covariates used in the analyses by sex, for the total population, and by sexual identity/behavior subpopulations. Adjusted chi square tests were conducted that compared descriptive statistics for each sexual identity-behavior subgroup to the reference group (heterosexual-WSM/MSW). Logistic regression was used to examine the relationship between sexual identity-behavior subgroups and the likelihood of a self-reported STI diagnosis. All results from logistic regression are presented in terms of odds ratios, which are the exponentiated form of the coefficients.

Results

Descriptive Statistics

Table 1 shows the descriptive statistics for self-reported STIs and all other covariates used in the analysis by identity-behavior subgroups for the female population. It can be seen that 75.9% of females reported a heterosexual identity and opposite-sex only sexual relationships (heterosexual-WSM) and 4.2% reported a heterosexual identity and at least one same-sex sexual relationship (heterosexual-WSMW). A total of 18.2% of females reported either a mostly heterosexual or bisexual identity, of which 50.5% reported at least one same-sex sexual relationship. Just 1.8% of females identified as gay or mostly gay.

Self-reported STI rates were significantly higher among heterosexual-WSMW (58.1%), bisexual-WSM (51.1%), and bisexual-WSMW (64.1%) compared to heterosexual-WSM (46.6%). Gay-WSMW had the lowest rates of self-reported STI (32.0%); however, this rate did not significantly differ from heterosexual-WSM. STI risk factors were also unevenly distributed by sexual orientation among females. Seventy-five percent of heterosexual-WSM women reported little or no victimization compared to 60.3% of heterosexual-WSMW, 70.3% bisexual-WSM, 65.4% gay-WSMW, and 55.8% of bisexual-WSMW. Heterosexual-WSM also reported a significantly smaller mean number of sexual partners than all other identity groups and the second lowest prevalence of anal sex after gay-WSMW.

Table 2 shows the descriptive statistics for male participants. Among males, 90.8% of the sample reported a heterosexual identity and opposite-sex only sexual relationships (heterosexual-MSW) and 2.4% reported a heterosexual identity and at least one same-sex sexual relationship (heterosexual-MSMW). A total of

⁴ All supplementary analyses are available upon request from the author.

⁵ This question was not asked at Wave IV.

Table 1 Descriptive statistics of covariates by sex and sexual orientation, U.S. females aged 24–32

	Total sample	100% Heterosexual		Mostly straight/bisexual		Mostly gay/ 100% gay
		Op. sex only	Both sex	Op. sex only	Both sex	Both sex
	<i>N</i> = 7,392	<i>N</i> = 5,607	<i>N</i> = 307	<i>N</i> = 716	<i>N</i> = 629	<i>N</i> = 133
Self-reported STI	46.63	43.62	58.09***	51.11**	64.19***	32.00
Demographics						
Race/ethnicity (%)						
Non-Hispanic white	68.35	67.17	65.61	74.92*	72.54	67.47
Non-Hispanic black	15.32	16.72	13.92	8.49***	10.99	18.89
Hispanic	11.46	11.55	13.27	10.63	10.81	11.24
Asian	3.10	3.15	4.93	4.10	1.18**	0.77*
Other race/ethnicity	1.77	1.41	2.27	1.86	4.48*	1.63
Age (years)	28.71	28.79	28.65	28.45	28.35	28.52
Education (%)						
≥College graduate	33.97	35.82	25.54**	38.23	20.05***	24.53***
Some college	35.46	34.70	35.69	33.45	43.04**	39.17
Vocational training	9.25	9.03	7.63	10.42	10.86	7.62
High school	13.89	13.72	19.59	11.44	13.83	20.84
Less than high school	7.43	6.73	11.55*	6.46	12.22**	7.84
Married, ever (%)	56.77	59.39	57.11	54.41*	45.30***	15.42***
Tested for STI, WIII (%)	28.52	26.83	35.10*	33.23**	34.60**	27.12
Last regular medical visit (%)						
<1 year	70.85	72.80	70.31	64.83**	64.55**	53.93**
≥1 year & <2 years	13.07	12.36	15.28	18.71**	10.22	22.16
≥2 years	16.08	14.84	14.41	16.46	25.23***	23.91
Victimization (%)						
<.25	72.33	75.43	60.34***	70.34**	55.78***	65.39*
≥.25 and <.75	15.60	13.01	23.03**	18.01**	30.25***	19.33
>.75	12.07	11.56	16.63*	11.65	13.97	15.28*
Sexual behaviors						
Total no. of sexual partners (μ)	10.41	7.70	15.84***	11.63***	27.77***	16.50***
Anal sex	44.29	37.53	62.82***	63.64***	73.00***	33.20

