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Operational Definitions of Sexual Orientation and Estimates of Adolescent Health Risk Behaviors

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Abstract

Purpose—Increasing attention to the health of lesbian, gay, and bisexual (LGB) populations comes with requisite circumspection about measuring sexual orientation in surveys. However, operationalizing these variables also requires considerable thought. This research sought to document the consequences of different operational definitions of sexual orientation by examining variation in health risk behaviors.

Methods—Using Massachusetts Youth Risk Behavior Survey data, we examined how operational definitions of sexual behavior and sexual identity influenced differences among three health behaviors known to disparately affect LGB populations: smoking, suicide risk, and methamphetamine use. Sexual behavior and sexual identity were also examined together to explore if they captured unique sources of variability in behavior.

Results—Estimates of health disparities changed as a result of using either sexual behavior or sexual identity. Youth who reported their sexual identity as “not sure” also had increased odds of health risk behavior. Disaggregating bisexual identity and behavior from same-sex identity and behavior frequently resulted in the attenuation or elimination of health disparities that would have otherwise been attributable to exclusively same-sex sexual minorities. Finally, sexual behavior and sexual identity explained unique and significant sources of variability in all three health behaviors.

Conclusion—Researchers using different operational definitions of sexual orientation could draw different conclusions, even when analyzing the same data, depending upon how they chose

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to represent sexual orientation in analyses. We discuss implications that these manipulations have on data interpretation and provide specific recommendations for best-practices when analyzing sexual orientation data collected from adolescent populations.

Keywords

adolescents; data analysis; health behavior; measurement; sexual orientation

Introduction

The health needs of lesbian, gay, and bisexual (LGB) individuals have gained increasing attention in the United States.¹⁻⁴ A recent report from the Institute of Medicine (IOM) notes several health disparity issues for LGB populations, such as increased self-directed violence and substance use.¹ The report also makes several recommendations for research, a major one being assessing sexual orientation in health surveillance surveys.¹ Though there is increasing consensus on best practices to *measure* sexual orientation in survey research (e.g., item wording, response options),⁵ less attention is given on how to *operationalize* these data in empirical analysis (e.g., which response categories to aggregate, what constitutes a missing value). Several studies highlight the theoretical and empirical consequences of using only one dimension of sexual orientation in analysis (i.e., attraction, behavior, and identity).⁶⁻¹² Even still, researchers vary with respect to how each of these dimensions is operationalized. Research with adolescents may be particularly sensitive to issues of measurement and operationalization, as this population is in the midst of several developmental changes, including various stages of sexual experience and sexual identity formation.^{10,13-15} Furthermore, risk behaviors such as smoking, illicit drug use, and self-directed violence increase during adolescence, with particularly high prevalence of risk behaviors noted among LGB youth.²

The variability of outcomes based on operational definitions of sexual orientation among adolescents is highlighted by Kann et al.² in analyses of Youth Risk Behavior Survey (YRBS) data pooled across 9 years from those states and cities that assessed either sexual behavior or sexual identity. For example, the prevalence of skipping school due to feeling unsafe differed significantly between students who identified as lesbian or gay and students who indicated same-sex sexual experience (median 21.1% and 15.2%, respectively). Brewster and Tillman¹⁰ note similar constellations of difference in an analysis of 15- to 24-year-olds from the National Survey of Family Growth. For instance, 44% of female respondents who indicated a lesbian or bisexual identity reported smoking, whereas only 14% of females who indicated any same-sex sexual experiences reported smoking. Though both of these studies note variation across the three dimensions of sexual orientation, Kann et al. did not examine differences by sex, and Brewster & Tillman did not separate lesbian/gay and bisexual in analysis. Further research is needed to explore both the sex-specific and sexual orientation dimension-specific nuances that may impact results across definitions of sexual orientation.

In addition to using different dimensions of sexual orientation, the implications of combining lesbian/gay and bisexual groups in analyses (most often for the sake of statistical

power) are becoming clearer. Studies suggest that combining lesbian/gay and bisexual groups together can mask unique differences between groups and exaggerate risk to one group that may, in actuality, be significantly lower in the other. Recalling Kann and colleagues' YRBS analysis,² they report the median percentage of lesbian or gay students that made suicide plans was 21.2%, but the percentage was 35.7% among bisexual-identified students. Additionally, Ford and Jasinski¹⁶ found that bisexual female college students had a significantly higher prevalence of illicit drug use than both their heterosexual and lesbian peers.

