

Adult Health Behaviors Over the Life Course by Sexual Orientation

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Researchers have identified differences in negative health behaviors by sexual orientation. For example, population-based data show that gay men, lesbians, and bisexual women are more likely than are heterosexual men and women to be smokers.¹ Lesbians and bisexual women have lower alcohol abstinence rates and are more likely to report alcohol-related social consequences, alcohol dependence, and past help-seeking for an alcohol problem.² Among men, sexual orientation is linked to fewer differences in alcohol use.² In addition, several studies indicate that sexual minorities (e.g., lesbians, gays, bisexuals) are not receiving regular medical care and are more frequently utilizing the emergency room (ER).³⁻⁵ Parallel to the literature showing sexual minority individuals exhibiting riskier behaviors is a body of literature linking risky behaviors to minority stress and more experiences of discrimination.^{6,7}

Despite the emergence of an increasing number of studies indicating differences in risk behaviors by sexual orientation and describing the societal conditions that contribute to these risk behaviors, there is still no certainty about the extent to which risky behaviors are consistent across age cohorts. To date, alcohol use among women is highest among sexual minority women aged 26 to 35 years.⁸ Similarly, Hughes concluded that rates of drinking, heavy drinking, and problem drinking among lesbians and gay men decline less with age compared with declines among heterosexual women and men.⁹ However, other studies have suggested that although lesbians smoke more than do heterosexual women at younger ages, the difference is not significant at older ages.^{10,11}

Research that assesses risk behaviors across age cohorts is lacking because of a number of barriers, including data sets with small subsamples of lesbian, gay, and bisexual individuals, which do not allow for further detailed analyses by age. We suggest that understanding risk behaviors by age is important to determine the extent to which there are age

Objectives. We estimated differences in health behaviors among adults by sexual orientation.

Methods. We pooled 4 years of data (2001, 2003, 2005, and 2007) from the California Health Interview Survey. We estimated the frequency of smoking, alcohol use, healthy dietary behaviors, physical activity, and health care utilization, and we used logistic regression modeling to determine the odds of each behavior with increasing age and for 2 age groups: younger than 50 years and 50 years old or older.

Results. At any adult age, lesbians had greater odds of smoking and binge drinking than did heterosexual women, and gay and bisexual men had greater health care utilization than did heterosexual men. Other risk behaviors differed with age.

Conclusions. Some behavioral change interventions should target lesbians, gays, and bisexuals at all ages, whereas other interventions should specifically target individuals at younger ages. (*Am J Public Health.* 2012;102:292-300. doi: 10.2105/AJPH.2011.300334)

and sexual orientation disparities in risk behaviors and to inform interventions to reduce these risk behavior disparities. Therefore, we sought to determine the extent to which risk behaviors of lesbian, gay, and bisexual individuals differed from those of heterosexual populations across age cohorts. We tested 2 hypotheses for each gender: (1) risk behaviors are more prevalent among younger sexual minorities compared with same-aged heterosexuals, and (2) risk behavior disparities by sexual orientation are reduced at older ages.

METHODS

This protocol was deemed exempt from institutional review board review. We obtained data from the California Health Interview Survey (CHIS), the largest state health survey conducted in the United States. The survey employs a 2-stage geographically stratified random-digit-dial sample design and continuously monitors the health of Californians by collecting information biannually on hundreds of health topics. The CHIS response rate is comparable to response rates for other scientific telephone surveys in California, such as the California Behavioral Risk Factor Surveillance

System Survey, and it varies by year from 37.7% for 2001 to 18.1% for 2007. Before CHIS data are released to researchers, the CHIS uses multiple imputation methods, in particular for items that are essential for weighting the data. However, overall item nonresponse rates in the CHIS are low, with most variables missing valid responses for less than 2% of the sample. An exception to this low item nonresponse is household income. As recommended by the CHIS, we weighted all analyses to obtain estimates that were an unbiased representation of the California population. More detailed information about the CHIS methodology, including imputation, nonresponse, and weighting, can be obtained from the CHIS Web site (<http://www.chis.ucla.edu>).

To have a sufficient sample of lesbian, gay, and bisexual individuals at different ages, we combined 4 years of data: the 2001, 2003, 2005, and 2007 surveys. Our analyses were restricted to participants who were asked about their sexual orientation and who identified as heterosexual, gay, lesbian, or bisexual, which resulted in a sample size of 68 125 men and 95 096 women. This eligibility criterion excluded 0.3% to 0.9% individuals per year who

reported being celibate, not sexual, or other. We did not ascertain gender identity; therefore, data on transgender individuals were not available.

Outcome Variables

The outcome variables included 4 types of health behaviors: (1) tobacco use, (2) alcohol use, (3) diet and physical activity, and (4) health care utilization. Measures for each of the health behaviors were included in each of the 4 survey years unless otherwise noted. We dichotomized all measures for analysis. The CHIS entailed 2 measures of tobacco use: (1) having ever smoked at least 100 cigarettes over the lifetime (yes vs no) and (2) current smoking status (smoker vs nonsmoker). The CHIS included 2 measures of alcohol use: (1) any alcohol use in the past month (yes vs no), asked in 2001, 2003, and 2005, which we combined with the 2007 question, any alcohol in the past 12 months, because the prevalence was similar; and (2) binge drinking in the past month, defined for women as drinking 4 or more drinks on 1 occasion and for men as drinking 5 or more drinks on 1 occasion (yes vs no), not ascertained in 2007.

