Women's Sexual Orientation and Health: Results from a Canadian Population-Based Survey

Leah S. Steele MD and PhD , Lori E. Ross PhD , Cheryl Dobinson MA , Scott Veldhuizen BA & Jill M. Tinmouth MD and PhD

Women's Sexual Orientation and Health: Results from a Canadian Population-Based Survey

LEAH S. STEELE, MD, PhD

Department of Family and Community Medicine, St. Michael's Hospital, University of Toronto and Health Systems Research & Consulting Unit, Centre for Addiction and Mental Health, Toronto, Canada

LORI E. ROSS, PhD and CHERYL DOBINSON, MA

Social Equity & Health Research Section, Centre for Addiction & Mental Health, Toronto, Canada

SCOTT VELDHUIZEN, BA

Health Systems Research & Consulting Unit, Centre for Addiction & Mental Health, Toronto, Canada

JILL M. TINMOUTH, MD, PhD

Division of Gastroenterology and Clinical Epidemiology and Health Services Research Program, Sunnybrook Health Sciences Centre and Department of Medicine, University of Toronto, Toronto, Canada

The current study sought to determine whether health status and health risk behaviors of Canadian women varied based on sexual identity. This was a cross-sectional analysis of data from the Canadian Community Health Survey: cycle 2.1, a national population-based survey designed to gather health data on a representative sample of over 135,000 Canadians including 354 lesbian respondents, 424 bisexual women respondents, and 60,937 heterosexual women respondents. Sexual orientation was associated with disparities in health status and health risk behaviors for

lesbian and bisexual women in Canada. Bisexual women were more likely than lesbians or heterosexual women to report poor or fair mental and physical health, mood or anxiety disorders, lifetime STD diagnosis, and, most markedly, life-time suicidality. Lesbians and bisexual women were also more likely to report daily smoking and risky drinking than heterosexual women. In sum, sexual orientation was associated with health status in Canada. Bisexual women, in particular, reported poorer health outcomes than lesbian or heterosexual women, indicating this group may be an appropriate target for specific health promotion interventions.

KEYWORDS   lesbian, bisexual women, sexual orientation, health status, risk behaviors, mental health, women's health

INTRODUCTION

Existing international population-based research into the relationship between sexual orientation and health has suggested that lesbian and bisexual women are at increased risk for a variety of health problems and health risk behaviors. Lesbians report higher rates of arthritis (Cochran & Mays, 2007; Diamant & Wold, 2003; Diamant et al., 2000) and obesity (Boehmer, Bowen, & Bauer, 2007; Diamant & Wold, 2003) than other sexual orientation groups. Lesbian and bisexual women report higher rates of asthma (Cochran & Mays, 2007; Diamant & Wold, 2003), poor mental health, depression, anxiety, suicidal ideation and self-harm (Diamant & Wold, 2003; Fergusson et al., 2005; Gilman et al., 2001; Jorm et al., 2002; Mays & Cochran, 2001; Sandfort et al., 2006; Sandfort et al., 2001; Skegg et al., 2003), smoking (Burgard, Cochran, & Mays, 2005; Diamant & Wold, 2003; Diamant et al., 2000; Gruskin & Gordon, 2006; Gruskin et al., 2007; Gruskin et al., 2001; McCabe et al., 2003; Tang et al., 2004), and risky drinking (Burgard, Cochran, & Mays, 2005; Cochran et al., 2000; Cochran & Mays, 2000; Drabble, Midanik, & Trocki, 2005; Gruskin & Gordon, 2006; Gruskin et al., 2001; Sandfort et al., 2001) than heterosexual women. Although few studies have analyzed lesbian and bisexual women separately, some evidence suggests that bisexual women report higher rates of sexually-transmitted disease (STD) diagnoses (Mercer et al., 2007), depression, anxiety, suicidal ideation and self-harm (Jorm et al., 2002; McNair et al., 2005), smoking (Diamant et al., 2000; Mercer et al., 2007), and risky drinking (Burgard, Cochran, & Mays, 2005; Drabble, Midanik, & Trocki, 2005; Mercer et al., 2007) compared to both lesbians and heterosexual women.

Until recently, Canadian population-based data have not been available to determine whether these same health disparities exist for lesbian and bisexual women in Canada. Cycle 2.1 of the Canadian Community Health

Survey was the first Canadian population-based survey to include a question about sexual orientation. Among the 18–59 year age group, 0.7% of Canadian women reported that they identified as homosexual (that is lesbian or gay), and 0.9% of women reported that they identified as bisexual (Statistics Canada, 2004b). In the current study, we have conducted a detailed analysis of the data available from the CCHS 2.1 to determine whether health status and health risk behaviors of Canadian women vary based on sexual identity.

METHODS

Design

We conducted a secondary analysis of cross-sectional data from the Canadian Community Health Survey: cycle 2.1 (CCHS 2.1). We received approval from the institutional review board at the Centre for Addiction and Mental Health in Toronto. Informed consent was obtained from participants by Statistics Canada at the time of survey participation.