As large federal surveys begin to add measures of sexual orientation,³ circumspection about the consequences of using different definitions and combinations of sexual orientation is a necessary exercise not only to appraise epidemiologic results accurately but strategize interventions as well. With a focus on previously documented risk behaviors known to disproportionately occur among LGB youth (i.e., smoking,¹⁷ methamphetamine use,^{2,18} and suicide risk¹⁹⁻²¹), the purpose of the present study is to explore the sensitivity of estimates in these three behaviors as a function of varying operational definitions of sexual orientation.

Methods

We analyzed a combined dataset of three independent years (i.e., 2003, 2005, and 2007) of YRBS data from Massachusetts (MA). Though a majority of states conduct the YRBS, MA was among the first to include questions assessing sexual behavior and sexual identity. By stratifying all public high schools by enrollment size, randomly selecting schools within each stratum, and then randomly selecting classrooms within selected schools, the MA YRBS is designed to be representative of all public high school students within the state. The MA YRBS is biannual and employs an anonymous survey; school participation rates were 88% in 2003²² and 87% in both 2005 and 2007.^{23,24} In all, 82%, 78%, and 85% of eligible students completed the questionnaire in 2003, 2005, and 2007, respectively.²²⁻²⁴ More detailed information about the MA YRBS sampling and weighting methodology is available elsewhere.²⁵⁻²⁷ Twenty-four students missing data on sex were excluded from analysis, resulting in an analytic sample of 10,253 students, of which 9,869 (96.3%) provided responses to both the sexual identity and sexual behavior questions.

Measures

Health risk behaviors—We selected three health risk behaviors *a priori* to illustrate the variation from manipulating operational definitions of sexual orientation. We examined current smoking habits (i.e., smoked a cigarette in the past 30 days), having ever made a plan to commit suicide, and having ever used methamphetamines. We selected these behaviors among available health risk behaviors in the YRBS for three primary reasons: 1) published research suggested we would observe disparities by sexual orientation in these behaviors among this population;^{2,17-21,28} 2) these behaviors ranged from somewhat common to rare, increasing confidence that any variation in estimates were due to operational manipulations and not specific to any one behavior; and 3) by not examining

sexual health risk behaviors, we minimized definitional overlap with the sexual behavior dimension of sexual orientation.

Sexual orientation—We assessed sexual orientation using two separate questions that asked respondents about sexual behavior and sexual identity. Sexual behavior was assessed with the item, “During your life, with whom have you had sexual contact? 1) I have never had sexual contact, 2) Females, 3) Males, or 4) Females and Males.” Sexual identity was assessed with the item, “Which of the following best describes you? 1) Heterosexual (straight), 2) Gay or lesbian, 3) Bisexual, or 4) Not sure.”

Demographic characteristics—We used student grade (9th to 12th) and year of data collection (2003, 2005, or 2007) to control for both developmental and cohort effects. We also controlled for race/ethnicity, however its distribution led us to collapse race/ethnicity into four categories: Black or African American, Hispanic or Latino, White, and all others. Following previous research, we stratified analyses by sex.^{10,12,29}

Operational manipulations

We created six comparisons of operational definitions of sexual orientation. The first three definitions were manipulations of the sexual behavior variable. Definition 1 compared those with any same-sex sexual behavior to those with exclusively opposite-sex sexual behavior. Definition 2 disaggregated any same-sex sexual behavior into exclusively same-sex sexual behavior and sexual behavior with both women and men. In both definitions 1 and 2, persons reporting “no sexual contact” were excluded from analyses. For definition 3, students who indicated “no sexual contact” were added as a group alongside the three other previously defined sexual behavior groups. Exclusively opposite-sex sexual behavior was the referent category for all analyses.

The last three definitions similarly manipulated the sexual identity variable. Definition 4 compared students with any sexual minority identity (lesbian, gay, or bisexual) to students who identified as heterosexual/straight. Definition 5 disaggregated the sexual minority group into bisexual identity and lesbian/gay identity. Definition 6 built upon the previous definition by including “not sure” as a sexual identity rather than excluding it as missing data. Heterosexual/straight identity was the referent category for each of these definitions.

Data analysis

We utilized logistic regression to analyze the association of sexual orientation definitions with each of the three health risk behaviors. Each analysis of health risk behavior consisted of six models, corresponding to one of the previously described operational definitions. All analyses were weighted to accommodate the survey design.

We also tested if adding sexual identity explained a statistically significant amount of additional and unique variability beyond sexual behavior for each of the health risk behaviors. Using a chi-square test with 3 degrees of freedom, we compared the $-2 \log$ likelihood value of a fully saturated model with that of Model 6 in order to test the “value

added” of sexual behavior to a model already including sexual identity.³⁰ Analyses were conducted using SAS software for Windows, version 9.3 (SAS Institute Inc., Cary, NC).