The CHIS included 4 measures of diet and physical activity: (1) consumption of at least 5 fruits or vegetables daily (yes vs no), ascertained in 2001 and 2005; (2) participation in vigorous physical activities in the past 7 days (yes vs no), asked in 2005 and 2007, combined with a 2001 question about participation in vigorous physical activities in the past 30 days; (3) participation in moderate physical activities in the past 7 days (yes vs no) asked in 2005 and 2007, combined with a question asked in 2001 about participation in moderate physical activities in the past 30 days; and (4) muscle strengthening during the past week (yes vs no), not ascertained in 2003. The CHIS included 4 measures of health care utilization: (1) physician visit in past year (≥ 1 vs 0); (2) ER visits in past year (≥ 1 vs 0), not ascertained in 2003; (3) colon cancer screening among those aged 50 years or older (ever had vs never had); and (4) cervical cancer screening in past year among women (yes vs no).

We considered race, educational attainment, total annual household income, health insurance status, and nativity as covariates.

Analysis

We performed all statistical analyses with the SURVEY procedures in SAS version 9.2 (SAS Institute, Cary, NC), which incorporated the final sampling weight and the replicate weights to account for the complex sampling design of the CHIS. We used the jackknife repeated replication method to obtain accurate standard errors of the estimates of the means, proportions, and odds ratios. We used the Rao-Scott χ^2 test or *F* statistic to test for demographic and behavior differences in frequencies or means by sexual orientation groups, stratified by gender. We computed 2 logistic regression models for each behavior, with age defined differently in each model. In the first model, we used a continuous measure of age centered at 18 years and an interaction term for sexual orientation by age. In the second model, we used a dichotomous measure of age (<50 years vs ≥ 50 years) and an interaction term for sexual orientation and age. We chose to focus on age 50 years because this is the age at which the risk for cancer, heart disease, and stroke increases significantly, which is why it is recommended that several preventive screenings begin at that age.¹² We adjusted all models for race, education, household income, and nativity.

RESULTS

Table 1 shows demographic characteristics by sexual orientation, stratified by gender. Among women, the sexual orientation groups significantly differed on all demographic characteristics. Compared with heterosexual women, lesbians were more likely to be White, to have more education and higher incomes, and to be US-born. Bisexual women were more likely to be younger, uninsured, and US-born compared with heterosexual women. Among men, the sexual orientation groups differed on all demographics except for age. Men were aged, on average, 40 years regardless of sexual orientation. However, fewer gay and bisexual men were older than 50 years compared with heterosexual men. In addition, gay men were more likely than were heterosexual men to be White and to have more education, whereas bisexual men were more likely than were heterosexual men to have lower incomes, to be uninsured, and to be US-born.

Women

Table 2 presents the unadjusted prevalence estimates and logistic regression models for women's health behaviors.

Tobacco use. Compared with heterosexual women, lesbian and bisexual women had a higher prevalence of tobacco use. At age 18, lesbians had more than twice the odds and bisexuals more than 3 times the odds of having smoked 100 cigarettes in their lifetime and being current smokers. The interaction effect with age as a continuous measure indicates that tobacco use decreased for bisexual women at older ages, whereas lesbians' tobacco use did not significantly differ with age. When we dichotomized age at 50 years, lesbians had more than twice the odds of heterosexual women of endorsing tobacco use in both age strata. Compared with heterosexual women, bisexual women were more than twice as likely to use tobacco when younger than 50 years, but among those aged 50 years or older, bisexual women's likelihood of reporting as a current smoker was not significantly different from that of heterosexual women of the same age. Bisexual women aged 50 years or older were less likely than were younger bisexual women to have smoked 100 cigarettes in their lifetime, but they still had 1.45 the odds of having done so compared with heterosexual women.

Alcohol use. Compared with heterosexual women, both lesbians and bisexual women had a greater prevalence of alcohol use. At age 18, lesbians and bisexual women were about twice as likely as heterosexual women to report alcohol use in the past month and binge drinking on at least 1 occasion in the past year. With an increase in age, reports of alcohol use in the past month decreased for both lesbian and bisexual women. However, reports of binge drinking did not significantly change with an increase in age for lesbian and bisexual women. Compared with heterosexual women younger than 50 years, lesbians and bisexual women of comparable age were 70% more likely to endorse alcohol use, whereas among those aged 50 years or older, alcohol use no longer significantly differed from that of heterosexual women. Lesbians' binge drinking remained significantly higher than heterosexual women's among both age strata. Binge drinking among bisexual women younger than

TABLE 1—Demographic Characteristics of the California Population, by Sexual Orientation: California Health Interview Survey, 2001, 2003, 2005, and 2007

