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Research Paper

The prevalence and factors associated with smoking among lesbian and bisexual women: Analysis of the Australian National Drug Strategy Household Survey

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ABSTRACT

Background: In many countries, sexual minority women smoke at higher rates than their heterosexual counterparts. Analyses tend to combine lesbian and bisexual women, preventing an understanding of relevant factors associated with smoking for each group. This analysis used a representative sample of the Australian population to compare tobacco use between heterosexual, lesbian and bisexual women, and examine factors associated with smoking among these groups.

Methods: In a secondary analysis of data from the National Drug Strategy Household Survey (N = 23,855), descriptive statistics were produced for heterosexual (n = 11,776), lesbian (n = 135) and bisexual (n = 167) women. Multivariate logistic regression modelling was undertaken to assess which factors were associated with current smoking among the different groups.

Results: Compared to heterosexual women, lesbian and bisexual women were more likely to be current smokers (OR 2.9(1.8,4.5) and OR 3.6(2.4, 5.4) respectively). Employment, income and psychological distress were significant factors associated with smoking for lesbian women. Recent illicit drug use was the only significant factor associated with smoking for bisexual women.

Conclusions: We need to better understand the psychological, social and cultural factors that influence initiation, and sustain smoking among lesbian and bisexual women. Our findings demonstrate that sexual minority women in Australia warrant specific policy attention in a national framework.

Introduction

Smoking related disease continues to be a substantial burden globally, and one of the leading risk factors for early, and preventable, mortality (Reitsma et al., 2015). The prevalence of smoking among Australia's general population has halved from 24% in 1991 to 12% in 2016 (Australian Institute of Health & Welfare, 2017). Despite this, minority populations such as Aboriginal and Torres Strait Islander people, prison populations, people with mental health problems and members of the lesbian, gay and bisexual communities continue to smoke at higher rates than the general community (Australian Institute of Health & Welfare, 2011, 2014; Johnston, Shahid, Schlumpp, & Wilkins, 2015; Lawrence, Mitrou, & Zubrick, 2009). These high rates of smoking have prompted a significant public health focus on reducing tobacco use, with Australia's National Tobacco Strategy 2012–2018 making smoking among some minority groups a priority (Intergovernmental Committee on Drugs, 2012). What is currently missing from this national policy is consideration of the higher prevalence of smoking in sexual minorities and, in particular, sexual minority women (Intergovernmental Committee on Drugs, 2012).

International studies from industrialised countries show sexual minority women smoke at substantially higher rates than heterosexual women (Lee, Griffin, & Melvin, 2009; Lunn et al., 2017; Meads, Buckley, & Sanderson, 2007; Steele, Ross, Dobinson, Veldhuizen, & Tinmouth, 2009). A recent representative study from the United States shows lesbian and bisexual women have twice the odds of tobacco use than heterosexual women (McCabe et al., 2018). Another United States study found that lesbian and bisexual women have higher rates of

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smoking than heterosexual men and women, and sexual minority men (Wheldon, Kaufman, Kasza, & Moser, 2018). In Australia, there are few studies using representative samples of lesbian and bisexual women to examine smoking prevalence. One analysis, using National Drug Strategy Household Survey (NDSHS) data, reported lesbian/bisexual women had increased rates of smoking compared to heterosexual women (23.7% and 10.6% respectively; Roxburgh, Lea, de Wit, & Degenhardt, 2016). A more recent Australian study, using data from the Household, Income and Labour Dynamics in Australia (HILDA) survey, reported lesbian and bisexual women were significantly more likely to use tobacco than heterosexual women (Sabia, Wooden, & Nguyen, 2018).

There is a lack of consensus in the evidence from the United States, Canada and Australia, around differences in smoking rates between bisexual and lesbian women. Representative evidence from Australia is slim: two Australian representative studies investigating substance use did not separate lesbian and bisexual women (Hillier, De Visser, Kavanagh, & McNair, 2003; Roxburgh et al., 2016). A more recent study (using HILDA data) adjusted for demographic, family and personality controls, found only bisexual women were significantly more likely to smoke than heterosexual women, and results among lesbian women were non-significant (Sabia et al., 2018). Non-representative studies from the United States and Canada report bisexual women have higher odds of current smoking than lesbian women (Fallin, Goodin, Lee, & Bennett, 2015; Matthews, Steffen, Hughes, Aranda, & Martin, 2017).