Results

Demographic characteristics are presented in Table 1. Consistent with the demographic makeup of Massachusetts, most students in the sample were white (75%). Almost 20% of the sample had smoked a cigarette in the past 30 days, 7.4% had ever made a plan to commit suicide, and 4.8% had ever used methamphetamines. The majority of the sample (52.9%) reported only having sexual contact with someone of the opposite sex, and a minority reported either exclusively same-sex (2.1%) or both-sex sexual behavior (3.5%). Most students identified as heterosexual or straight (93.7%), approximately 1% identified as lesbian or gay, 3% identified as bisexual, and 2% were “not sure” about their sexual identity. Seven percent of the sample reported any same-sex sexual behavior or sexual minority identity. Table 2 summarizes the distribution of sexual behavior by sexual identity for females and males. The results of sexual orientation operational manipulations are presented for current smoking status (Table 3), forming a suicide plan (Table 4), and methamphetamine use (Table 5).

Operational manipulations of sexual behavior

Manipulations of the sexual behavior variable are represented in Models 1–3 (Tables 3–5). For all health risk behaviors, once any same-sex sexual behavior was disaggregated into its two component categories (i.e., having sex with both men and women, and having sex exclusively with same-sex partners) disparities previously attributed to same-sex behavior appeared to be largely driven by persons who were behaviorally bisexual. This manipulation (i.e., moving from Model 1 to Model 2) was so large that effects associated with exclusively same-sex sexual behavior were no longer statistically significant for males or females. For example, the adjusted odds ratio (AOR) for smoking among females with any same-sex sexual behavior was 3.2 (95% confidence interval [CI]: 2.4, 4.3), but in the disaggregated model, the AOR for women who only had sex with women was 1.0 (95% CI: .76, 1.4), while the AOR for women who had sex with both women and men was 3.8 (95% CI: 2.4, 6.3). The addition of students who were not sexually active did not change the findings from the previous model, though they were significantly less likely to engage in all health risk behaviors.

Operational manipulations of sexual identity

Manipulations of the sexual identity variable are represented in Models 4–6 (Tables 3–5). In contrast to the results of disaggregating the sexual behavior variable, disaggregating the sexual identity variable from Model 4 into its component categories (i.e., lesbian/gay and bisexual) in Model 5 neither erased nor attenuated associations of exclusive same-sex identity with the outcomes. All sexual minority identities were associated with increased likelihood of engaging in all health risk behaviors for both males and females. However, lesbians were just as, if not more, likely to engage in health risk behaviors compared to bisexual females, a result contrary to comparable manipulations for sexual behavior. Furthermore, compared to their heterosexual counterparts, lesbian and bisexual females

appeared to have greater odds of engaging in health risk behaviors than gay and bisexual men. Disaggregating sexual identity among sexual minority males revealed that disparities for gay and bisexual males were relatively similar to each other, with the exception that gay males appeared to have greater odds of having ever made a suicide plan. Finally, the addition of those students who were unsure about their sexual identity revealed that they too were consistently more likely to engage in health risk behaviors than heterosexual students. Being “not sure” of one’s sexual identity appeared to result in a greater disparity for males than females.

Sexual behavior and sexual identity

We ran a fully saturated model that included the most expansive definitions of both sexual behavior and sexual identity to determine if these variables were redundant in modeling the association between sexual orientation and health risk behavior. The addition of sexual identity was statistically significant for both females and males for all three behaviors ($p < 0.001$; data not shown). These results indicate that both sexual identity and sexual behavior explain significant and unique sources of variability in health disparities by sexual orientation.

Discussion

The accumulating documentation of health disparities among sexual minority populations has received national attention in the last several years through high-profile documents such as the IOM consensus report.¹ With the Department of Health and Human Services expressing public intent to add sexual orientation to federal surveys,³ data about sexual minority populations will grow. We should be circumspect about how sexual orientation is operationalized; two researchers with the same data but different operational definitions could reach two different conclusions. Just as studies illustrate the empirical consequences of making distinctions between dimensions of sexual orientation on the prevalence of studied outcomes,⁶⁻¹² so too can the operationalization of these dimensions influence results. Rather than labeling these definitional issues as limitations, we suggest they provide opportunities to investigate how identity changes across the life course and to explore mechanisms through which sexual orientation becomes associated with health inequities.