Sampling

The CCHS 2.1 was a national population-based survey designed to gather cross-sectional health data on a representative sample of Canadians. The target population of the CCHS was all Canadians aged 12 years and over. Excluded from the sampling frame were individuals living on Indian Reserves and on Crown Lands, institutional residents, full-time members of the Canadian Forces, and residents of certain remote regions. In total, approximately 98% of the population living in the Canadian provinces was eligible for sampling. The CCHS used three sampling frames to select the sample of households: the majority of households came from an area frame for this cycle of the CCHS. The area frame used by the CCHS was developed via a complex two-stage stratified design in which clusters of households were defined within each health region in Canada. Clusters were selected using a sampling method with a probability proportional to size, and then the final sample was chosen using a systematic sampling of dwellings in the selected clusters. Once a household was selected, all members of the household were listed and one person aged 12 years or over was automatically selected using various selection probabilities based on age and household composition. More detail regarding the complex sampling strategy of the CCHS can be found at Statistic Canada's website (Statistics Canada, 2004a).

Trained interviewers conducted extensive computer-assisted interviews with over 135,000 Canadians. Interviewers worked independently using laptop computers and were supervised from a distance by senior interviewers. The overall response rate for this cycle of the survey was 80.7%. For our

secondary analysis, we limited the sample to respondents 18 years of age and older.

Instrument Design

Study questions were designed in a collaborative effort with specialists from Statistics Canada, other federal and provincial departments, and academic fields. Where appropriate, they used standard scales and word items consistently to facilitate comparisons between different survey cycles as well as comparisons to other national surveys and comparable surveys from other countries. This survey was field tested prior to implementation, and assessments of data quality were used to make appropriate adaptations from cycle to cycle.

Sexual Orientation

The CCHS measured respondents' sexual orientation by asking, "Do you consider yourself to be: (1) heterosexual?; (2) homosexual, that is, lesbian or gay?; (3) bisexual?." If respondents indicated difficulty understanding the question, they were offered probes that expanded the definition as follows: "Do you consider yourself to be: (1) heterosexual (sexual relations with people of the opposite sex)?; (2) homosexual, that is, lesbian or gay (sexual relations with people of your own sex)?; (3) bisexual (sexual relations with people of both sexes)?." Hence, the CCHS 2.1 primarily measured the proportion of Canadians that *identified* as belonging to a sexual minority. Previous research has demonstrated that an "identity" measure for sexual orientation is the most specific measure; consequently, it will capture a smaller proportion of individuals who might have been defined as belonging to a sexual minority if sexual orientation had been measured by same-sex behaviors or attractions (Dean et al., 2004).

Sociodemographic Variables

Socio-demographic variables included age (continuous), sex, recent immigration (born in a country other than Canada and moved to Canada within five years of participating in the survey), education level (high school diploma or no high school diploma), low income adequacy (a measure based on total household income and the number of people living in the household), employment status (currently employed or not), and race/ethnicity measured using an identity approach ("People living in Canada come from many different cultural and racial backgrounds. Are you Black, South Asian, Caucasian, etc.?"). Unfortunately, we were obliged to aggregate race/ethnicity data into a binary variable ("White" or "Other") to avoid small cells.

Health Status

Measures of health status included chronic conditions, defined as those that have lasted or were expected to last six months or more and had been diagnosed by a health professional. To avoid instability in our regression results, we restricted our outcome variables to those that had a prevalence of greater than 5% in every group. These included: respiratory disease (Yes to any of "do you have asthma," "do you have chronic bronchitis," or "do you have emphysema or chronic obstructive pulmonary disease?"); hypertension ("Do you have high blood pressure?"); mood or anxiety disorders (Yes to either "Do you have a mood disorder, such as depression, bipolar disorder, mania, or dysthymia?" or "Do you have an anxiety disorder, such as a phobia, obsessive-compulsive disorder, or a panic disorder?"); and reports of life-time suicidal ideation (Yes to "Have you ever seriously considered committing suicide or taking your own life?"). Several studies have shown good agreement between self-reported chronic conditions including psychiatric diagnoses and medical records or other standard measures, although the agreement levels differ between populations and diagnoses (Martin et al., 2000; Sanchez-Villegas et al., 2008; Skinner et al., 2005). Self-perceived physical health status and self-perceived mental health status were also included. The self-report global health status variables were measured using a 5-point global assessment scale (excellent, very good, good, fair, or poor). Single-item global measures of general health status have been shown to agree well with longer health status scales and to correlate with mortality (Idler & Benyamini, 1997). BMI was calculated by self-reported weight and height (kg/m^2) and divided into three categories: (1) underweight <18.5; (2) normal (18.5–25); and (3) overweight (>25–30) or obese (>30). While self-reported BMI has been shown to underestimate rates of obesity and overweight (Elgar & Stewart, 2008), there is no a priori reason to suspect that this bias would differ by sexual orientation group. For our BMI analysis, we compared the proportions of overweight and obesity between sexual orientation groups and excluded underweight individuals from the analysis.