Characteristic	Women (n = 95 096)			P	Men (n = 68 125)			P
	Heterosexual, No. or % (SE)	Lesbian, No. or % (SE)	Bisexual, No. or % (SE)		Heterosexual, No. or % (SE)	Gay, No. or % (SE)	Bisexual, No. or % (SE)	
Unweighted sample size	92 379	1281	1436		65 294	2037	794	
Mean age, y								
Range (18–85)	41.91 (0.02)	41.29 (0.55)	34.68 (0.52)	<.001	40.84 (0.03)	40.35 (0.42)	39.33 (0.77)	.894
18–49	69.15 (0.09)	75.17 (1.50)	84.84 (1.29)	<.001	71.63 (0.10)	78.95 (1.05)	75.42 (2.00)	<.001
50–85	30.85 (0.09)	24.83 (1.50)	15.16 (1.29)		28.37 (0.10)	21.05 (1.05)	24.58 (2.06)	
Race/ethnicity				<.001				<.001
White	49.49 (0.10)	67.49 (2.33)	56.15 (2.17)		49.32 (0.11)	63.86 (1.74)	53.64 (2.53)	
Latino	25.12 (0.14)	13.12 (2.04)	17.69 (1.96)		26.98 (0.16)	15.89 (1.43)	21.36 (2.23)	
Asian	12.97 (0.05)	4.93 (1.06)	10.57 (1.33)		11.95 (0.05)	7.45 (1.06)	10.67 (1.78)	
African American	6.54 (0.03)	7.43 (1.44)	7.42 (1.04)		5.65 (0.04)	6.48 (1.00)	5.52 (1.08)	
Other	5.88 (0.12)	7.03 (1.00)	8.17 (1.37)		6.10 (0.14)	6.32 (1.04)	8.81 (1.82)	
Education				<.001				<.001
High school or lower	42.41 (0.18)	24.07 (2.06)	35.76 (2.13)		44.11 (0.19)	21.95 (1.60)	39.68 (2.74)	
Some college or vocational school	18.84 (0.19)	18.32 (1.75)	22.97 (1.78)		16.66 (0.21)	18.43 (1.43)	19.14 (2.09)	
Completed college	27.53 (0.20)	35.73 (2.19)	27.24 (1.91)		25.98 (0.21)	37.70 (1.66)	28.31 (2.38)	
More than college	11.22 (0.13)	21.88 (1.51)	14.03 (1.20)		13.25 (0.15)	21.92 (1.22)	12.87 (1.65)	
Household annual income, \$				<.001				<.001
0–30 000	35.47 (0.22)	25.67 (1.98)	38.67 (2.19)		29.73 (0.25)	24.13 (1.52)	38.50 (2.65)	
30 001–70 000	31.57 (0.23)	34.23 (2.12)	31.36 (1.90)		31.92 (0.29)	32.75 (1.51)	32.77 (2.80)	
70 001–100 000	16.12 (0.18)	15.07 (1.42)	13.41 (1.31)		16.96 (0.21)	17.35 (1.33)	12.83 (1.57)	
> 100 000	16.85 (0.16)	25.03 (1.83)	16.57 (1.88)		21.39 (0.22)	25.77 (1.53)	15.90 (1.95)	
Insurance				.021				.013
Insured	84.42 (0.19)	86.10 (1.62)	80.23 (1.85)		80.18 (0.23)	83.32 (1.60)	74.58 (2.59)	
Not insured	15.58 (0.19)	13.90 (1.62)	19.77 (1.85)		19.82 (0.23)	16.68 (1.60)	25.42 (2.59)	
Nativity				<.001				<.001
US-born	65.85 (0.20)	86.61 (1.62)	80.47 (1.63)		65.53 (0.23)	82.35 (1.39)	70.19 (2.47)	
Foreign-born	34.15 (0.20)	13.39 (1.62)	19.53 (1.63)		34.47 (0.23)	17.65 (1.39)	29.81 (2.47)	

Note. Weighted estimates of the mean and column percentage of demographic characteristics of the population.

50 years was more than twice the odds of that among heterosexual women of the same age. Binge drinking did not significantly differ between lesbians and heterosexual women aged 50 years or older.

Diet and physical activity. The prevalence of physical activity significantly differed by sexual orientation, with both lesbians and bisexual women reporting more physical activity than heterosexual women. However, in models with continuous age, physical activity did not differ at age 18 years by sexual orientation group, and there were no significant changes with age for any of the measures of physical activity. Among women younger than 50 years, lesbians had increased odds of moderate activity

and bisexuals had increased odds of muscle strengthening relative to heterosexual women. Eating 5 or more servings of fruits and vegetables daily was not associated with sexual orientation or age, except for lower odds among lesbians compared with heterosexuals among those aged 50 years or older.