Bisexual women are more likely to have higher perceived stress, lower mental health scores and less social support than both lesbian and heterosexual women (Hughes, Szalacha, & McNair, 2010). Bisexual women may also experience increased rates of poor general health than lesbian women (Fredriksen-Goldsen, Kim, Barkan, Balsam, & Mincer, 2010). Evidence from a recent review indicates bisexual women are at risk of increased rates of alcohol and illicit drug use (Green & Feinstein, 2012). These increased health risks may be a result of negative attitudes and prejudice from both the heterosexual and lesbian population (Mohr, 2004). Further investigation using Australian population level data, separating lesbian and bisexual women is needed.

Internationally, large representative studies report that smoking, risky or binge drinking, and illicit drugs are more highly correlated among sexual minority women than among the general population (Blosnich, Farmer, Lee, Silenzio, & Bowen, 2014; Kerr, Ding, Burke, & Ott-Walter, 2015; McCabe, Hughes, Bostwick, West, & Boyd, 2009). One longitudinal study found risky drinking significantly associated with tobacco use and associated with continued tobacco use over time among sexual minority women (Matthews et al., 2014). An Australian periodic survey of the health of lesbian, bisexual and queer women engaged with the Sydney's lesbian, gay, bisexual and transgender (LGBT) communities (known as SWASH) found current smokers were significantly more likely to report illicit drug use than ex-smokers and significantly more likely to report regular binge drinking and illicit drug use than never smokers (Deacon & Mooney-Somers, 2017). One explanation for higher rates of smoking, drinking and illicit drug use is the attendance at LGBT bars and clubs. Socialising in bars may expose women to pro-smoking norms among the LGBT community, with the qualitative literature suggesting that for sexual minority women, smoking is both a way to connect with peers and a way of projecting an identity in these social spaces (Green & Feinstein, 2012; Gruskin, Byrne, Altschuler, & Dibble, 2008; Youatt, Johns, Pingel, Soler, & Bauermeister, 2015). We will examine the relationship between alcohol, illicit drug use and smoking among sexual minority women to confirm if these are significant factors for lesbian and bisexual women in the Australian population.

Meyer's minority stress model (Meyer, 2003) is often used to explain high rates of smoking, risky drinking and illicit drug use (see for example, Lehavot & Simoni, 2011; Bariola, Lyons, & Leonard, 2016). This theory suggests that stressors such as internalised homophobia, anticipated stigma or stress and sexuality-related victimisation explain the higher rates of mental health diagnoses among sexual minorities and may have an effect on substance use in this population (Meyer, 2003).

Another approach to understanding factors associated with smoking is as a coping mechanism for psychological distress, potentially an outcome of minority stress experiences (Lea, de Wit, & Reynolds, 2014). International research shows a significant association between psychological distress (including depression, anxiety and worry, measured for example by the Kessler psychological distress (K10 scale; Kessler et al., 2002) and sexual minority status (Cochran, Greer Sullivan, & Mays, 2003; Platt & Scheitle, 2018). There has been limited work in Australia on the relationship between smoking and psychological distress among sexual minority women. In Australia, the SWASH survey found high rates of psychological distress among their sample of sexual minority women (42% reported medium to high psychological distress using the K6), however no significant association was found with smoking (Deacon & Mooney-Somers, 2017). The authors speculate that the high rates of psychological distress in their sample created a ceiling effect for the association between psychological distress and smoking (Deacon & Mooney-Somers, 2017). An Australian-based study found no clear link between higher rates of psychological distress and alcohol or illicit drug use; they did not examine smoking (Lea et al., 2014). Given these uncertain results, further investigation of the association between psychological distress and smoking in Australia is needed.

Objectives

In this study, we use a representative sample of the Australian population, to examine tobacco use in lesbian and bisexual women (objective 1). We first use adjusted prevalence estimates to compare smoking prevalence between heterosexual and lesbian, and heterosexual and bisexual women. With the emerging evidence of health differences, and potentially different explanations for these differences, between bisexual and lesbian women, we have chosen to examine the factors associated with smoking for each sexuality group separately (objective 2); we do this through a multivariate analysis.

Methods

The National Drug Strategy Household Survey (NDSHS) is a randomly selected nationally representative population survey of Australians aged 14 years and over. The NDSHS employs a multi-stage stratified sampling methodology and is conducted by the Australian Institute of Health and Welfare (AIHW) (Australian Institute of Health & Welfare, 2014). More detail on the survey and sampling is available at https://www.aihw.gov.au/about-our-data/our-data-collections/national-drug-strategy-household-survey. The 2013 sample included 23,855 complete and usable responses from 48,579 contacted households. This represents a response rate of 49.1% (Australian Institute of Health & Welfare, 2014). We undertook a secondary analysis of data captured by this population survey.