Health Risk Behaviors

We examined health risk behaviors including tobacco use (Binary variable "Daily" or "Not daily" derived from responses to the question: "At the present time do you smoke cigarettes (daily, occasionally, not at all, don't know, refused)?", high risk alcohol consumption (over eight drinks per week), and high-risk sexual behavior (ever diagnosed with a sexually transmitted disease (STD)). The STD question was asked only of those participants who reported that they had ever had "sexual intercourse." There were not sufficient numbers to include illicit drug use in our analyses. Self-reported measures for tobacco use, risky drinking, and STD diagnoses have been

shown to have reasonable sensitivity when compared to biological markers for tobacco (Gorber et al., 2009) a Structured Clinical Interview for alcohol abuse (Buchsbaum et al., 1995) and medical and State Health Department reports for STDs (Niccolai et al., 2005).

Statistical Analysis

We compared respondents' demographic characteristics by sexual orientation group using *t*-tests for continuous variables and chi-square tests for categorical variables. Next, we conducted unadjusted bivariate analyses to identify potential associations between sexual orientation and the dependent variables. Finally, we used multivariable logistic regression to assess the independent effects of sexual orientation on health status and health risk behaviors. We determined which covariates would be included in the model based on known relationships between those variables and our outcome variables. We adjusted our analyses of health status for age, immigration, ethnicity education, household income adequacy, employment level, and certain particularly relevant health risk behaviors or characteristics (e.g., smoking for respiratory disease, BMI for hypertension). We adjusted our health risk behaviors analyses for age, immigration, ethnicity, education level, household income adequacy, employment level, and self-perceived health status. Because of the possibility of non-linear effects for age for many outcomes, we included quadratic age terms in all models. Since the analyses were exploratory, we did not attempt to adjust results for the number of tests performed.

For all logistic regression models, we calculated odds ratios and determined *p*-values, standard errors, and 95% confidence intervals using the bootstrap re-sampling procedure recommended by Statistics Canada. This method involves the repeated selection with replacement of simple random samples from each stratum and the recalculation of information for each stratum; for CCHS 2.1, this operation was performed by Statistics Canada, which provided 500 replicate weights to be used in all analyses. An estimate was then calculated using each of these weights; the standard deviation of these estimates was the bootstrap variance estimator. Prior to finalizing our regression models, we assessed our explanatory variables and covariates for the presence of significant collinearity. We did not test for the presence of interactions. Important interactions among the independent variables were not suggested by existing work, and the large number of models tested made it impractical to examine specific interactions in detail. To assess the fit of our weighted models, we examined the F-statistic for each model with 500 degrees of freedom (one for each bootstrap replicate weight). All of our models were highly significant ($p < 0.001$), indicating a good model fit. All analyses were performed using Stata 10SE. We had 354 lesbian women, 424 bisexual women, and 60,937 heterosexual women in our sample. Setting

power at 80% and alpha at 0.05, we estimated that we would be able to detect, at minimum, a 6% difference between lesbian women and heterosexual women for a binary outcome.

RESULTS

The three sexual orientation groups were significantly different for most demographic characteristics (Table 1). Heterosexual women were more likely to be older, immigrants, of lower education levels, and not currently working. Lesbians were the most likely to be currently working and the least likely to have a low education level. Bisexual women were the youngest, the least likely to be immigrants, and the most likely to have lower income adequacy.

Health Status

Data for bisexual women showed a non-significant trend toward higher rates of respiratory disorders than the other two groups [11.8% for heterosexual women, 12.8% for lesbians, and 18.2% for bisexual women (chi-square = 3.26, $p = 0.05$)]; however, this difference disappeared after adjusting for smoking rates and other potential confounders (Table 2). Heterosexual women had higher rates of hypertension compared to lesbians and bisexual women in our sample [16.5%, 10.2%, and 10.8%, respectively ($p = 0.03$)]. However, after adjustment for other variables, this relationship changed; bisexual women had an increased rate of hypertension, a difference that just reached statistical significance. No significant differences were observed in rates of obesity or overweight in our bivariate analysis [38.8% for heterosexual women, 37.9% for lesbians, and 35.8% for bisexual women (chi-square = 0.41, $p = 0.660$) or after adjustment for potential confounders

TABLE 1 Demographic Characteristics by Sexual Orientation

	Heterosexual women $N = 60,937$		Lesbians $N = 354$		Bisexual women $N = 424$		ANOVA or chi-square[a]
	Mean/%	SD[b]/95% CI[c]	Mean/%	SD/95% CI	Mean/%	SD/95% CI	*p*-value
Age (mean yrs)	45.8	45.7–45.9	40.0	38.0–41.9	34.3	32.6–36.0	<0.01
Immigrant (%)	20.9	20.4–21.5	14.5	8.2–20.8	12.9	6.4–19.3	0.03
Less than high school education (%)	18.9	18.5–19.4	9.6	4.1–15.1	14.4	10.2–18.6	0.01
Percentage with low or low-medium income adequacy	9.4	9.1–9.8	8.8	5.3–12.3	15.5	10.5–20.5	<0.01
Currently working (%)	55.0	54.4–55.6	75.2	69.1–81.3	59.2	51.7–66.7	<0.01
Caucasian (%)	86.4	85.9–86.9	88.0	81.9–94.2	86.3	79.9–92.8	0.92

[a]ANOVA for age; chi-square for other variables. [b]SD = standard deviation. [c]CI = confidence interval.