Source: National Longitudinal Survey of Adolescent Health

* $p \leq .05$; ** $p \leq .01$;

*** $p \leq .001$

4.1% of male participants identified as mostly heterosexual or bisexual, of which 45% reported at least one same-sex sexual relationship. Three percent of male participants reported a gay or mostly gay identity, of which 55.6% reported same-sex sexual relationship(s) only.

Heterosexual-MSMW (41.4%), Bisexual-MSMW (43.7%), gay-MSM (39.4%), and gay-MSMW (48.9%) reported significantly higher rates of self-reported STIs compared to heterosexual-MSW (32.0%). Fewer differences in STI risk factors were detected by sexual orientation among males compared to females. Heterosexual-MSW reported lower rates of victimization only compared to heterosexual-MSMW. However, several identity-behavior groups reported higher mean levels of sexual partners including heterosexual-MSMW (20.2%), bisexual-MSMW (26.9%), gay-MSM (37.5%), and gay-MSMW (29.5%) compared to heterosexual-MSW (17.3%). All bisexual and gay

identified males, including bisexual males who did not report same-sex sex, had a higher prevalence of reported anal sex compared to heterosexual-WSM.

STI Disparities by Sexual Orientation Among Females

The results from logistic regressions that regressed identity-behavior subgroups on self-reported STI diagnosis for females are shown in Table 3. Model 1 controlled for sociodemographic characteristics only and revealed heterosexual-WSMW (OR = 1.75, $p < .01$), bisexual-WSM (OR = 1.47, $p < .001$), and bisexual-WSMW (OR = 2.20, $p < .001$) were all more likely to report an STI diagnosis than heterosexual-WSM. Gay women were significantly less likely to report an STI than heterosexual-WSM (OR = 0.47, $p < .01$). Model 2 included the victimization scale; victimization was associated with elevated STI risk and

Table 2 Descriptive statistics of covariates by sex and sexual orientation, U.S. males aged 24–32

	Total sample	100% Heterosexual		Mostly straight/bisexual		Mostly gay/ 100% gay	Mostly gay/ 100% gay
		Op. sex only	Both sex	Op. sex only	Both sex	Same sex only	Both sex
Self-reported STI	<i>N</i> = 6,323 32.67	<i>N</i> = 5,744 31.96	<i>N</i> = 151 41.36**	<i>N</i> = 142 32.04	<i>N</i> = 117 43.66**	<i>N</i> = 94 39.41**	<i>N</i> = 75 48.85**
Demographic							
Race/ethnicity (%)							
Non-Hispanic white	68.69	68.92	54.28***	79.56*	73.48*	55.16*	67.05
Non-Hispanic black	14.47	14.59	21.17***	4.98***	12.89**	14.52	12.49
Hispanic	11.80	11.44	19.65	10.06	11.75	22.69*	14.39
Asian	3.08	3.12	1.66	3.11	1.88	4.33	3.86
Other race/ethnicity	1.96	1.93	3.24	2.29	0.00	3.30	2.21
Age (years)	28.93	28.93	29.18	28.85	28.79	29.11	28.75
Education (%)							
≥College graduate	27.24	26.63	10.65***	42.26*	37.93*	40.91**	49.26**
Some college	32.46	32.45	31.38	28.50	33.04	40.14	33.60
Vocational training	9.68	9.89	10.15	7.96	7.71	6.20	1.42
High school	20.77	21.07	34.53	13.46	11.96*	9.57*	10.12*
Less than high school	9.85	9.96	13.29***	7.82	9.36*	3.18**	5.60
Married, ever (%)	46.44	48.42	35.81**	37.44	27.61***	2.57***	5.44***
Tested for STI, WIII (%)	13.13	12.61	8.73	15.43	20.03	28.78*	32.33**
Last regular medical visit (%)							
<1 year	47.96	47.81	48.79	46.89	41.45	61.51***	57.56
≥1 year & <2 years	16.00	16.04	16.56	13.16	12.83	15.59	24.15
≥2 years	36.04	36.15	34.65	39.95	45.72	22.90*	18.29**
Victimization (%)							
<.25	77.26	77.82	52.95***	78.72	77.76	72.88	84.77
≥.25 and <.75	12.86	12.37	32.33***	17.19	12.23	11.70	3.70***
>.75	9.88	9.81	14.72	4.09**	10.01	15.42*	11.53
Sexual behaviors							
Total no. of sexual partners (μ)	17.64	17.10	20.21***	12.09	26.92*	37.45***	29.47***
Anal sex	45.42	43.53	37.39	51.97	79.90***	93.82***	92.34***