Measures

Sexuality and gender

Sexuality was determined by a single self-identifying question "Do you think of yourself as…?" with the options of heterosexual or straight; homosexual (gay or lesbian); bisexual; not sure or undecided; something else or other. Data from the sexuality variable was combined with a dichotomous gender question "are you male or female?" Participants who identified as female (N = 12,078) and either heterosexual, lesbian or bisexual were included in the analysis.

Tobacco use

Tobacco use was characterised as, never smoker (smoked less than

100 cigarettes in their lifetime); ex-smoker (have smoked more than 100 cigarettes in their lifetime but no longer smoke); current smoker (have smoked more than 100 cigarettes in their lifetime and report current smoking). These categories are mutually exclusive.

Demographic variables

Demographic data used in the analysis included mean age; level of education, dichotomised university degree or below (below including high school only, TAFE certificates and diplomas); currently employed, dichotomised as currently employed (self-employed, employed for wages, salary or payment in kind) or not; personal annual income, income level based on Australian Bureau of statistics (ABS) data and dichotomised into greater than or below $31,199 AUD (Australian Bureau of Statistics, 2013) to reflect weekly earnings that fell below the poverty line at the time of data collection (Dorch, Phillips, & Crow, 2016); currently in a relationship, dichotomised as currently in a relationship (married, de facto or living with partner) or not; living outside major cities, dichotomised as living outside major cities (inner/outer regional and remote/very remote) or not, was calculated in accordance with Australian Statistical Geography Standard Classification using postcode (Pink, 2011); and has dependent children. The measure for socio-economic status used was the Socio-Economic Indexes for Areas (SEIFA). SEIFA was characterised in accordance with the Australian Bureau of Statistics report: SEIFA 2011 (Pink, 2013), but due to small sample numbers the quintiles were collapsed into two groups, the bottom two quintiles that represent the least socioeconomically advantaged areas were compared to the top three quintiles.

Psychosocial variables

Self-reported high psychological distress was measured using the Kessler psychological distress scale (K10; Kessler et al., 2002). This scale presents a global measure of distress aggregated from ten questions regarding the respondent's anxiety and depression levels. A score above 21 is classified as high to very high psychological distress (Australian Bureau of Statistcs, 2012). This was dichotomised to high psychological distress or not.

To determine high risk drinking AUDIT-C was used. This scale (ranking from 0 to 12) scores the respondent's answers regarding frequency and quantity of alcohol use, with a score of 9 or above indicating that the respondent is drinking at high risk levels (Harris, Bradley, Bowe, Henderson, & Moos, 2010). This was dichotomised as high risk drinking (a score of 9 or above) or not.

Recent use of any illicit drug was determined from reported illicit use of any drugs including marijuana, meth/amphetamine, cocaine, ecstasy, and heroin, and non-medical use of painkillers/analgesics/opioids, or methadone/buprenorphine and steroids in the last 12 months.

Statistical analysis

All analyses were conducted using SAS version 9.4. Analyses were conducted taking into account the effects of complex sampling: Specifically, data were weighted to correct for differential response rates and to account for over-sampling in some of the smaller jurisdictions; and strata and cluster variables were used in all analyses to account for the multilevel stratification of recruitment of the 2013 NDSHS sample (Roy Morgan Research, 2014).

Given the disparity in age distribution across heterosexual, lesbian and bisexual women (with both lesbian and bisexual women being significantly younger than their heterosexual counterparts) all prevalence estimates were age adjusted using the 2001 ABS population census data. This is in line with ABS guidelines on adjusting prevalence estimates (Australian Bureau of Statistics, 2013). Statistical analysis of smoking status across heterosexual, lesbian and bisexual women was also adjusted for age. Finally, all multivariate models controlled for age.

Categorical variables (e.g. demographic characteristics, 12 month prevalence of illicit drug use, current smoking status) were analysed using the chi square tests, while continuous variables (e.g. mean age, mean age of initiation of tobacco use) were analysed using independent sample T tests. All analyses are presented by sexual identity among female respondents and categorised as heterosexual, lesbian and bisexual women. Multivariate logistic regression modelling was undertaken to assess factors associated with current smoking for each sexuality group. Three models were built, modelling; 1) smoking among heterosexual women; 2) smoking among lesbian women; and 3) smoking among bisexual women.