Health care utilization. The prevalence of physician visits over the past year and colon cancer screening did not significantly differ by sexual orientation or age. However, both lesbians and bisexual women reported significantly more ER visits, and lesbians reported significantly fewer Papanicolaou (Pap) tests than did heterosexual women. Compared with heterosexual women aged 18 years, lesbians

aged 18 years had about twice the odds of an ER visit but less than half the odds of having had a Papanicolaou (Pap) test. However, with increasing age, lesbians' odds of both Pap tests and ER visits did not significantly differ from those of heterosexual women. When we focused on those younger than 50 years, lesbians had about half the odds of having had a Pap test, and both lesbian and bisexual women had greater odds of an ER visit, than did heterosexual women of the same age. After age 50 years, the odds no longer differed by sexual orientation groups. Because of differences in health insurance by sexual orientation, we reexamined each health care utilization measure by adding health insurance status as an

TABLE 2—Unadjusted Prevalence and Adjusted Odds Ratios of Women’s Adult Health Behaviors, by Sexual Orientation and Age: California Health Interview Survey, 2001, 2003, 2005, and 2007

Variable	Unadjusted Prevalence, % (SE)	P	Model 1 (Continuous Age)		Model 2 (Dichotomous Age)	
			Effect of Sexual Orientation, AOR (95% CI)	Effect of Age and Interaction Terms, AOR (95% CI)	Effect of Sexual Orientation for Age <50 Years, AOR (95% CI)	Effect of Sexual Orientation for Age ≥50 Years, AOR (95% CI)
Tobacco use						
Smoked 100 cigarettes in life		<.001				
Heterosexual	31.03 (0.21)			1.02 (1.02, 1.02)	1.00 (Ref)	1.00 (Ref)
Lesbian	53.58 (2.10)		2.36 (1.50, 3.71)	1.00 (0.98, 1.01)	2.20 (1.79, 2.71)	2.21 (1.70, 2.88)
Bisexual	52.28 (2.12)		3.61 (2.61, 5.01)	0.98 (0.97, 1.00)	2.68 (2.17, 3.32)	1.51 (1.07, 2.11)
Current smoker		<.001				
Heterosexual	12.58 (0.16)			0.99 (0.99, 0.99)	1.00 (Ref)	1.00 (Ref)
Lesbian	23.52 (2.09)		2.72 (1.56, 4.73)	0.98 (0.97, 1.00)	1.94 (1.47, 2.56)	1.45 (1.07, 1.96)
Bisexual	28.48 (2.01)		3.48 (2.45, 4.93)	0.97 (0.96, 0.99)	2.57 (2.04, 3.23)	1.15 (0.81, 1.64)
Alcohol use						
Alcohol use past mo		<.001				
Heterosexual	54.61 (0.23)			0.99 (0.99, 0.99)	1.00 (Ref)	1.00 (Ref)
Lesbian	71.74 (1.88)		2.34 (1.47, 3.74)	0.98 (0.97, 1.00)	1.72 (1.33, 2.22)	1.25 (0.91, 1.71)
Bisexual	66.92 (1.96)		2.00 (1.43, 2.79)	0.99 (0.97, 1.00)	1.74 (1.41, 2.14)	1.03 (0.74, 1.42)
Binge drinking past mo		<.001				
Heterosexual	8.83 (0.16)			0.96 (0.96, 0.96)	1.00 (Ref)	1.00 (Ref)
Lesbian	16.30 (1.73)		1.85 (1.05, 3.26)	1.00 (0.97, 1.02)	1.54 (1.15, 2.05)	1.74 (1.05, 2.86)
Bisexual	20.22 (2.22)		2.05 (1.37, 3.07)	0.99 (0.98, 1.01)	2.26 (1.71, 2.99)	0.91 (0.47, 1.77)
Diet and physical activity						
≥5 fruits and vegetables daily		.094				
Heterosexual	43.20 (0.36)			1.00 (1.00, 1.00)	1.00 (Ref)	1.00 (Ref)
Lesbian	40.66 (2.79)		1.35 (0.74, 2.48)	0.98 (0.96, 1.00)	1.05 (0.78, 1.40)	0.57 (0.37, 0.87)
Bisexual	37.2 (2.74)		0.67 (0.44, 1.02)	1.02 (1.00, 1.03)	0.84 (0.64, 1.09)	1.02 (0.69, 1.51)
Vigorous activities past wk		<.001				
Heterosexual	31.45 (0.25)			0.97 (0.97, 0.97)	1.00 (Ref)	1.00 (Ref)
Lesbian	41.79 (2.57)		1.72 (0.99, 2.99)	0.99 (0.97, 1.01)	1.26 (0.97, 1.65)	1.15 (0.82, 1.62)
Bisexual	37.56 (2.32)		0.99 (0.68, 1.46)	1.00 (0.99, 1.02)	1.12 (0.88, 1.42)	1.17 (0.85, 1.62)
Moderate activities past wk		<.001				
Heterosexual	65.90 (0.26)			1.00 (1.00, 1.00)	1.00 (Ref)	1.00 (Ref)
Lesbian	75.67 (2.10)		1.48 (0.83, 2.66)	1.00 (0.98, 1.02)	1.41 (1.08, 1.86)	1.11 (0.80, 1.55)
Bisexual	69.60 (2.47)		1.18 (0.79, 1.78)	1.00 (0.98, 1.01)	1.16 (0.89, 1.51)	0.98 (0.67, 1.43)
Muscle strengthening past wk		<.001				
Heterosexual	40.66 (0.29)			0.99 (0.99, 0.99)	1.00 (Ref)	1.00 (Ref)
Lesbian	46.71 (2.44)		1.30 (0.79, 2.13)	0.99 (0.97, 1.01)	1.05 (0.82, 1.34)	1.01 (0.75, 1.35)
Bisexual	46.85 (2.30)		1.18 (0.83, 1.67)	1.00 (0.98, 1.01)	1.25 (1.01, 1.56)	0.80 (0.59, 1.09)
Health care utilization						
Physician visit past y		.202				
Heterosexual	86.81 (0.18)			1.01 (1.01, 1.02)	1.00 (Ref)	1.00 (Ref)
Lesbian	87.55 (1.37)		0.64 (0.35, 1.14)	1.02 (0.99, 1.04)	0.82 (0.62, 1.10)	1.49 (0.92, 2.41)
Bisexual	89.05 (1.24)		1.26 (0.81, 1.97)	1.00 (0.98, 1.02)	1.23 (0.93, 1.63)	1.20 (0.69, 2.06)