TABLE 2 Adjusted Odds Ratios and 95% Confidence Intervals (CIs) for Physical Health Status Outcomes for Lesbian and Bisexual Women Compared to Heterosexual Women

	Respiratory condition (n = 61,767)			Hypertension (n = 61,720)			Physical health fair or poor (n = 61,798)			Overweight/obese (n = 556,555)[a]		
	OR	LCI[b]	UCI[c]	OR	LCI	UCI	OR	LCI	UCI	OR	LCI	UCI
Lesbian	1.17	0.77	1.77	1.10	0.55	2.19	1.05	0.62	1.78	1.00	0.71	1.41
Bisexual	1.28	0.78	2.10	**1.74**	**1.01**	**3.00**	**2.15**	**1.31**	**3.54**	1.18	0.79	1.75
Heterosexual	Ref	—	—	Ref	—	—	Ref	—	—	Ref	—	—
Age (per yr)	**0.98**	**0.97**	**0.99**	**1.17**	**1.15**	**1.19**	**1.05**	**1.04**	**1.06**	**1.10**	**1.09**	**1.11**
Low income adequacy[d]	**1.24**	**1.09**	**1.40**	**0.81**	**0.72**	**0.90**	**1.80**	**1.63**	**1.99**	1.04	0.95	1.14
Income missing	0.94	0.84	1.05	1.02	0.94	1.10	1.03	0.95	1.12	0.94	0.88	1.00
Recent immigrant	**0.47**	**0.29**	**0.74**	**0.37**	**0.23**	**0.60**	**0.44**	**0.30**	**0.64**	**0.62**	**0.48**	**0.80**
No high school diploma	1.09	0.99	1.20	**1.13**	**1.04**	**1.23**	**1.78**	**1.63**	**1.94**	**1.55**	**1.44**	**1.67**
Currently working	0.94	0.85	1.02	**0.88**	**0.80**	**0.97**	**0.47**	**0.43**	**0.52**	**0.93**	**0.87**	**0.99**
Caucasian	**1.54**	**1.30**	**1.83**	**0.85**	**0.79**	**0.99**	**0.61**	**0.53**	**0.71**	**1.31**	**1.17**	**1.45**
Health Description Index[e]	**0.61**	**0.58**	**0.63**	**0.61**	**0.59**	**0.64**				**0.72**	**0.70**	**0.75**
Current daily smoker	**1.25**	**1.13**	**1.38**									
BMI overweight				**2.36**	**2.18**	**2.55**						
BMI missing				**2.10**	**1.74**	**2.54**						

Note. Also adjusted for age[2], missing income, and missing BMI. [a]Underweight excluded from analysis. [b]Lower 95% confidence interval. [c]Upper 95% confidence interval. [d]"Low income adequacy" described individuals in the lowest two quintiles (lowest and lower-middle) of household income relative to household size. [e]Range 0 to 4, higher values indicate better self-perceived general health.
Bold indicates statistically significant results.
Ref = reference category.

(Table 2). In our bivariate analyses, poor or fair self-reported physical health was reported by 12.4% of heterosexual women, 8.9% of lesbian women, and 17.6% of bisexual women (chi-square = 3.23, $p = 0.04$). The increased likelihood of bisexual women to report poor or fair physical health was maintained after adjustment.

Marked differences were observed in mental health status outcomes among the three groups. Unadjusted rates of self-reported mood or anxiety disorder were 9.9% for heterosexual women, 13.4% for lesbian women, and 31.4% for bisexual women (chi-square = 45.7, $p = <0.01$). After adjustment, bisexual women were 3.6 times as likely to report a mood or anxiety disorder than heterosexual women (Table 3). Poor or fair self-reported mental health was reported by 5.2% of heterosexual women, 6.2% of lesbian women, and 19.4% of bisexual women (chi-square = 38.4, $p = <0.01$). After adjustment, bisexual women were 3.7 times more likely to report poor or fair mental health compared to heterosexual women (Table 3). Finally, both lesbian and bisexual women had markedly elevated rates of life-time suicidal ideation compared to heterosexual women (Table 3). Unadjusted rates for lifetime suicidal ideation were 9.6% for heterosexual women, 29.5% for lesbian women, and 45.4% bisexual women (chi-square = 47.9, $p = <0.01$). After adjustment, lesbian women were 3.5 times more likely than heterosexual women and bisexual women were 5.9 times more likely than heterosexual women to report having seriously considered suicide.