Results

Psychosocial and demographic characteristics of the sample

Within the full sample of female respondents (12,078), 11,776 identified as heterosexual, 135 identified as lesbian and 167 identified as bisexual. There were significant differences in the psychosocial and demographic variables between heterosexual, lesbian and bisexual women (Table 1).

Compared to heterosexual women, lesbian women were younger (mean age 45.4 years and 39.2 respectively), and more likely to be currently employed (Odds Ratio (OR) 2.0 (1.2, 3.3). Lesbian women were more likely to earn greater than $31,199 than heterosexual women (OR 3.6 (2.3, 5.7)) and over half (59.3%) earned over $31,199. Lesbian women were less likely to be in a current relationship (OR 0.4 (0.2, 0.6)) or have dependent children (OR 0.3 (0.1, 0.5)). They were more likely to self-report high psychological distress (OR 1.9 (1.2, 3.4)), high risk drinking (OR 2.3 (1.1, 5.2)) and recent use of any illicit drug (OR 2.5 (1.5, 4.1)) than heterosexual women.

Compared to the heterosexual women, bisexual women were younger (mean age 45.4 years and 30.0 years respectively), less likely to earn above $31,199 (OR 0.6 (0.3, 0.9)), less likely to be in a current relationship (OR 0.3 (0.2, 0.4)) and more likely to live in a socio-economic disadvantaged area (the bottom two SEIFA quintiles) (OR 1.5 (1.1, 2.2)). Bisexual women were significantly more likely to report high psychological distress (OR 4.3 (3.0, 6.3)), high risk drinking (OR 2.1 (1.1, 4.1)) and report recent illicit drug use (OR 4.7 (3.2, 6.8)) than heterosexual women.

Prevalence of tobacco use

The prevalence of smoking among lesbian and bisexual women was high compared to heterosexual women (Table 2) (objective 1). When adjusted for age, compared to heterosexual women, lesbian women were nearly three times as likely to report being a current smoker (OR 2.9 (1.8, 2.8)). When all psychosocial and demographic variables were controlled for, lesbian women continued to show higher odds of being a current smoker (OR 2.5 (1.5, 4.1)) than heterosexual women. Lesbian women also had significantly increased odds of daily smoking (OR 2.6 (1.5, 4.2)) and significantly decreased odds of never smoking (OR 0.3 (0.2, 0.4)) than heterosexual women (Table 2).

Compared to heterosexual women, bisexual women had increased age adjusted odds of being a current smoker (OR 3.6 (2.4, 5.4)). After adjusting for all psychosocial and demographic variables, bisexual women continued to have significantly increased odds of being a current smoker (OR 1.8 (1.2, 2.7)) than heterosexual women. Bisexual women also had significantly increased odds of daily smoking (OR 3.9 (2.5, 5.9)), and significantly decreased odds of never smoking (OR 0.3 (0.2, 0.4)) compared to heterosexual women.

Table 1
Psychosocial demographics characteristics of female respondents by self-reported sexual identity, NDSHS, 2013.

Number	Heterosexual[+] Women N = 11,776 (97.5%)	Lesbian Women N = 135 (1.1%)	Statistic Lesbian vs Heterosexual women	Bisexual Women N = 167 (1.4%)	Statistic Bisexual vs Heterosexual women
Mean age (years)	45.4	39.2***	t = −10.3	30.3***	t = −10.3
Range	(14-84.2)	(15-76)		(14-77)	
Level of Education (%)	44.3	50.7	ns	32.8	ns
University degree					
Currently Employed (%)	49.9	66.7**	OR 2.0 (1.2,3.3)	44.8	ns
Personal Annual income greater than $31,199 (%)	28.5	59.3***	OR 3.6 (2.3,5.7)	19.1*	0.6 (0.3,0.9)
Currently in a relationship	62.8	40.9***	OR 0.4 (0.2,0.6)	34.9***	OR 0.3 (0.2,0.4)
Has dependent children	44.6	19.5***	OR 0.3 (0.1,0.5)	44.2	ns
Living outside of Major Cities	29.3	26.1	ns	32.5	ns
Bottom two SEIFA quintiles	37.2	33.5	ns	47.3*	OR 1.5 (1.1,2.2)
Self-report High Psychological Distress (K10)	11.5	20.8*	OR 1.9 (1.2,3.4)	36.1***	OR 4.3 (3.0,6.3)
High Risk drinking according to Audit-C	2.8	4.8^^,*	OR 2.3 (1.1,5.2)	8.0^^,*	OR 2.1 (1.1, 4.1)
Recent use any illicit drug	11.2	22.7**	OR 2.5 (1.5, 4.1)	38.2***	OR 4.7 (3.2, 6.8)

Numbers are unweighted while percentages are weighted.
ns – non-significant.
[+] Heterosexual women were the reference category.
^^ Relative standard error is greater than 25%. This figure should be interpreted with caution.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.0001$.