Continued

TABLE 2—Continued

Emergency room visit past y		<.001			
Heterosexual	18.46 (0.24)		1.00 (0.99, 1.00)	1.00 (Ref)	1.00 (Ref)
Lesbian	25.94 (2.56)	2.05 (1.06, 3.64)	0.99 (0.97, 1.01)	1.55 (1.13, 2.11)	1.24 (0.88, 1.74)
Bisexual	23.96 (2.16)	1.28 (0.87, 1.88)	1.00 (0.98, 1.01)	1.32 (1.03, 1.68)	0.86 (0.54, 1.35)
Papanicolaou test past y		<.001			
Heterosexual	73.63 (0.22)		0.97 (0.97, 0.98)	1.00 (Ref)	1.00 (Ref)
Lesbian	64.84 (2.23)	0.43 (0.26, 0.69)	1.02 (1.00, 1.03)	0.54 (0.42, 0.69)	0.89 (0.70, 1.15)
Bisexual	77.19 (1.75)	1.26 (0.90, 1.75)	0.99 (0.98, 1.00)	1.20 (0.97, 1.50)	0.97 (0.70, 1.35)
Ever screened for colon cancer ^a		.139			
Heterosexual	68.30 (0.35)		1.07 (1.06, 1.07)	NA	1.00 (Ref)
Lesbian	73.75 (2.44)	1.12 (0.77, 1.71)	1.02 (0.97, 1.08)	NA	1.04 (0.80, 1.37)
Bisexual	65.54 (3.89)	1.13 (0.54, 2.36)	0.97 (0.88, 1.07)	NA	0.81 (0.56, 1.19)

Note. AOR = adjusted odds ratio; CI = confidence interval; NA = not applicable. All presented AORs are adjusted for race/ethnicity, education, household income, and nativity. Age is centered to being 18 years of age in model 1, with the exception of ever screened for colon cancer. The sample size was n = 95 096.

^aEver screened for colon cancer in model 1 refers to age 50 years.

additional control variable to the logistic models (results not shown). Controlling for health insurance status did not change the significant associations we show in Table 2, with the exception of bisexual women younger than 50 years, who had 1.4 times the odds of heterosexual women of having visited a physician and 1.3 times the odds of having had a Pap test (results not shown).

Men

Table 3 presents the unadjusted prevalence estimates and logistic regression models for men's health behaviors.

Tobacco use. The prevalence of tobacco use was significantly higher for gay and bisexual men than for heterosexual men. Gay men younger than 50 years were 35% more likely to have smoked at least 100 lifetime cigarettes than were heterosexual men of the same age. However, when we focused on current smoking status, gay men at age 18 years were 80% more likely than were heterosexual men to be current smokers, and gay men younger than 50 years were 60% more likely to be current smokers. Bisexual men only differed from heterosexual men in the age cohort of 50 years or older, with 1.6 the odds of heterosexual men of reporting as current smokers.

Alcohol use. The prevalence of binge drinking did not differ by sexual orientation, whereas alcohol use in the past month was significantly higher for gay men than for heterosexual men. At age 18 years, gay men had 3

times the odds of reporting alcohol use in the past month compared with heterosexual men. For gay men, reports of alcohol use decreased with an increase in age. When we dichotomized age, the likelihood of alcohol use in the past month was 70% higher for gay men than for heterosexual men among those younger than 50 years, but the likelihood of alcohol use in the past month did not differ among those aged 50 years or older. Binge drinking at age 18 years did not differ by sexual orientation and decreased with age. Gay men aged 50 years or older were 30% less likely to binge-drink than were heterosexual men of the same age, but the odds did not significantly differ for those younger than 50 years.

Diet and physical activity. Of the diet and physical activity measures, only muscle strengthening was significantly associated with sexual orientation, in that both gay and bisexual men had a higher prevalence than heterosexual men. At age 18 years, gay men were 80% more likely to report muscle strengthening than did heterosexual men. When we stratified by age, compared with heterosexual men of comparable ages, bisexual men younger than 50 years were 60% more likely to report vigorous physical activities, and gay men younger than 50 years were 50% more likely to report muscle strengthening.