TABLE 3 Adjusted Odds Ratios and 95% Confidence Intervals for Mental Health Status Outcomes for Lesbian and Bisexual Women Compared to Heterosexual Women

	Mood or anxiety disorder ($n = 61,717$)			Mental health fair or poor ($n = 61,668$)			Life-time suicidal ideation ($n = 23,729$)		
	OR	LCI[a]	UCI[b]	OR	LCI	UCI	OR	LCI	UCI
Lesbian	1.42	0.94	2.15	1.38	0.65	2.92	**3.54**	**1.89**	**6.64**
Bisexual	**3.60**	**2.51**	**5.16**	**3.77**	**2.43**	**5.86**	**5.93**	**2.97**	**11.85**
Age (per year)	**1.07**	**1.05**	**1.08**	**1.03**	**1.01**	**1.05**	**1.03**	**1.01**	**1.05**
Low income adequacy[c]	**1.24**	**1.09**	**1.40**	**1.73**	**1.47**	**2.04**	**1.61**	**1.33**	**1.96**
Income missing	0.96	0.87	1.05	**1.07**	**0.93**	**1.22**	**0.83**	**0.71**	**0.96**
Immigrant	**0.44**	**0.23**	**0.81**	0.71	0.45	1.12	**0.14**	**0.03**	**0.60**
No high school diploma	**1.14**	**1.02**	**1.27**	**1.18**	**1.02**	**1.37**	1.11	0.93	1.34
Currently working	**0.71**	**0.64**	**0.79**	**0.81**	**0.70**	**0.93**	0.87	0.75	1.03
Caucasian	**1.60**	**1.34**	**1.91**	**0.76**	**0.62**	**0.92**	1.05	0.82	1.34

[a]Lower 95% confidence interval. [b]Upper 95% confidence interval. [c]"Low income adequacy" described individuals in the lowest two quintiles (lowest and lower-middle) of household income relative to household size.
Bold indicates statistically significant results.

Health Risk Behaviors

Lesbian and bisexual women were more likely to report smoking and risky drinking habits than heterosexual women (Table 4). Unadjusted rates of daily smoking were 17.4% for heterosexual women, 28.7% for lesbian women,

TABLE 4 Adjusted Odds Ratios and 95% Confidence Intervals Health Behaviors for Lesbian and Bisexual Women Compared to Heterosexual Women

	Daily smoker (27,880)			Risky drinking (46,238)			Ever diagnosed with STD (27,864)		
	OR	LCI[a]	UCI[b]	OR	LCI	UCI	OR	LCI	UCI
Lesbian	**1.77**	**1.22**	**2.57**	**2.67**	**1.67**	**4.28**	1.19	0.59	2.43
Bisexual	**2.04**	**1.47**	**2.83**	**2.00**	**1.30**	**3.09**	**3.34**	**2.14**	**5.23**
Age (per year)	**1.07**	**1.05**	**1.08**	**0.95**	**0.94**	**0.97**	**1.25**	**1.17**	**1.32**
Low Income adequacy[c]	**1.92**	**1.73**	**2.12**	**0.77**	**0.64**	**0.93**	**1.53**	**1.23**	**1.89**
(Income missing)	0.95	0.88	1.02	**0.95**	**0.29**	**0.89**	0.88	0.74	1.04
Immigrant	**0.33**	**0.21**	**0.52**	**0.51**	**0.29**	**0.89**	**0.28**	**0.15**	**0.51**
No high school diploma	**2.23**	**2.04**	**2.45**	**0.72**	**0.60**	**0.86**	1.09	0.86	1.39
Currently working	1.03	0.95	1.12	1.00	0.88	1.13	0.93	0.80	1.08
Health Description Index[d]							**0.83**	**0.78**	**0.89**
Caucasian	**1.99**	**1.55**	**2.55**	**1.99**	**1.55**	**2.55**	**1.41**	**1.15**	**1.72**

[a]Lower 95% confidence interval. [b]Upper 95% confidence interval. [c]"Low income adequacy" described individuals in the lowest two quintiles (lowest and lower-middle) of household income relative to household size. [d]Range 0 to 4, higher values indicate better self-perceived general health.
Bold indicates statistically significant results.

and 33.9% for bisexual women (chi-square $= 17.0, p = $ <0.01). Unadjusted rates of risky drinking were 7.5% for heterosexual women, 17.7% for lesbian women, and 15.6% for bisexual women (chi-square $= 22.6, p = $ <0.01). These differences were maintained after adjustment for potential confounders.

Bisexual women were most likely to report ever having been diagnosed with an STD (Table 4). Unadjusted rates of self-reported history of STD were 7.6% for heterosexual women, 9.1% for lesbian women, and 22.7% for bisexual women (chi-square $= 21.4, p < 0.01$). After adjustment, bisexual women were 3.3 times as likely to report having been diagnosed with an STD.