Factors associated with smoking for heterosexual, lesbian and bisexual women

A multivariate analysis comparing current smokers with non-smokers for each sexuality group is presented in Table 3 (objective 2). When controlling for all variables listed in Table 1, factors individually associated with smoking (cf. non-smokers) for heterosexual women were level of education (OR 0.6 (0.5, 0.7)), relationship status (OR 0.7 (0.6, 0.8)), living outside major cities (OR 1.3 (1.1, 1.4)), having dependent children (OR 1.3 (1.2, 1.6)), living in a socioeconomically disadvantaged area (bottom two SEIFA quintiles) (OR 1.9 (1.6, 2.1)), self-reported high psychological distress (OR 1.9 (1.6, 2.3)), high risk drinking (OR 2.7 (2.0, 3.6)) and recent illicit drug use (OR 4.3 (3.7, 5.1)). Factors individually associated with smoking (cf. non-smokers) for lesbian women were being currently employed (OR 5.7 (1.2, 27.5)) and high psychological distress (OR 6.9 (2.0, 24.1)); while personal annual income > $31,199 was associated with lower odds of smoking (OR 0.1 (0.04, 0.7)). Contrary to expectations, risky alcohol use was not significantly associated with smoking for lesbian women. The only factors individually associated with smoking (cf. non-smokers) for bisexual women was recent illicit drug use (OR 8.2 (3.2, 20.8)). Again, risky alcohol use was not significantly associated with smoking for bisexual women.

Discussion

In this paper we presented an analysis that separately examined smoking among lesbian and bisexual women in an Australian nationally representative survey (objective 1): lesbian women and bisexual women had higher odds of current smoking than their heterosexual counterparts. As could be expected from high rates of smoking among these groups, there were significantly lower numbers of lesbian and bisexual women who never smoked.

The prevalence of smoking among lesbian and bisexual women in our sample was similar to or higher than international studies (Lunn et al., 2017; McCabe et al., 2018; Meads et al., 2007; Steele et al., 2009; Wheldon et al., 2018). One large comparable representative study - conducted from the United States National Health Interview Survey 2013-15 - showed the difference in current smoking between lesbian women and heterosexual women to be 9.23% (compared to 13.7% in our sample), and in bisexual women to be 6.85% (compared to 14.5% in our sample; Lunn et al., 2017). Our analysis demonstrates that

Table 2
Tobacco use by self-reported sexual identity, 2013.

Number	Heterosexual women[+] N = 11,776	Lesbian women N = 135	Statistic Lesbian vs Heterosexual women	Bisexual women N = 167	Statistic Bisexual vs Heterosexual women
Smoking Status					
Never Smoked (%)	64.9	34.6	OR 0.3 (0.2,0.4)***	38.4	OR 0.3 (0.2,0.4)***
Ex-Smoker (%)	22.3	31.8	OR 1.9 (1.3,2.8)**	27.2	Ns
Current Smoker (%)	12.7	26.4	OR 2.9 (1.8,4.5)***	27.2	OR 3.6 (2.4, 5.4)***
			#ADJ OR 2.5(1.5,4.1)**		#ADJ OR 1.8(1.2,2.7)**
Daily Smoker (%)	10.6	21.7	OR 2.6 (1.5,4.2)**	24.8	OR 3.9 (2.5,5.9)***
Mean age initiated smoking (years)	16.5	15.8	Ns	14.7	t = −3.08**

NB: All prevalence estimates and all ORs are adjusted for age.
Numbers are unweighted while percentages are weighted.
[+] Heterosexual women were the reference category.
[#] Controlling for all psychosocial demographic variables listed in Table 1.
** $p < 0.01$.
*** $p < 0.0001$.

Table 3
Modelling associations with smoking across self-reported sexual identity.