Source: National Longitudinal Survey of Adolescent Health

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

mediated the relationship between sexual orientation STI risk by roughly 6% for heterosexual-WSMW, 10% for bisexual-WSMW, and 4% for gay-WSMW.

Model 3 added controls for total number of sexual partners and whether the participant had had anal intercourse to the sociodemographic controls included in Model 1. These measures fully mediated the relationship between heterosexual-WSMW, bisexual-WSM, and reduced both the magnitude and significance for bisexual-WSMW STI risk ($OR = 1.99, p < .05$) compared to heterosexual-WSM. Further, in Model 3, the disparity between gay-WMSW and heterosexual-WSM became larger, such that gay-WMSW ($OR = 0.34, p < .01$) were significantly less likely to report an STI compared to heterosexual-WSM. Consistent with Model 3, controlling for both victimization and sexual behaviors in Model 4 fully mediated the relationship between

heterosexual-WSMW, bisexual-WSM, and bisexual-WSMW, and showed that gay-WSMW ($OR = 0.34, p < .01$) were significantly less likely to report an STI compared to heterosexual-WSM.

STI Disparities by Sexual Orientation Among Males

Estimates for STI risk among males are shown in Table 4. Model 1, which only controlled for sociodemographic characteristics, showed there was no significant difference in heterosexual-MSMW's, bisexual-MSW's, and gay-MSM's STI risk compared to heterosexual-MSW participants. Bisexual-MSMW ($OR = 1.81, p < .05$) and gay-MSMW ($OR = 2.20, p < .05$) had elevated risk of reporting an STI diagnosis compared to heterosexual-MSW. Model 2 controlled for victimization, which was

Table 3 Odds ratios for self-reported STI diagnosis among U.S. females aged 24–32