Health care utilization. ER visits did not differ by sexual orientation. However, physician visits and colon cancer screening significantly differed, with gay and bisexual men more likely

to report being seen by a physician over the past year and gay men having greater rates of colon cancer screening than heterosexual men. At age 18 years, both gay and bisexual men had twice the odds of having seen a physician in the past year. However, at increasing ages, gay and bisexual men did not significantly differ from heterosexual men. Similarly, both gay and bisexual men younger than 50 years were about 90% more likely to have seen a physician in the past year than were heterosexual men of the same age. After age 50 years, gay and bisexual men's odds of having seen a physician in the past year were still about 70% greater than were those of heterosexual men of the same age. At age 50 years, gay men had more than twice the odds of heterosexual men of having ever been screened for colon cancer. Compared with heterosexual men aged 50 years or older, gay men had twice the odds of colon cancer screening.

As we did for women, we also reexamined each measure of health care utilization by adding health insurance status as an additional control variable to the logistic models (results not shown). Each health care utilization measure's significant association with sexual orientation and age remained unchanged, with 1 exception: at age 18 years, bisexual men retained their significantly greater odds of having seen a physician over the past year, but now their interaction with age was significant, indicating a decrease. In model 2, the odds of bisexual men aged 50 years or older having visited a physician

TABLE 3—Unadjusted Prevalence and Adjusted Odds Ratios for Men’s Adult Health Behaviors, by Sexual Orientation and Age: California Health Interview Survey, 2001, 2003, 2005, and 2007

Variable	Unadjusted Prevalence, % (SE)	P	Model 1 (Continuous Age)		Model 2 (Dichotomous Age)	
			Effect of Sexual Orientation, AOR (95% CI)	Effect of Age and the Interaction Terms, AOR (95% CI)	Effect of Sexual Orientation for Age <50, AOR (95% CI)	Effect of Sexual Orientation for Age ≥50, AOR (95% CI)
Tobacco use						
Smoked 100 cigarettes in life		.044				
Heterosexual	46.60 (0.28)			1.03 (1.03, 1.03)	1.00 (Ref)	1.00 (Ref)
Gay	50.51 (1.69)		1.20 (0.85, 1.68)	1.00 (0.99, 1.01)	1.34 (1.13, 1.60)	0.92 (0.73, 1.14)
Bisexual	49.80 (2.76)		1.13 (0.73, 1.77)	1.00 (0.98, 1.02)	1.10 (0.84, 1.44)	1.09 (0.75, 1.57)
Current smoker		<.001				
Heterosexual	20.16 (0.24)			0.99 (0.99, 0.99)	1.00 (Ref)	1.00 (Ref)
Gay	26.90 (1.71)		1.79 (1.27, 2.53)	0.99 (0.98, 1.00)	1.58 (1.29, 1.94)	0.89 (0.68, 1.16)
Bisexual	28.08 (2.63)		1.20 (0.73, 1.56)	1.01 (0.99, 1.02)	1.33 (0.97, 1.82)	1.59 (1.05, 2.41)
Alcohol use						
Alcohol use past mo		<.001				
Heterosexual	70.06 (0.27)			0.99 (0.99, 1.00)	1.00 (Ref)	1.00 (Ref)
Gay	80.38 (1.28)		3.17 (2.20, 4.58)	0.97 (0.96, 0.98)	1.77 (1.42, 2.21)	1.19 (0.94, 1.52)
Bisexual	69.20 (2.38)		0.91 (0.59, 1.40)	1.00 (0.99, 1.02)	0.92 (0.71, 1.19)	1.29 (0.90, 1.83)
Binge drinking past mo		.513				
Heterosexual	25.58 (0.29)			0.97 (0.97, 0.97)	1.00 (Ref)	1.00 (Ref)
Gay	24.30 (1.66)		1.27 (0.77, 2.10)	0.98 (0.96, 1.00)	0.88 (0.72, 1.08)	0.66 (0.45, 0.95)
Bisexual	23.23 (2.53)		0.80 (0.47, 1.37)	1.00 (0.98, 1.02)	0.82 (0.59, 1.13)	1.06 (0.58, 1.91)
Diet and physical activity						
≥5 fruits and vegetables daily		.702				
Heterosexual	56.72 (0.39)			0.99 (0.99, 0.99)	1.00 (Ref)	1.00 (Ref)
Gay	56.89 (2.22)		0.87 (0.53, 1.42)	1.01 (0.99, 1.02)	0.97 (0.78, 1.21)	1.02 (0.78, 1.36)
Bisexual	59.89 (4.09)		1.54 (0.86, 2.77)	0.99 (0.97, 1.01)	1.22 (0.81, 1.84)	1.11 (0.68, 1.82)
Vigorous activities past wk		.120				
Heterosexual	46.98 (0.33)			0.96 (0.96, 0.96)	1.00 (Ref)	1.00 (Ref)
Gay	50.84 (2.18)		1.01 (0.63, 1.62)	1.00 (0.99, 1.02)	0.98 (0.78, 1.22)	1.03 (0.79, 1.35)
Bisexual	50.41 (3.20)		0.92 (0.52, 1.62)	1.01 (0.99, 1.03)	1.16 (0.78, 1.71)	1.65 (1.08, 2.50)
Moderate activities past wk		.874				
Heterosexual	68.90 (0.31)			0.99 (0.99, 0.99)	1.00 (Ref)	1.00 (Ref)
Gay	69.70 (1.96)		0.94 (0.61, 1.44)	1.00 (0.99, 1.01)	0.91 (0.72, 1.14)	0.95 (0.72, 1.24)
Bisexual	67.99 (2.94)		1.10 (0.67, 1.83)	1.00 (0.98, 1.01)	0.93 (0.67, 1.29)	1.23 (0.77, 1.95)
Muscle strengthening past wk		<.001				
Heterosexual	47.91 (0.31)			0.97 (0.97, 0.98)	1.00 (Ref)	1.00 (Ref)
Gay	59.64 (1.95)		1.88 (1.27, 2.77)	0.99 (0.98, 1.00)	1.50 (1.24, 1.82)	1.17 (0.89, 1.53)
Bisexual	55.98 (3.27)		1.35 (0.84, 2.18)	1.00 (0.98, 1.02)	1.37 (0.99, 1.89)	1.48 (0.99, 2.20)
Health care utilization						
Physician visit past y		<.001				
Heterosexual	71.76 (0.26)			1.03 (1.03, 1.03)	1.00 (Ref)	1.00 (Ref)
Gay	82.98 (1.44)		1.91 (1.22, 2.98)	1.00 (0.98, 1.01)	1.88 (1.48, 2.39)	1.64 (1.20, 2.25)
Bisexual	81.86 (1.95)		2.55 (1.62, 4.00)	0.98 (0.97, 1.00)	1.90 (1.39, 2.59)	1.75 (1.01, 3.02)