Adjusted Statistic	Heterosexual smokers vs non-smokers AOR (95%CI)	Lesbian smokers vs non-smokers	Bisexual smokers vs non-smokers
Mean age (years)	1.00 (0.9, 1.01)	0.98 (0.95, 1.01)	1.00 (0.9, 1.04)
Level of Education (%)	OR 0.6 (0.5,0.7) ***	0.6 (0.1, 2.7)	0.6 (0.1, 2.3)
University degree			
Currently Employed (%)	1.1 (0.9, 1.3)	OR 5.3 (1.2,23.6)*	0.5 (0.2, 1.3)
Personal Annual income greater than $31,199 (%)	1.1 (0.9, 1.3)	OR 0.2 (0.05,0.9)*	1.6 (0.4, 6.4)
Currently in a relationship	OR 0.7 (0.6,0.8)**	0.8 (0.3, 2.4)	0.3 (0.09, 1.1)
Living outside Major Cities	OR 1.3 (1.1,1.4)**	0.7 (0.2, 2.1)	1.5 (0.6, 3.9)
Has dependent children	OR 1.3 (1.2,1.6)**	0.3 (0.08, 1.6)	1.7 (0.5, 5.5)
Bottom two SEIFA quintiles	OR 1.9 (1.6,2.1)***	2.3 (0.8, 6.5)	2.3 (0.9, 5.9)
Self-report High Psychological Distress (K10)	OR 1.9 (1.6,2.3)***	OR 7.1 (2.1,23.4)**	1.7 (0.6, 5.1)
High Risk drinking according to Audit-C	OR 2.2 (1.7,3.1)***	2.4 (0.2, 21.7)	4.0 (0.8, 20.1)
Recent use any illicit drug	OR 4.3 (3.7,5.1)***	1.7 (0.4, 7.1)	OR 8.1 (3.2,19.8)***

NB: All ORs are adjusted for age.
ns – non-significant.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.0001$.

smoking among sexual minority women is a major concern in Australia, which is consistent with community studies that have monitored the high rates and marginal reduction in smoking in this population for more than 10 years (Deacon & Mooney-Somers, 2017; Drew, Rodrigues, Wright, Deacon, & Mooney-Somers, 2017; Hyde, Comfort, McManus, Brown, & Howat, 2009; Leonard et al., 2012). While resources have been directed to address LGBT tobacco use in the United States (Eliason, Dibble, Gordon, & Soliz, 2012; Levinson, Hood, Mahajan, & Russ, 2012; Greenwood et al., 2002), in Australia work has been limited to local initiatives such as LGBT health promotion organisation ACON Health's 'Smoke Free Still Fierce' campaign (ACON, 2018a).

Our second analysis examined the factors associated with smoking for each sexuality group (objective 2). With the emerging evidence of health differences, and potentially different explanations for these differences between bisexual and lesbian women, we separately examined the factors significantly associated with smoking among lesbian and bisexual women.

Among lesbian women, smoking was associated with being currently employed, having low income and experiencing high psychological distress in the past 4 weeks. The finding in relation to employment contrasts with research from the United States which shows associations between unemployment and both current (vs former smoking) and ever smoking (vs never smoking) for sexual minority women (Matthews et al., 2017). It may be that the workplace is a specific source of sexuality-related discrimination contributing to minority stress (not measured by NDSHS; Smith, Oades, & McCarthy, 2013; Zurbrügg & Miner, 2016). This difference in employment status, only observed in lesbian smokers, may represent an important finding in understanding the Australian context of smoking for lesbian women. Further research is needed to provide nuance and to determine if the workplace may be of particular importance in future smoking intervention research for lesbian women.

The association between smoking and low income among lesbian smokers, is in line with literature in the general population (Kalisch, 2015) but may present a higher degree of disadvantage for lesbian smokers when viewed in the context of the significantly higher income shown in all lesbian women (see Table 1).

We found a high prevalence of psychological distress among both lesbian and bisexual women in our sample; this was significantly associated with smoking for lesbian women only. The Australian SWASH survey also found high rates of psychological distress among its sample of sexual minority women, but no association with smoking (Deacon & Mooney-Somers, 2017). This may reflect differences in methodology, including a higher cut off for psychological distress that may explain the lack of relationship found in SWASH (Deacon & Mooney-Somers, 2017). It also suggests there is a complex relationship between sexuality, psychological distress and smoking. It is important to note that the NDSHS does not measure minority stressors such as internalised homophobia, victimisation and discrimination, nor does it measure connection to LGBT communities. The international literature shows inconsistent evidence on the relationship between minority stressors and smoking, particularly victimisation and discrimination (Blosnich, Lee, & Horn, 2013), although qualitative studies find women describe internalised homophobia, anticipated stigma and other minority stressors as important factors in their smoking (Gruskin et al., 2008; Youatt et al., 2015). Further research is needed to better understand the relationship between minority stressors, psychological distress and smoking.