DISCUSSION

This study found marked differences by sexual orientation in the areas of health status and health risk behaviors for Canadian women. Bisexual women stood out as having particular risk for poor health status measures, including self-reported poor or fair mental and physical health, mood or anxiety disorders, lifetime STD diagnosis, and, most markedly, life-time suicidality rates. Almost half of bisexual respondents reported having seriously considered suicide at some point during their lifetime, representing an almost six-fold increase relative to heterosexual women. Close to a third of lesbian respondents reported lifetime suicidal ideation representing an almost four-fold increase relative to heterosexual women. Lesbians and bisexual women were also more likely to report health risk behaviors, such as daily smoking and risky drinking, than heterosexual women.

The large sample size and breadth of the CCHS 2.1 was an important strength of our study. Existing population-based studies have been limited by small numbers of lesbian and bisexual women respondents. These small numbers have led to relatively imprecise estimates and, in some cases, insufficient power to show clinically important differences between lesbian, bisexual, and heterosexual groups. As well, some studies have aggregated information from bisexual and lesbian respondents. This approach could have masked important differences between sexual orientation groups.

A significant limitation of our study was measurement of sexual orientation by the CCHS. The prevalence rates of lesbian and bisexual identities described in the CCHS probably underestimate the true prevalence of these minority sexual orientations. Accurate estimation of prevalence in epidemiologic surveys relies upon the truthful disclosure of sexual orientation to the interviewer, and some individuals may have chosen not to disclose their sexual orientation for privacy or safety reasons. Moreover, the estimated prevalence of sexual orientation varies according to how sexual orientation is measured. Studies measuring sexual identity, such as the CCHS, find lower estimates of homosexuality than studies that measure same-sex sexual behaviors (Dean et al., 2004). Surveys requiring a participant to self-identify as

homosexual or bisexual tend to miss individuals who have same-sex sexual behaviors or attractions but do not consider themselves to be gay, lesbian, or bisexual. This could lead to an underestimate of differences between lesbian and bisexual women and other groups (if non-disclosing lesbian and bisexual individuals are more likely to experience health disparities than disclosing lesbian and bisexual individuals) or to an overestimation of differences between groups (if non-disclosing lesbian and bisexual individuals are less likely to experience health disparities than disclosing lesbian and bisexual individuals). On the other hand, some evidence suggests that probability samples have improved generalizability and result in different risk estimates than those determined by convenience sampling approaches for research on sexual minorities (Bowen, Bradford, & Powers, 2006; Dodds et al., 2006).

Other limitations of our study included the cross-sectional design which makes inferences about temporality impossible. This is a less important limitation for sexual orientation than for modifiable risk factors, such as smoking, because once a woman establishes a sexual minority identity, she is relatively unlikely to transition to a heterosexual identity in later years (Kinnish, Strassberg, & Turner, 2005). Other limitations included the lack of use of standard instruments and developing and using self-reported measures of health-status, and health behaviors which have not been validated. Finally, we conducted multiple statistical analyses, which might have resulted in some differences being found significant by chance. However, our findings gain additional credence from their general consistency with related published research.

The results of our study were mostly consistent with previous international research on this subject. However, U.S. studies have found significant differences in BMI, with higher BMIs in lesbian and bisexual women than for heterosexual women (Boehmer, Bowen, & Bauer, 2007; Diamant & Wold, 2003); we did not observe this in our Canadian study or in a population-based study from the Netherlands (Sandfort et al., 2006). While we did show a non-significant trend in the bivariate analysis, we did not find the increased risk of respiratory diseases that has been shown in the U.S. (Cochran & Mays, 2007; Diamant & Wold, 2003). It is possible that we lacked the statistical power to detect a significant difference for this variable. Our regression also included smoking status which confounds the relationship between sexual orientation and smoking.

Recent analyses of 2003 and 2005 CCHS data on health service utilization have indicated that lesbian and bisexual women were more likely than heterosexual women to consult mental health professionals; however, they were less likely to have a regular family doctor and more likely to report an unmet need for health care in the last 12 months (Tjepkema, 2008). The increased rate of mental health service use is consistent with our findings of overall poorer mental health status among lesbian and bisexual women relative to heterosexual women. High rates of unmet needs are particularly marked among bisexual women. This fact, together with our findings of poor

self-perceived physical health and poor mental health outcomes, indicate that bisexual women, in particular, appear to not be well served by the Canadian healthcare system.

Questions remain regarding the mechanism underlying the relationship between sexual orientation and health disparities in Canada. However, social stigmatization has been identified as a risk factor for psychiatric problems among marginalized populations, including lesbian, gay, and bisexual people (Mays & Cochran, 2001). Minority stress, which refers to stress resulting from experiences of discrimination, expectations of discrimination, and the internalization of oppressive beliefs, is also considered an important determinant of mental health disparities for sexual minorities (Meyer, 2003). A recent meta-analysis found that elevated rates of mood, anxiety and substance-related disorders in lesbian and gay individuals could be primarily attributed to experiences of discrimination (Meyer, 2003). Recent research also indicates that higher levels of psychological distress experienced by sexual minorities may also negatively affect physical health (Cochran & Mays, 2007; Sandfort et al., 2006). So for sexual minorities, discrimination, mental distress, risky health behaviors (including substance-use), and physical health, are inextricably linked, pointing to the need for a comprehensive biopsychosocial approach to improve health status. Recent qualitative research conducted in Ontario indicates that there may be markedly elevated levels of minority stress for bisexuals due to lack of adequate support from both gay/lesbian and heterosexual communities (Dobinson et al., 2005).