We highlight three primary findings. The first is that aggregating all sexual minorities into one category, while increasing statistical power, obscures important differences. In our sample, bisexual behavior was associated with disparities in health risk behaviors to such a degree that it effectively masked the lack of significant differences in health risk behaviors between those who engaged in exclusively same-sex sexual behavior and their opposite-sex counterparts until these groups were examined separately.

The second primary finding concerns the inability to align sexual behavior and sexual identity, confirming work done by others.⁶⁻¹² As shown in Table 2, there is a sizeable “discordance” between sexual identity and sexual behavior, indicative that distinct dimensions of sexual orientation should not be misinterpreted as proxies for each other. This lack of concordance may signify the rapid development in adolescence, which makes equating sexual identity and sexual behavior even more problematic. For instance, among

sexually active adolescents, there may be limited opportunities to engage in same-sex sexual behavior due to external influences, such as identifying same-sex romantic partners or being pressured to comply with heterosexist narratives of opposite-sex sexual behavior. Such factors may contextualize why one in five self-identified gay men reported having had sex only with women or why one-fourth of self-identified bisexual women reported sex only with men. When possible, these dimensions of sexual orientation should be examined independently.

Our last primary finding is an extension of this “discordance.” The inclusion of both identity and behavior in the saturated regression model indicated that these two separate dimensions explain unique and significant sources of variability in behaviors, which highlights the robustness of disparities across multiple dimensions of sexual orientation. The theoretical reasoning for separation of these constructs notwithstanding, post-hoc analyses of multicollinearity confirmed that sexual behavior and sexual identity were not so highly correlated that, even empirically, one could be used as a proxy for the other.

These operational manipulations provide opportunities for additional explication of how sexual orientation ultimately results in health disparities, since, to be clear, sexual minority status does not, *itself*, cause poor health. The frequency with which bisexual-identified adolescents reported the highest odds of engaging in health risk behaviors lends support to Zinik’s articulation of the “double closet,” where the effect of stress for bisexual persons is enhanced because of hiding same-sex activities from their heterosexual peers while simultaneously hiding heterosexual activities from their gay and lesbian peers.³¹ Bauer and Brennan³² note that measurement of bisexual behavior may cause an artificial association with negative health outcomes. Unlike other response categories, individuals must have had sex with at least two partners over a time period and may be confounded with number of sex partners, a variable which may reflect a general risk-taking propensity irrespective of sexual orientation. Our results support this possibility, since respondents in the MA YRBS who had not yet initiated sexual behavior were far less likely to engage in any of the three health risk behaviors, and bisexual identity did not diverge from gay or lesbian identity to the extent that bisexual behavior diverged from same-sex sexual behavior.

Disparities experienced by those who were “not sure” of their sexual identity also provide additional insight. Austin et al.³³ found that adolescents preferred sexual identity measures that allowed for intermediate options, such as “mostly heterosexual,” reporting “not sure” may reflect a desire for these intermediate categories. Additionally, “not sure” may reflect the process in which an adolescent begins to reconcile a newly discovered same-sex attraction with self-identity.^{15,34} An examination of “not sure” among those who have had more time to develop their sexual identity may yield very different results from our study of adolescents. Much remains to be learned about what “not sure” substantively entails for adolescents, though it appears to suggest a consequence of being unable to benefit from heterosexual privilege.

The impending inclusion of sexual orientation on federal health surveys necessitates consensus for best ways to operationalize and analyze these data to allow for meaningful comparisons.^{3,5} Acknowledging the previously mentioned imprecision of “not sure” as a

response option, we recommend that when statistically viable researchers treat this as a valid response group rather than recoding as missing data. We also caution against aggregating bisexual and exclusively same-sex response options when possible. Though not the focus of this study, we recommend researchers continue to stratify analyses by sex and formally test effect modification by sex if sample size allows. Public health intersectionality research illustrates the varying effects of race and class by sex,³⁵ so too should modeling strategies accommodate this perspective with sexual orientation when the data can support it. Notably, other research has indicated “discordance” between sexual behavior and sexual identity may be more likely among racial and ethnic minority individuals.^{36,37}

There are notable limitations in this study, one of which is the relatively small sample of sexual minority respondents in the sample, despite the large overall sample size. Furthermore, the use of one state’s YRBS data hampers generalizability of results. We strongly suspect changing the operational definition of sexual orientation will have consequences in any sample of LGB adolescents. However, we caution that the specific nature of effects documented in this study will vary across regions within the United States and countries over the world given the diverse and changing sociocultural and temporal contexts of sexual orientation. Social desirability bias may be enhanced among students fearing disclosure of their sexual orientation because the YRBS is administered at school. The MA YRBS did not assess sexual attraction, so we were unable to include this dimension in our operational manipulations. We also acknowledge the limits of quantitative methods to explore the heterogeneity captured by the “not sure” response option. Despite controlling for several demographic factors to reduce the likelihood of confounding, there are other unmeasured variables for which we could not control (e.g., the extent of sexual identity disclosure).