Among bisexual women, the only factor associated with smoking was recent illicit drug use. International research shows bisexual women have increased rates of illicit drug use relative to both heterosexual and lesbian women (Kerr et al., 2015). The research also demonstrates illicit drug use is a cofactor for tobacco use among sexual minority women (Deacon & Mooney-Somers, 2017; Matthews et al., 2014, 2017). There is a lack of research investigating why bisexual women, in particular, have higher rates of illicit drug use, or how this interacts with their tobacco use. This may present an important future research focus to contextualise bisexual women's tobacco use.

The lack of a significant association with smoking and risky drinking for either lesbian or bisexual women is important to note. Both international and Australian research has found that risky (or binge) drinking patterns are associated with smoking (Deacon & Mooney-Somers, 2017; Matthews et al., 2014). The fact that we found no such association in the NDSHS sample is most likely due to the low numbers of risky drinkers in the sample (see Table 1). Further research is recommended to confirm if risky drinking remains an important contextual factor in lesbian and bisexual women's smoking in Australia, and to understand the context in which this drinking is occurring. Previous research has shown an association between LGBT bar use and smoking (Deacon & Mooney-Somers, 2017; Matthews, Hotton, DuBois, Fingerhut, & Kuhns, 2011). Attendance at LGBT bars may provide socialisation opportunities where lesbian and bisexual women may be exposed to pro-smoking norms. However, the changing nature of socialisation among the LGBT community, including the reduction of LGBT bars and more socialisation in online spaces (Simon Rosser, West, & Weinmeyer, 2008) may impact drinking and smoking norms among lesbian and bisexual women.

Our findings have important implications. Policies that recognise

the needs of sexual minority women in tobacco control are required if Australia is to meet its target of reducing smoking in the population to below 10% (Intergovernmental Committee on Drugs, 2012). Given the comparatively higher rates of smoking shown in our analysis (lesbian women 26.4% and bisexual women 27.2%) and the slow reduction observed in community studies over time (Deacon & Mooney-Somers, 2017), a reduction in smoking in line with the general community (to 12.7%) would represent a major public health achievement. With this in mind, the need for representative research to inform national tobacco policy is clear. This study has sought to explain the drivers of smoking within different sexuality groups by comparing smokers to non-smokers. Understanding the specific factors associated with smoking for lesbian women and for bisexual women separately, can better inform future research, and the development of appropriately targeted interventions to address the disparities we documented above.

Limitations

Aboriginal and/or Torres Strait Islander peoples and culturally and linguistically diverse women identifying as lesbian and bisexual were not reported due to low numbers of respondents. More research is needed to examine the intersection of ethnicity and sexuality and how this may impact initiating and maintaining smoking among sexual minority women in Australia.

Obtaining accurate representation of lesbian and bisexual women in national studies is hampered by the lack of established population figures for sexual minority women in Australia. In the NDSHS, lesbian and bisexual women made up 2.5% of the sample, while the nationally representative Australian Study of Health and Relationships reported 3.4% (1.2% identified as homosexual and 2.2% identified as bisexual; Richters et al., 2014). It is likely the Australian Study of Health and Relationships has a more accurate estimate of the proportion of sexual minority women due to its methodological focus on obtaining accurate sexual identity, sexual attraction and sexual behaviour data, its high response rate and low rate of missing data. Due to the lack of methodological focus on sexual minority women in the NDSHS our data may not be wholly representative of all Australian women who identify as lesbian or bisexual. Our analysis included 42 lesbian smokers and 64 bisexual smokers; with a larger sample, several of the factors associated with smoking for these women may have been significant. While it is important to note the low numbers of lesbian and bisexual smokers in our sample, the issue of sample size is unlikely to change and has been previously noted as a limitation in Australian representative studies working with lesbian and bisexual women (Sabia et al., 2018). Future representative research may benefit from targeted or oversampling techniques for this population, such as the methods used by the Australian Study of Health and Relationships (Richters et al., 2014).