	Model 1 OR (SE)	Model 2 OR (SE)	Model 3 OR (SE)	Model 4 OR (SE)
Sexual identity-behavior subgroups (Heterosexual-WSM)				
Heterosexual-WSMW	1.75 (0.30)**	1.64 (0.29)**	1.29 (0.23)	1.24 (0.22)
Bisexual-WSM	1.47 (0.16)***	1.42 (0.16)**	1.23 (0.14)	1.21 (0.14)
Bisexual-WSMW	2.20 (0.27)***	1.99 (0.24)***	1.31 (0.17)*	1.25 (0.17)
Gay-WSMW	0.47 (0.13)**	0.45 (0.12)**	0.34 (0.12)**	0.33 (0.11)**
Race/ethnicity (Non-Hispanic white)				
Non-Hispanic black	2.44 (0.22)***	2.41 (0.21)***	2.63 (0.23)***	2.60 (0.22)***
Hispanic	1.18 (0.14)	1.16 (0.14)	1.28 (0.15)*	1.26 (0.15)*
Asian	0.78 (0.18)	0.77 (0.19)	0.84 (0.19)	0.84 (0.20)
Other	1.49 (0.31)	1.43 (0.31)	1.53 (0.32)*	1.48 (0.32)
Age	1.07 (0.02)**	1.07 (0.02)**	1.06 (0.02)*	1.06 (0.02)*
Education (\geq College graduate)				
<High school degree	1.97 (0.32)***	1.81 (0.31)***	1.92 (0.33)***	1.80 (0.32)***
High school degree	1.40 (0.16)*	1.32 (0.16)*	1.34 (0.16)*	1.29 (0.16)*
Vocational training	1.38 (0.15)	1.31 (0.14)*	1.28 (0.14)*	1.24 (0.14)*
Some college	1.39 (0.11)**	1.32 (0.11)***	1.32 (0.11)***	1.27 (0.10)**
Married, ever	0.62 (0.05)***	0.62 (0.05)***	0.68 (0.05)***	0.68 (0.05)***
Tested for STI, WIII (not tested)	1.62 (0.10)***	1.63 (0.10)***	1.42 (0.09)***	1.44 (0.09)***
Last medical visit (<1 year)				
≥ 1 year & <2 years	0.84 (0.07)	0.84 (0.08)	0.85 (0.07)	0.84 (0.08)
≥ 2 years	0.86 (0.08)	0.85 (0.08)	0.83 (0.09)	0.82 (0.08)
Victimization Scale ($\geq .75$)				
<.25		2.07 (0.19)***		1.79 (0.17)***
$\geq .25$ and <.75		1.27 (0.12)*		1.20 (0.12)
Total number of partners				
Anal sex, ever			1.04 (0.00)***	1.04 (0.00)***
			1.34 (0.10)***	1.31 (0.10)***

Source: National Longitudinal Survey of Adolescent Health; OR odds ratio, SE standard error
 * $p \leq .05$; ** $p \leq .01$;
 *** $p \leq .001$

independently associated with an elevated STI risk, but had almost no mediating effect on the relationship between bisexual-MSMW and self-reported STIs. Moreover, in Model 2, the odds ratio for gay-MSMW actually increased, such that gay-MSMW were almost 2.3 times as likely to have reported an STI compared to heterosexual-MSW.

Model 3 added controls for sexual behaviors. Total number of partners and anal intercourse were both positively associated with STI diagnosis and fully mediated the relationship between both bisexual-MSMW and gay-MSMW' elevated self-reported STI risk compared to heterosexual-MSMW. Model 4 controlled for all factors and showed that only gay-MSMW (OR = 1.91, $p < .05$) were more likely to report an STI than heterosexual-MSW.

Discussion

Researchers have repeatedly demonstrated that sexual orientation identity and sexual behaviors do not always directly coincide with one another (Bauer & Jairam, 2009; Diamond, 2008; Lauermann et al., 1994; Moradi et al., 2009; Yon-Leau & Muñoz-

Laboy, 2010). While sexual health scholars frequently acknowledge this discrepancy, few studies have explicitly examined how STI varies at the intersection of these two indicators. This research provided new insights into the social patterning of STIs and the risk factors that mediate STI disparities in several important ways.

First, the results presented in this study showed that behavior-based measures of sexual orientation that exclude sexual identity may lead to misinformed conclusions about STI disparities. For example, compared to heterosexual identified women with opposite sex only relationships, STI risks were elevated among heterosexual and bisexual women who reported same-sex sex, but lower among gay identified women with histories of same-sex sex. Behavior-based categories also mischaracterized risk among males: No significant difference was detected in the likelihood of self-reporting an STI between heterosexual-MSM and heterosexual-MSMW, but elevated risk was detected among gay-MSMW and bisexual-MSMW. Second, this study differentiated bisexual and mostly heterosexual-identified persons who reported same-sex sex from those that reported only opposite-sex sexual relationships. Almost 10% of the female population and 2% of the male population reported a bisexual or mostly heterosexual