This study makes notable contributions by empirically demonstrating the consequences of operational definitions in the study of LGB health disparities among adolescents. Though the nature of secondary data analysis precludes the ability to directly impact how sexual orientation is assessed, we hope that by making an explicit distinction between measurement and operationalization that we encourage researchers to spend additional time thinking about how to analyze data and interpret results. Finally, it should be made clear that we do not advocate for abandoning a great analysis for a perfect one when the latter can never be. All statistical modeling necessitates decisions that are not conceptually ideal. Instead of impeding quantitative research with sexual minority adolescents, we intend the opposite: to enable the producers and consumers of research to engage in a more informed contextualization of reported findings. The thoughtful analysis of sexual orientation in public health data can help to elucidate mechanisms and better inform those interventions and policies aimed at severing the links between sexual orientation and poor health.

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References

1. Institute of Medicine. *The Health of Lesbian, Gay, Bisexual, and Transgender People: Building a Foundation for Better Understanding*. Washington, DC: The National Academies Press; 2011.
2. Kann L, Olsen E, McManus T, Kinchen S, Chyen D, Harris WA, Wechsler H. Sexual identity, sex of sexual contacts, and health-risk behaviors among students in grades 9–12—youth risk behavior surveillance, selected sites, United States, 2001–2009. *MMWR*. 2011; 60:1–133. [PubMed: 21659985]
3. Department of Health and Human Services. *Plan for Health Data Collection on Lesbian, Gay, Bisexual and Transgender (LGBT) Populations*. 2012. [updated October 2; cited 2013 March 14]. Available at <http://minorityhealth.hhs.gov/templates/browse.aspx?lvl=2&lvlID=209>
4. Department of Health and Human Services. *Lesbian, Gay, Bisexual, and Transgender Health*. Washington, DC: 2012. [updated September 6; cited 2013 March 18]. Available at www.healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicid=25
5. Sexual Minority Assessment Research Team (SMART). *Best Practices for Asking Questions About Sexual Orientation on Surveys*. Los Angeles, CA: The Williams Institute; 2009.
6. Igartua K, Thombs BD, Burgos G, Montoro R. Concordance and discrepancy in sexual identity, attraction, and behavior among adolescents. *J Adolesc Health*. 2009; 45:602–608. [PubMed: 19931833]
7. Sell RL. Defining and measuring sexual orientation: A review. *Arch Sex Behav*. 1997; 26:643–658. [PubMed: 9415799]
8. Young R, Meyer I. The trouble with “MSM” and “WSW”: Erasure of the sexual-minority person in public health discourse. *Am J Public Health*. 2005; 95:1144–1149. [PubMed: 15961753]
9. McCabe SE, Hughes TL, Bostwick W, Morales M, Boyd CJ. Measurement of sexual identity in surveys: Implications for substance abuse research. *Arch Sex Behav*. 2012; 41:649–657. [PubMed: 21573706]
10. Brewster KL, Tillman KH. Sexual orientation and substance use among adolescents and young adults. *Am J Public Health*. 2012; 102:1168–1176. [PubMed: 22021322]
11. Rotheram-Borus MJ, Fernandez MI. Sexual orientation and developmental challenges experienced by gay and lesbian youths. *Suicide Life Threat Behav*. 1995; 25:26–34. [PubMed: 8553426]
12. Bostwick WB, Boyd CJ, Hughes TL, McCabe SE. Dimensions of sexual orientation and the prevalence of mood and anxiety disorders in the United States. *Am J Public Health*. 2009; 100:468–475. [PubMed: 19696380]
13. Coker TR, Austin SB, Schuster MA. The health and health care of lesbian, gay, and bisexual adolescents. *Annu Rev Public Health*. 2010; 31:457–477. [PubMed: 20070195]
14. Jamil OB, Harper GW, Fernandez MI. Sexual and ethnic identity development among gay/bisexual/questioning (GBQ) male ethnic minority adolescents. *Cultur Divers Ethnic Minor Psychol*. 2009; 15:203–214. [PubMed: 19594249]
15. Savin-Williams RC. A critique of research on sexual-minority youths. *J Adolesc*. 2001; 24:5–13. [PubMed: 11259066]
16. Ford JA, Jasinski JL. Sexual orientation and substance use among college students. *Addict Behav*. 2006; 31:404–413. [PubMed: 15970397]
17. Lee JGL, Griffin GK, Melvin CL. Tobacco use among sexual minorities in the USA, 1987 to May 2007: A systematic review. *Tob Control*. 2009; 18:275–282. [PubMed: 19208668]
18. Stall R, Paul JP, Greenwood G, Pollack LM, Bein E, Crosby GM, Mills TC, Binson D, Coates TJ, Catania JA. Alcohol use, drug use and alcohol-related problems among men who have sex with men: The Urban Men’s Health Study. *Addiction*. 2001; 96:1589–1601. [PubMed: 11784456]
19. Marshal MP, Dietz LJ, Friedman MS, Stall R, Smith HA, McGinley J, Thoma BC, Murray PJ, D’Augelli AR, Brent DA. Suicidality and depression disparities between sexual minority and heterosexual youth: A meta-analytic review. *J Adolesc Health*. 2011; 49:115–123. [PubMed: 21783042]
20. Blosnich J, Bossarte R. Drivers of disparity: differences in socially based risk factors of self-injurious and suicidal behaviors among sexual minority college students. *J Am Coll Health*. 2012; 60:141–149. [PubMed: 22316411]