In sum, sexual orientation was associated with disparities in health status and health risk behaviors for lesbian and bisexual women in Canada. Bisexual women, in particular, reported poorer health outcomes than lesbian or heterosexual women, indicating that this group may be an appropriate target for specific health promotion interventions. Our findings have implications for clinical practice and policy. To ensure inclusive and appropriate health care for lesbian and bisexual women, physicians need to understand the relationships between discrimination, health status, and health risk behaviors. Interventions and training regarding sexual minority women and mental health should take special care to ensure they are inclusive of bisexual women due to the high level of health challenges reported by bisexual women compared to other sexual orientation groups.

REFERENCES

Boehmer, U., D. J. Bowen, and G. R. Bauer. 2007. Overweight and obesity in sexual-minority women: Evidence from population-based data. *Am J Publ Health* 97:1134–40.

Bowen, D. J., J. Bradford, and D. Powers. 2006. Comparing sexual minority status across sampling methods and populations. *Women & Health* 44:121–34.

Buchsbaum, D. G., J. Welsh, R. G. Buchanan, and R. K. Elswick. 1995. Screening for drinking problems by patient self-report even "safe" levels may indicate a problem. *Archives Intern Med* 155:104–8.

Burgard, S. A., S. D. Cochran, and V. M. Mays. 2005. Alcohol and tobacco use patterns among heterosexually and homosexually experienced California women. *Drug & Alcohol Depend* 77:61–70.

Cochran, S. D., C. Keenan, C. Schober, and V. M. Mays. 2000. Estimates of alcohol use and clinical treatment needs among homosexually active men and women in the U.S. population. *J Consult & Clin Psychol* 68:1062–71.

Cochran, S. D., and V. M. Mays. 2000. Relation between psychiatric syndromes and behaviorally defined sexual orientation in a sample of the US population. *Am J Epidemiol* 151:516–23.

Cochran, S. D., and V. M. Mays. 2007. Physical health complaints among lesbians, gay men and bisexual and homosexually experienced heterosexual individuals: Results from the California Quality of Life Survey. *Am J Publ Health* 97:2048–55.

Dean, L., I. L. Meyer, K. Robinson, R. L. Sell, R. Sember, V. B. M. Silenzio, D. J. Bower, et al. 2004. Lesbian, gay, bisexual, and transgender health: Findings and concerns. *J Gay & Lesbian Med Assoc* 4:102–51.

Diamant, A. L., and C. Wold. 2003. Sexual orientation and variation in physical and mental health status among women. *J Women's Health* 12:41–9.

Diamant, A. L., C. Wold, K. Spritzer, and L. Gelberg. 2000. Health behaviors, health status and access to and use of health care: A population-based study of lesbian, bisexual and heterosexual women. *Archives Fam Med* 9:1043–51.

Dobinson, C., J. MacDonell, E. Hampson, J. Clipsham, and C. Chow. 2005. Improving access and quality of public health services for bisexuals. *J Bisexuality* 5:39–78.

Dodds, J. P., C. H. Mercer, D. E. Mercey, A. J. Copas, and A. M. Johnson. 2006. Men who have sex with men: A comparison of a probaility sample survey and a community based study. *Sex Trans Infec* 82:86–7.

Drabble, L., L. T. Midanik, and K. Trocki. 2005. Reports of alcohol consumption and alcohol-related problems among homosexual, bisexual and heterosexual respondents: Results from the 2000 National Alcohol Survey. *J Stud Alcohol* 66:111–20.

Elgar, F. J., and J. M. Stewart. 2008. Validity of self-report screening for overweight and obesity. Evidence from the Canadian Community Health Survey. *Canad J Publ Health* 99:423–7.

Fergusson, D. M., L. J. Horwood, E. M. Ridder, and A. L. Beautrais. 2005. Sexual orientation and mental health in a birth cohort of young adults. *Psychol Med* 35:971–81.

Gilman, S. E., S. D. Cochran, V. M. Mays, M. Hughes, D. Ostrow, and R. C. Kessler. 2001. Risk of psychiatric disorders among individuals reporting same-sex sexual partners in the National Comorbidity Survey. *Am J Publ Health* 91:933–9.

Gorber, S. C., S. Schofield-Hurwitz, J. Hardt, G. Levasseur, and M. Tremblay. 2009. The accuracy of self-reported smoking: A systematic review of the relationship between self-reported and cotinine-assessed smoking status. *Nicotine & Tobacco Res* 11:12–24.

Gruskin, E. P., and N. Gordon. 2006. Gay/lesbian sexual orientation increases risk for cigarette smoking and heavy drinking among members of a large Northern California health plan. *BMC Publ Health* 6:241.