Table 4 Odds ratios for self-reported STI diagnosis among U.S. males aged 24–32

	Model 1 OR (SE)	Model 2 OR (SE)	Model 3 OR (SE)	Model 4 OR (SE)
Sexual identity-behavior subgroups (Heterosexual-MSW)				
Heterosexual-MSMW	1.30 (0.31)	1.16 (0.29)	1.31 (0.31)	1.18 (0.28)
Bisexual-MSW	1.15 (0.31)	1.14 (0.30)	1.18 (0.32)	1.16 (0.31)
Bisexual-MSMW	1.81 (0.45)*	1.82 (0.45)*	1.59 (0.38)	1.60 (0.39)
Gay-MSM	1.38 (0.44)	1.37 (0.42)	1.09 (0.37)	1.09 (0.35)
Gay-MSMW	2.20 (0.72)*	2.30 (0.76)*	1.82 (0.60)	1.91 (0.63)*
Race/ethnicity (Non-Hispanic white)				
Non-Hispanic black	2.28 (0.27)***	2.20 (0.26)***	2.28 (0.27)***	2.21 (0.27)***
Hispanic	1.18 (0.14)	1.17 (0.14)*	1.18 (0.14)	1.17 (0.14)
Asian	0.60 (0.13)*	0.60 (0.13)*	0.64 (0.14)*	0.64 (0.14)*
Other	1.53 (0.38)*	1.48 (0.38)*	1.55 (0.38)	1.50 (0.38)
Age	1.08 (0.03)**	1.08 (0.03)**	1.07 (0.03)**	1.07 (0.03)*
Education (\geq College graduate)				
<High school degree	1.51 (0.21)***	1.39 (0.19)*	1.45 (0.20)**	1.35 (0.19)*
High school degree	1.25 (0.16)	1.22 (0.16)	1.26 (0.17)	1.24 (0.17)
Vocational training	1.22 (0.18)	1.18 (0.18)	1.18 (0.18)	1.15 (0.17)
Some college	1.27 (0.13)*	1.22 (0.13)	1.20 (0.13)	1.16 (0.13)
Married, ever	0.94 (0.07)	0.95 (0.07)	0.98 (0.07)	0.99 (0.07)
Tested for STI, WIII (not tested)	0.84 (0.11)	0.81 (0.11)	0.75 (0.10)*	0.74 (0.10)*
Last medical visit (<1 year)				
≥ 1 year & <2 years	1.06 (0.12)	1.05 (0.12)	1.07 (0.12)	1.06 (0.12)
≥ 2 years	0.82 (0.08)*	0.82 (0.08)*	0.81 (0.08)*	0.81 (0.08)*
Risk Factors				
Victimization Scale ($\geq .75$)				
<.25		1.66 (0.17)***		1.56 (0.16)***
$\geq .25$ and <.75		1.41 (0.16)**		1.37 (0.16)**
Total number of partners			1.01 (0.00)***	1.01 (0.02)***
Anal sex, ever			1.33 (0.10)***	1.32 (0.09)***

Source: National Longitudinal Survey of Adolescent Health; OR Odds Ratio; SE Standard Error

* $p \leq .05$; ** $p \leq .01$;

*** $p \leq .001$

identity but reported never having had a same-sex sexual relationship. Previous work has shown that both-sex oriented persons are more likely to report an STI than heterosexual-identified persons; the results presented here showed that this risk varied by sexual histories. Finally, the results presented in this study demonstrated that both victimization and sexual behaviors mediated STI disparities among females, but only sexual behaviors mediated STI disparities among males.

Females

Among women, the results showed that gay-WSMW were less likely to report an STI than heterosexual-WSM. Thus, behavior-based categories of sexual orientation, which label WSWs as an “at risk” population, without considering sexual identity, mischaracterize STI risk among females. This finding was supported by Xu, Maya, et al.’s (2010) as well as Kral et al.’s (1997) research that found a lesbian identity was protective against STI risk, and contradicted Bell, et al.’s (2006) results, which sugges-

ted that STI risks did not differentiate by identity. The Bell et al. sample, however, was collected from a group of women who reported using heroin, crack, or cocaine in the previous five years, limiting the generalizability of the results to the gay female population in the United States. Some research work has suggested that gay or lesbian-identified women are less likely to be tested for STIs and less likely to get regular pap smears (Aaron et al., 2001; Cochran et al., 2001; Marrazzo, Koutsky, Kiviat, Kuypers, & Stine, 2001), which may, in part, explain the lower risk among this group. Supplementary analyses examining STI disparities with biomarker data on chlamydia and gonorrhea in Wave III of the survey, however, showed similar results to those presented in this study: gay women were not more likely to report an STI than heterosexual-WSM women.