21. King M, Semlyen J, Tai SS, Killaspy H, Osborn D, Popelyuk D, Nazareth I. A systematic review of mental disorder, suicide, and deliberate self harm in lesbian, gay and bisexual people. *BMC Psychiatry*. 2008; 8:70. [PubMed: 18706118]
22. Massachusetts Department of Education. 2003 Youth Risk Behavior Survey Results. Malden, MA: 2004.
23. Massachusetts Department of Education. 2005 Youth Risk Behavior Survey Appendix B: Sampling, Survey Administration, Data Weighting, Data Analysis Procedures. Malden, MA: 2006.
24. Massachusetts Departments of Education & Public Health. Health and Risk Behaviors of Massachusetts Youth, 2007: The Report. Boston, MA: 2008.
25. Grunbaum JA, Kann L, Kinchen S, Ross J, Hawkins J, Lowry R, Harris WA, McManus T, Chyen D, Collins J. Youth risk behavior surveillance—United States, 2003. *MMWR*. 2004; 53:1–96.
26. Eaton DK, Kann L, Kinchen S, Ross J, Hawkins J, Harris WA, Lowry R, McManus T, Chyen D, Shanklin S, Lim C, Grunbaum JA, Wechsler H. Youth risk behavior surveillance—United States, 2005. *MMWR*. 2006; 55:1–108. [PubMed: 16760893]
27. Eaton DK, Kann L, Kinchen S, Shanklin S, Ross J, Hawkins J, Harris WA, Lowry R, McManus T, Chyen D. Youth risk behavior surveillance—United States, 2007. *MMWR*. 2008; 57:1–131. [PubMed: 18528314]
28. Marshal MP, Friedman MS, Stall R, King KM, Miles J, Gold MA, Bukstein OG, Morse JQ. Sexual orientation and adolescent substance use: a meta-analysis and methodological review. *Addiction*. 2008; 103:546–556. [PubMed: 18339100]
29. Conron KJ, Mimiaga MJ, Landers SJ. A population-based study of sexual orientation identity and gender differences in adult health. *Am J Public Health*. 2010; 100:1953–1960. [PubMed: 20516373]
30. Hosmer, DW.; Lemeshow, S. *Applied Logistic Regression*. 2. New York: John Wiley & Sons; 2004.
31. Zinik, G. Identity conflict or adaptive flexibility? Bisexuality reconsidered. In: Rust, PC., editor. *Bisexuality in the United States: A Social Science Reader*. New York: Columbia University Press; 2000. p. 55-60.
32. Bauer G, Brennan D. The problem with “behavioral bisexuality”: Assessing sexual orientation in survey research. *J Bisex*. 2013; 13:148–165.
33. Austin SB, Conron KJ, Patel A, Freedner N. Making sense of sexual orientation measures: findings from a cognitive processing study with adolescents on health survey questions. *J LGBT Health Res*. 2007; 3:55–65. [PubMed: 18029316]
34. Troiden RR. The formation of homosexual identities. *J Homosex*. 1989; 17:43–74. [PubMed: 2668403]
35. Schulz, AJ.; Mullings, L., editors. *Gender, Race, Class, and Health: Intersectional Approaches*. San Francisco, CA: Jossey-Bass; 2006.
36. Pathela P, Hajat A, Schillinger J, Blank S, Sell R, Mostashari F. Discordance between sexual behavior and self-reported sexual identity: a population-based survey of New York City men. *Ann Intern Med*. 2006; 145:416–425. [PubMed: 16983129]
37. Ross MW, Essien EJ, Williams ML, Fernandez-Esquer ME. Concordance between sexual behavior and sexual identity in street outreach samples of four racial/ethnic groups. *Sex Transm Dis*. 2003; 30:110–113. [PubMed: 12567166]