Continued

TABLE 3—Continued

Emergency room visit past y		.177				
Heterosexual	16.61 (0.25)		1.00 (1.00, 1.00)	1.00 (Ref)	1.00 (Ref)	
Gay	19.10 (1.65)	1.13 (0.73, 1.75)	1.00 (0.98, 1.01)	1.14 (0.88, 1.46)	0.96 (0.63, 1.45)	
Bisexual	19.02 (2.46)	1.00 (0.54, 1.85)	1.01 (0.99, 1.03)	1.16 (0.79, 1.72)	1.05 (0.67, 1.66)	
Ever screened for colon cancer ^a		<.001				
Heterosexual	68.71 (0.37)		1.08 (1.07, 1.08)	NA	1.00 (Ref)	
Gay	82.57 (2.38)	2.16 (1.24, 3.75)	1.02 (0.93, 1.11)	NA	1.96 (1.40, 2.74)	
Bisexual	69.45 (4.39)	1.30 (0.59, 2.83)	0.98 (0.91, 1.05)	NA	1.03 (0.67, 1.59)	

Notes. AOR=adjusted odds ratio; CI=confidence interval; NA=not applicable. All presented AORs are adjusted for race/ethnicity, education, household income, and nativity. Age is centered to being 18 years old in model 1, with the exception of ever screened for colon cancer. The sample size was n=68 125.

^aEver screened for colon cancer in model 1 refers to age 50 years.

in the past year were no longer significantly different from those of heterosexual men of the same age (results not shown).

DISCUSSION

Our findings confirm those of previous studies of differences by sexual orientation in smoking, alcohol consumption, and health care utilization.^{1,2,5} We expanded on these earlier findings by identifying behaviors that may differ by age cohorts. Our first hypothesis was that risk behaviors would be more prevalent among younger sexual minorities compared with same-aged heterosexuals. We found support for this hypothesis among women as evidenced by the higher odds of tobacco use, and alcohol use, and ER utilization among sexual minority women as well as the decreased odds of a Pap test among lesbians relative to heterosexual women. Among men, the findings were more modest, in that we only found increased odds for tobacco use and alcohol use for gay men compared with heterosexual men.

Our second hypothesis was that sexual orientation disparities in risk behaviors would be reduced at older ages. We were able to confirm this only for some risk behaviors. Among younger cohorts, gay men smoked and consumed alcohol at higher levels than heterosexuals did, but with increasing age there was no significant difference between the groups with respect to those behaviors. After age 50 years, gay men's smoking and alcohol use did not differ from heterosexual men's. Lesbians' rates of ER visits and Pap test screening at younger ages were not significantly different from those

of heterosexual women at older ages and after age 50 years.