Elevated risk of reporting an STI among WSW populations was instead concentrated among heterosexual-WSMW and bisexual-WSMW. These results were in line with other research that has shown that heterosexual-WSMW have an elevated STI risk compared to heterosexual-WSM (Bauer et al., 2010). More-

over, the findings presented in this study also showed that bisexual-WSM were also more likely to report an STI than heterosexual-WSM; behavior-based markers of sexual orientation would miss the elevated risk associated with a bisexual or mostly straight identity among women who have not engaged in same-sex sex. Elevated STI risk among both-sex oriented women found in this study corroborated other research that suggests that both-sex oriented women are at an increased STI risk compared to heterosexual-identified women (Austin et al., 2008; Fethers et al., 2000; Rosario et al., 1999). Both-sex oriented women have elevated levels of victimization, fewer political or interpersonal resources, as well as decreased access to social support systems and accurate sexual health information (Allen, Glick, Beach, & Naylor, 1998; Balsam & Mohr, 2007; Blake et al., 2001; Corliss, Austin, Roberts, & Molnar, 2009; Corliss, Shankle, & Moyer, 2007; Hutchins, 1996), which may, in part, explain the elevated risk of STI among both-sex oriented women (Mazzaferro et al., 2006). Victimization partially mediated the relationship between bisexual identified women and STI risk in this study. While supplementary analysis not shown in this study did not show that drug use mediated the relationship between sexual orientation and STI risk, other work has suggested that drug use among both-sex oriented women may increase their risk of contracting an STI (Bauer et al., 2010; Koh et al., 2005).

Differences in the number of sexual partners and prevalence of anal intercourse also mediated disparities in self-reported STIs by sexual orientation among women: controlling for these factors in Model 3 fully explained elevated STI risk among heterosexual-WSM and bisexual-WSM women, and reduced STI risk among bisexual-WSMW. Heterosexual-WSMW's STI risk may not, in fact, be linked to behaviors engaged with women, but may be due to more frequent opposite-sex sexual relationships (Bauer et al., 2010). Supplementary analyses not shown revealed that heterosexual-WSMW reported an average of 14.2 male partners, bisexual-WSM reported an average of 11.6 male partners, and bisexual-WSMW reported an average of 24.2 male partners compared to heterosexual-WSM, who reported an average of 7.7 male partners. Future research should continue to explore increased STI risk associated with opposite-sex sexual relationships among both-sex oriented women.

Males

Among males, much research has identified elevated risk of STI among MSM populations (Groves, Parsons, & Bimbi, 2007; Halkitis, Parsons, & Stirratt, 2001; Stall & Purcell, 2000; Wolitski et al., 2006). Heterosexual-identified MSM or men on the "down-low" have often been characterized as sexually deviant and vectors of disease in heterosexual relationships (Ford, Whetten, Hall, Kaufman, & Thrasher, 2007; Saleh & Operario, 2009). The results reported in this study, however, showed that heterosexual-MSMW were not more likely to report an STI than heterosexual-MSW. Other research has also found that while the prevalence of

specific risk factors may vary by identity, MSM who do not identify as gay or bisexual may not have an elevated STI risk compared to bisexual or gay identified-MSM (Bond et al., 2009; Millet, Malebranche, Mason, & Spikes, 2005; Pathela et al., 2006;). The lack of elevated STI risk among heterosexual-MSM in this study may, in part, be due to the fact that this research used a nationally representative sample of U.S. young adults as opposed to a sample drawn from high-risk populations. Alternatively, differences in STI testing may also contribute to the lack of differences in self-reported STI diagnoses by a medical professional among heterosexual-MSM as some research has suggested that MSM who have not disclosed a gay or bisexual identity are less likely to be tested for STIs (Wolitski et al., 2006).