Gruskin, E. P., G. L. Greenwood, M. Matevia, L. M. Pollack, and L. L. Bye. 2007. Disparities in smoking between the lesbian, gay and bisexual population and the general population in California. *Am J Publ Health* 97:1496–1502.

Gruskin, E. P., S. Hart, N. Gordon, and L. Ackerson. 2001. Patterns of cigarette smoking and alcohol use among lesbians and bisexual women enrolled in a large health maintenance organization. *Am J Publ Health* 91:976–9.

Idler, E. L., and Y. Benyamini. 1997. Self-rated health and mortality: A review of 27 community studies. *J Health & Soc Behav* 38:21–37.

Jorm, A. F., A. E. Korten, B. Rodgers, P. A. Jacomb, and H. Christensen. 2002. Sexual orientation and mental health: Results from a community survey of young and middle-aged adults. *Br J Psych* 180:423–7.

Kinnish, K. K., D. S. Strassberg, and C. W. Turner. 2005. Sex differences in the flexibility of sexual orientation. A multi-dimensional, restrospective assessment. *Archives Sex Behav* 34:173–83.

Martin, L. M., M. Leff, N. Calonge, G. Garrett, and D. E. Nelson. 2000. Validation of self-reported chronic conditions and health services in a managed care population. *Am J Prev Medi* 18:215–8.

Mays, V. M., and S. D. Cochran. 2001. Mental health correlates of perceived discrimination among lesbian, gay and bisexual adults in the United States. *Am J Publ Health* 91:1869–76.

McCabe, S. E., C. Boyd, T. L. Hughes, and H. d'Arcy. 2003. Sexual identity and substance use among undergraduate students. *Subst Abuse* 24:77–91.

McNair, R., A. Kavanagh, P. Agius, and B. Tong. 2005. The mental health status of young adult and mid-life non-heterosexual Australian women. *Austral New Zealand J Publ Health* 29:264–71.

Mercer, C. H., J. V. Bailey, A. M. Johnson, B. Erens, K. Wellings, K. A. Fenton, A. J. Copas, et al. 2007. Women who report having sex with women: British national probability data on prevalence, sexual behaviors, and health outcomes. *Am J Publ Health* 97:1126–33.

Meyer, I. H. 2003. Prejudice, social stress, and mental health in lesbian, gay and bisexual populations: Conceptual issues and research evidence. *Psychol Bull* 129:674–97.

Niccolai, L. M., T. S. Kershaw, J. B. Lewis, D. V. Cicchetti, K. A. Ethier, and J. R. Ickovics. 2005. Data collection for sexually transmitted disease diagnoses: A comparison of self-report, medical record reviews, and State Health Department reports. *Ann Epidemiol* 15:236–42.

Sanchez-Villegas, A., J. Schlatter, F. Ortuno, F. Lahortiga, J. Pla, S. Benito, and M. A. Matinez-Gonzalez. 2008. Validity of a self-reported diagnosis of depression among participants in a cohort study using the Structured Clinical Interview for DSM-IV (SCID-I). *BMC Psychiatry* 8:43.

Sandfort, T. G. M., F. Bakker, F. G. Schellevis, and I. Vanwesenbeeck. 2006. Sexual orientation and mental and physical health status: Findings from a Dutch population survey. *Am J Publ Health* 96:1119–25.

Sandfort, T. G. M., R. de Graaf, R. V. Bijl, and P. Schnabel. 2001. Same-sex sexual behavior and psychiatric disorders: Findings from the Netherlands Mental Health Survey and Incidence Study (NEMESIS). *Archives Gen Psych* 58:85–91.

Skegg, K., S. Nada-Raja, N. Dickson, and S. Williams. 2003. Sexual orientation and self-harm in men and women. *Am J Psych* 160:541–6.

Skinner, K. M., D. R. Miller, E. Lincoln, A. Lee, and L. E. Kazis. 2005. Concordance between respondent self-reports and medical records for chronic conditions. Experience from the Veterans Health Study. *J Ambulatory Care Mgmt* 28:102–10.

Statistics Canada. 2004a. Canadian Community Health Survey: Detailed information for 2003. Cycle 2.1. Statistics Canada [On-line]. Retrieved September 23, 2009, from http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SurvId=3226&SurvVer=0&SDDS=3226&InstaId=15282&InstaVer=2&lang=en&db=imdb&adm=8&dis=2

Statistics Canada. 2004b. First information on sexual orientation. The Daily: Statistics Canada [On-line]. Retrieved July 6, 2009, from http://www.statcan.gc.ca/daily-quotidien/040615/dq040615b-eng.htm

Tang, H., G. L. Greenwood, D. W. Coling, J. C. Lloyd, A. Roeseler, and D. G. Bal. 2004. Cigarette smoking among lesbians, gays and bisexuals: How serious a problem? (United States). *Cancer Causes & Control* 15:797–803.

Tjepkema, M. 2008. Health care use among gay, lesbian and bisexual Canadians. *Health Rep* 19:53–64.