Table 1

Demographic Characteristics of Massachusetts Youth Risk Behavioral Surveillance System Respondents, 2003–2007

	n ^a	% (SE) ^b
Sex		
Female	5233	49.4 (0.71)
Male	5020	50.6 (0.71)
Grade		
9th	2923	28.5 (2.1)
10th	2785	25.6 (1.6)
11th	2430	23.9 (1.2)
12th	2033	22.0 (1.1)
Race/ethnicity		
Black or African American	707	8.7 (1.0)
Hispanic or Latino	876	8.7 (1.0)
White	6834	75.0 (1.9)
Other	1594	7.6 (0.35)
Health risk behaviors		
Current smoker	1935	19.7 (0.67)
Ever made suicide plan	675	7.4 (0.32)
Ever used methamphetamines	509	4.8 (0.27)
Sexual behavior		
Exclusively same sex	201	2.1 (0.15)
Both sexes	356	3.5 (0.23)
No sexual contact	4218	41.5 (0.72)
Exclusively opposite sex	5147	52.9 (0.74)
Sexual identity		
Lesbian or gay	120	1.2 (0.12)
Bisexual	320	3.1 (0.18)
Not sure	219	2.1 (0.21)
Heterosexual	9460	93.7 (0.32)
Any same-sex behavior or identity	740	7.2 (0.32)

^aUnweighted frequencies.

^bWeighted proportions.

Table 2

Reported Measures of Sexual Orientation: Sexual Behavior by Sexual Identity, Massachusetts Youth Risk Behavioral Surveillance System Respondents, 2003–2007

Sexual behavior	Sexual identity, n (%) ^a			
	Women			
	Lesbian (n = 41)	Bisexual (n = 246)	Heterosexual (n = 4,665)	Not sure (n = 112)
Exclusively same sex	16 (36.6)	14 (6.4)	53 (1.1)	3 (2.2)
Both sexes	19 (47.9)	124 (51.5)	94 (2.1)	22 (21.0)
No sexual contact	5 (13.5)	45 (16.9)	2127 (44.3)	55 (47.2)
Exclusively opposite sex	1 (2.0)	63 (25.3)	2391 (52.5)	32 (29.7)

Sexual behavior	Men			
	Gay (n = 75)	Bisexual (n = 66)	Heterosexual (n = 4,568)	Not sure (n = 96)
	Exclusively same sex	23 (33.5)	13 (20.2)	69 (1.6)
Both sexes	17 (20.4)	24 (37.3)	37 (0.9)	16 (16.9)
No sexual contact	20 (25.1)	12 (19.2)	1883 (40.4)	40 (43.3)
Exclusively opposite sex	15 (21.1)	17 (23.3)	2579 (57.2)	35 (33.4)

Note: Individuals were excluded from analysis if data was missing on either their sexual behavior or sexual identity.

^a Column percentages are weighted proportions.

Table 3

Adjusted Odds Ratios of Current Smoking for Sexual Minorities: Six Operational Definitions of Sexual Behavior and Sexual Identity, Massachusetts Youth Risk Behavioral Surveillance System Respondents, 2003–2007

	Currently smoking			Currently smoking		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Women						
Sexual behavior						
Any same sex (n = 349)	3.2 (2.4, 4.3)	—	—	6.4 (5.1, 8.0)	—	—
Only same sex (n = 89)	—	1.0 (0.76, 1.4)	1.0 (0.76, 1.4)	—	9.9 (4.8, 20.6)	9.9 (4.8, 20.4)
Sex with both (n = 260)	—	3.8 (2.4, 6.3)	3.8 (2.4, 6.3)	—	6.0 (4.6, 7.9)	6.0 (4.6, 7.9)
No sex (n = 2249)	—	—	0.23 (0.16, 0.33)	—	—	1.2 (0.73, 2.0)
Only opposite sex (n = 2492)	ref	ref	ref	ref	ref	ref
Men						
Sexual behavior						
Any same sex (n = 208)	2.2 (1.5, 3.2)	—	—	2.9 (2.0, 4.2)	—	—
Only same sex (n = 112)	—	1.4 (0.88, 2.2)	1.4 (0.87, 2.2)	—	2.8 (1.5, 5.2)	2.8 (1.5, 5.2)
Sex with both (n = 96)	—	3.8 (2.2, 6.6)	3.8 (2.2, 6.6)	—	3.0 (1.6, 5.3)	3.0 (1.6, 5.3)
No sex (n = 1969)	—	—	0.23 (0.19, 0.28)	—	—	2.0 (1.2, 3.3)
Only opposite sex (n = 2655)	ref	ref	ref	ref	ref	ref

All analyses are weighted and adjusted for year of data collection, race/ethnicity, and high school grade.