The results showed that STI risk was concentrated among males who identified as mostly heterosexual, bisexual, or gay *and* had a history of *both* sex partners, but that the relationship between bisexual-MSMW was mediated by sexual risk behaviors. Indeed, in Model 4, the only sexual identity-behavior subgroup that was associated with elevated STI risk was gay-MSMW participants. There was no statistically significant difference in heterosexual-MSW and gay-MSM's odds of reporting an STI. The absence of opposite-sex sexual partners among gay males may indicate early commitment to a gay identity and involvement with the gay community, which may decrease STI risk behaviors (Ramirez-Valles, 2002). While victimization and drug use (not shown) did not mediate the relationship between sexual orientation and STI disparities among males, other work has suggested that fear of violence and/or the use of drugs and alcohol contribute to an elevated risk of contracting an STI among behaviorally-bisexual males (Malebranche et al., 2010). Differences in sexual networks and locations where same-sex sex partners are sought out may also explain differences in STI risk between gay men with both-sex partners and gay men with exclusively same-sex partners (Nakamura et al., 2010). Future research should further investigate how STI risk varies among gay males by sexual histories.

Sex Differences

While both bisexual identified men and women have elevated STI risk in Model 1, several gender differences emerged in the patterns of STI disparities by sexual orientation. First, among women, a gay identity was associated with decreased risk while, among men, a gay identity among behaviorally bisexual males was associated with increased STI risk. This difference may be explained by differences in STI risk associated with specific sexual behaviors. While it is indeed possible to transmit STIs through female-to-female sexual relationships (Marrazzo et al., 2001), STIs are transmitted more easily through penile-vaginal intercourse or penile-anal intercourse. Second, differences in STI risk may be associated with STI prevalence in sexual networks by sex. If STI rates are lower among lesbian-WSMW, the chances of exposure to an STI from a sexual partner from this population are

also lower. Third, these differences may also be due to differences in STI testing between gay men and women. Public health campaigns have heavily targeted gay men and MSM for STI testing and sexual health information, while gay women and WSW's have received considerably less attention regarding the spread of STI risk. Moreover, for many women, STI screenings are completed during gynecological visits required for accessing birth control. If women are not engaging in opposite-sex sex, utilizing health services for acquiring birth control may be unnecessary, decreasing the likelihood that they will interact with women's health professionals.

Conclusion and Future Directions

This study had several limitations that may be addressed in future research. First, there are several behavioral risk factors that may help explain the elevated STI risk among some sexual identity-behavior risk groups that are not included in the Add Health survey, such as the extent to which condoms are used in every sexual encounter or the sex role (i.e., receptive versus insertive anal intercourse) of the participant engaging in specific sexual behaviors. Second, this study was limited in the types of identities presented for participants to choose from. Indeed, some participants may find sexual orientation labels off-putting or irrelevant to their sexuality (Savin-Williams, 2006; Yon-Leau & Muñoz-Laboy, 2010). Participants who do not identify with one of the offered identity categories were either excluded from this analysis or potentially included in an identity category that was not truly representative of their chosen identity. Third, it is difficult to assess the temporal ordering of risk factors and STI diagnosis, thus not allowing for a full meditational analysis. Supplementary analyses not shown restricted STI diagnosis to the last 12 months, however, revealed a similar pattern to the results presented. Finally, this research employed self-reported doctor diagnosis of an STI. Thus, the results may be biased towards showing greater risk among populations that were more likely to get tested. Some research, however, has suggested that self-reported doctor diagnoses are preferable to self-assessed STI risk and may not introduce a substantial amount of bias (Niccolai et al., 2005). While this study included controls for STI testing reported at Wave III of the survey, this survey item was not included in Wave IV of the Add Health survey and therefore may remain a source of bias.

This research provides evidence that it is critical to consider sexual behaviors in conjunction with sexual orientation identities when studying STI risk across the U.S. population. Indeed, these findings add to the growing body of research that suggests that behavior and identity are not interchangeable categories and that focusing on one indicator of sexual orientation alone may lead to misinformed conclusion about how STI risk is distributed across the population. More research is needed to understand sexual health needs of bisexual identified and behaviorally bisexual persons. Indeed, STI prevention efforts aimed at reducing victimization among women and addressing safe-sex practices among

both men and women may benefit from a more tailored focus of the needs of these risk groups rather than grouping all identity groups who engage in same-sex sex together.

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