However, for some other behaviors, sexual minorities differed from heterosexuals across age cohorts, contradicting our hypothesis. These behaviors included smoking for lesbians and health care utilization for gay and bisexual men. Lesbians had a greater likelihood of both current smoking and ever having smoked at least 100 cigarettes at any adult age, confirming earlier cross-sectional findings on smoking.¹ However, earlier findings also concluded that there were no smoking differences by sexual orientation among women older than 50 years.¹⁰ We suggest that this finding does not contradict our results; rather, it can be explained by the fact that the earlier study combined lesbian and bisexual women, whereas we compared lesbian women and bisexual women separately with heterosexual women. This explanation is also supported by the fact that bisexual women's smoking pattern in our study suggests greater odds of current smoking before age 50 years and a decrease after age 50 years. Nevertheless, when we compared bisexual women's smoking to heterosexual women's smoking, bisexual women had greater odds of ever having smoked 100 cigarettes regardless of age. Our finding that both gay and bisexual men had greater odds of visiting a physician at least 1 time per year at any adult age expands earlier cross-sectional findings of same-sex partnered men's greater health care utilization, possibly because of their greater use of HIV testing.⁵

Our findings with respect to alcohol consumption varied among women by the alcohol measure; thus, these findings both supported

and opposed the hypothesis that sexual minority risk behavior disparities would decline with age. When we focused on any alcohol use in the past month, only lesbian and bisexual women who were younger than 50 years had significantly greater odds than did heterosexual women of the same age, which is consistent with earlier studies indicating that alcohol consumption does not significantly differ by sexual orientation at older ages.^{10,13} However, we also found that lesbians had greater odds of binge drinking at any age.

Our findings also demonstrated some potential increases in sexual minority health disparities with age. Among those aged 50 years and older compared with same-gendered heterosexuals, lesbians had lower odds of consuming the recommended servings of fruits and vegetables, and bisexual men had greater odds of current smoking.

Our findings also identified some positive health behaviors among sexual minorities. For example, gay men had higher rates of colorectal cancer screening compared with heterosexual men. The odds of participation in moderate physical activity were higher for younger lesbians than for heterosexual women, and the odds of muscle strengthening were higher for bisexual women and gay men than for comparably aged heterosexuals. Bisexual men aged 50 years and older also had greater odds of engaging in vigorous activities than did heterosexual men of the same age. These findings are interesting because they shed new light on inconsistencies in previous findings that assessed sexual minorities' physical activity. Some have argued

that sexual minority women are more physically fit than heterosexual women because sexual minority women have a higher level of physical activity,^{14,15} whereas others have found that sexual minority women do not differ from heterosexual women with respect to their exercise behaviors.^{16,17} Similarly, there is a widely held perception that gay men have higher physical activity than do heterosexual men,¹⁸ but others have shown that sexual minority men do not differ from heterosexual men with respect to physical activity.¹⁹ We suggest that these inconsistencies may be explained by the age-dependent findings of this study, in that physical activity differences between sexual minorities and heterosexuals exist but only at younger ages.

The purpose of assessing health behaviors by gender and age cohort was to provide new information that can be used for intervention development. The gender differences in the effect of sexual orientation and age can inform program planners about the different needs for risk reduction intervention programs among sexual minority women and men. Our findings suggest that increased intervention efforts should be targeted to younger sexual minorities, with some exceptions. After age 50 years, lesbians should be targeted for diet and physical activity, bisexual men for smoking, and gay men for binge drinking. Finally, we suggest that the magnitude of difference in some risk behaviors, such as alcohol use among lesbians and bisexual women relative to heterosexual women, calls for targeted interventions to reduce alcohol use among sexual minorities.

Limitations

We acknowledge our study's limitations. First, these analyses were not based on longitudinal data, which are the best type of data to use in determining the timing of individual changes in health behaviors. Rather, we pooled data to have sufficient lesbian, gay, and bisexual individuals at any adult age to help us better understand behavior variation by age, although we were still confined by cross-sectional data. Second, our data were limited to the state of California; therefore, our findings are not representative of differences in behavior by sexual orientation in other states or the entire US population. Finally, because

we were limited by pooled cross-sectional data, we also did not have the ability to determine the mean age of individual behavior change.

Despite these limitations, we suggest that this study has considerable strengths. Our findings are novel in that they provide a comprehensive look at a broad range of behaviors across age cohorts of sexual minority groups, thereby providing new information about behaviors that may differ by age. We view this study as an initial response to a recent review of lesbian, gay, and bisexual aging studies, which concluded that we are missing data on risk factors and protective factors likely to affect the health of older lesbian, gay, and bisexual adults.²⁰

Conclusions

This age-dependent analysis of health behaviors suggests some preliminary information about the necessity of targeting sexual minorities at different ages and raises new questions about the implications of disparate health outcomes among lesbian, gay, and bisexual individuals, especially after an adulthood of smoking and consuming alcohol. Sufficiently large sample sizes allowed us to assess lesbians and gays separately from bisexuals, thereby contributing to a growing number of studies that point to discrepancies in behaviors within the sexual minority population.^{21,22} ■

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Contributors

U. Boehmer originated the study, led the writing, and interpreted the findings. X. Miao conducted the analyses and helped interpret the findings. C. Linkletter provided statistical expertise to the analysis and helped interpret the findings. M.A. Clark provided conceptual input, contributed to the writing, and helped interpret the

findings. All authors contributed in significant ways to the final article by reviewing and discussing earlier drafts.

Human Participant Protection

This protocol was deemed exempt from institutional review board review because it involved secondary data analyses of existing data.

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