AOR, adjusted odds ratio; CI, confidence interval.

Table 4

Adjusted Odds Ratios of Planned Suicide Attempt for Sexual Minorities: Six Operational Definitions of Sexual Behavior and Sexual Identity, Massachusetts Youth Risk Behavioral Surveillance System Respondents, 2003–2007

	Planned suicide attempt			Planned suicide attempt		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	AOR (95%CI)					
	AOR (95%CI)			AOR (95%CI)		
Women						
Sexual behavior						
Any same sex (n = 349)	2.9 (2.2, 3.7)			4.6 (3.3, 6.2)		
Only same sex (n = 89)	—	1.4 (0.78, 2.6)	1.4 (0.78, 2.6)	—	5.9 (2.9, 12.2)	5.9 (2.9, 12.3)
Sex with both (n = 260)	—	3.5 (2.6, 4.7)	3.5 (2.6, 4.7)	—	4.3 (3.1, 6.1)	4.3 (3.1, 6.1)
No sex (n = 2249)	—	—	0.56 (0.46, 0.68)	—	—	1.9 (1.1, 3.2)
Only opposite sex (n = 2492)	ref	ref	ref	ref	ref	ref
Men						
Sexual behavior						
Any same sex (n = 208)	2.8 (1.8, 4.3)			4.6 (3.0, 7.1)		
Only same sex (n = 112)	—	1.3 (0.67, 2.4)	1.3 (0.66, 2.4)	—	5.4 (3.4, 8.6)	5.4 (3.4, 8.7)
Sex with both (n = 96)	—	5.4 (2.9, 10.4)	5.4 (2.9, 10.4)	—	3.7 (1.9, 7.1)	3.7 (1.9, 7.1)
No sex (n = 1969)	—	—	0.59 (0.45, 0.77)	—	—	2.6 (1.3, 5.1)
Only opposite sex (n = 2655)	ref	ref	ref	ref	ref	ref

All analyses are weighted and adjusted for year of data collection, race/ethnicity, and high school grade.

Table 5

Adjusted Odds Ratios of Methamphetamine Use for Sexual Minorities: Six Operational Definitions of Sexual Behavior and Sexual Identity, Massachusetts Youth Risk Behavioral Surveillance System Respondents, 2003–2007

	Used methamphetamines			Used methamphetamines		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Women						
Sexual behavior						
Any same sex (n = 349)	4.1 (2.7, 6.3)	—	—	6.8 (4.9, 9.4)	—	—
Only same sex (n = 89)	—	1.1 (0.40, 3.2)	1.1 (0.41, 3.2)	—	10.4 (3.7, 29.0)	10.4 (3.8, 28.9)
Sex with both (n = 260)	—	5.3 (3.4, 8.2)	5.3 (3.4, 8.2)	—	6.4 (4.7, 8.6)	6.4 (4.7, 8.6)
No sex (n = 2249)	—	—	0.11 (0.06, 0.22)	—	—	2.5 (1.1, 6.0)
Only opposite sex (n = 2492)	ref	ref	ref	ref	ref	ref
Men						
Sexual behavior						
Any same sex (n = 208)	4.1 (2.5, 6.7)	—	—	5.2 (3.4, 7.9)	—	—
Only same sex (n = 112)	—	1.0 (0.45, 2.3)	1.0 (0.44, 2.3)	—	5.2 (2.4, 11.2)	5.1 (2.4, 11.1)
Sex with both (n = 96)	—	10.2 (6.1, 16.9)	10.2 (6.1, 16.9)	—	5.1 (2.5, 10.3)	5.1 (2.5, 10.3)
No sex (n = 1969)	—	—	0.13 (0.08, 0.21)	—	—	4.0 (2.4, 6.6)
Only opposite sex (n = 2655)	ref	ref	ref	ref	ref	ref

All analyses are weighted and adjusted for year of data collection, race/ethnicity, and high school grade.