Excluded from our analysis were 98 female respondents who responded to the NDSHS sexuality question with “not sure/undecided” and 103 who answered, “something else/other”. These women considered themselves neither heterosexual, lesbian nor bisexual. They *may* have identified as sexual minority women, e.g. queer or pansexual (see for example, Deacon & Mooney-Somers, 2017). They may have been in a period of transition around their sexuality, identified as asexual or have been experiencing a lack of congruity between their attraction and their behaviour and so felt unsure of how to categorise their sexuality. Respondents may also have not understood the question or felt it was irrelevant to them. Research in this area has largely sought to explain smoking in terms of the stress associated with having a minority identity and shared social connections (see for example, Deacon & Mooney-Somers, 2017; Matthews et al., 2011; Youatt et al., 2015), therefore, we focused on women expressing connection with a specific sexual identity, in this case lesbian and bisexual women. Future research would benefit from best practice sexuality questions such as those produced by ACON (ACON, 2018b), which encompass the diverse gender and sexuality identities expressed by this population.

Conclusion

Higher rates of smoking among lesbian and bisexual women reported in this paper provide further support for the need for evidence based national policy action on reducing smoking among these women. The specific pattern of factors associated with smoking for each sexuality group suggest that further epidemiological studies are needed to capture sexuality accurately in the context of tobacco use. Additionally, qualitative research is critical to understand the process and experience of smoking, and to inform the development of interventions that will meet the needs of this population. Ensuring access to, and development of, smoking cessation resources for sexual minority women and creating representations in mainstream tobacco control campaigns may assist in reducing tobacco use in sexual minority women and help Australia to meet its national policy target for smoking.

Declarations of interest

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References

ACON (2018a). *(a) smoke free still feirce.* Retrieved 10th April 2018 fromhttps://www.acon.org.au/who-we-are-here-for/women/smoke-free-still-fierce-project/.

ACON (2018b). *(b) recommended sexuality and gender indicators.* Retrieved 10th April 2018 fromhttps://www.acon.org.au/what-we-are-here-for/policy-research/#recommended-sexuality-and-gender-indicators.

Australian Bureau of Statistcs (2012). *Information paper: Use of the Kessler psychological distress scale in ABS health surveys, Australia, 2007-08 (4817.0.55.001)*.

Australian Bureau of Statistics (2013). *3101.0 Australian Demographic Statistics 2013 (3101.0)*. Canberra: Australian Government Printing Service.

Australian Institute of Health and Welfare (2011). *The health and welfare of Australia's Aboriginal and Torres Strait Islander people: An overview: 2011 (IHW 42)*. Canberra: Paragon Printers Australasia.

Australian Institute of Health and Welfare (2014). *National Drug Strategy Household survey detailed report 2013 (PHE 183)*Canberra: Australian Institute of Health and Welfare.

Australian Institute of Health and Welfare (2017). *National Drug Strategy Household survey 2016: Detailed findings (PHE 214)*. Canberra: Australian Institute of Health and Welfare.

Bariola, E., Lyons, A., & Leonard, W. (2016). Gender-specific health implications of minority stress among lesbians and gay men. *Australian and New Zealand Journal of Public Health, 40*(6), 506–512.

Blosnich, J. R., Farmer, G. W., Lee, J. G., Silenzio, V. M., & Bowen, D. J. (2014). Health inequalities among sexual minority adults: Evidence from ten U.S. states, 2010. [Erratum appears in Am J Prev Med. 2014 Jul;47(1):103]. *American Journal of Preventive Medicine, 46*(4), 337–349.

Blosnich, J., Lee, J. G., & Horn, K. (2013). A systematic review of the aetiology of tobacco disparities for sexual minorities. *Tobacco Control: An International Journal, 22*(2), 66–73.

Cochran, S. D., Greer Sullivan, J., & Mays, V. M. (2003). Prevalence of mental disorders, psychological distress, and mental health services use among lesbian, gay, and bisexual adults in the United States. *Journal of Consulting and Clinical Psychology, 71*(1), 53–61.

Deacon, R. M., & Mooney-Somers, J. (2017). Smoking prevalence among lesbian, bisexual and queer women in Sydney remains high: Analysis of trends and correlates. *Drug and Alcohol Review, 36*(4), 546–554.

Dorch, P., Phillips, J., & Crow, C. (2016). *Poverty in Australia (ISSN: 13267124)*. Sydney: ACOSS and The Social Policy Research Centre.

Drew, D., Rodrigues, E., Wright, S., Deacon, R., & Mooney-Somers, J. (2017). *The Labrys Project: Exploring the health and wellbeing of lesbian, bisexual, queer and same sex attracted women living in the Illawarra and Shoalhaven regions.* Sydney: ACON, Women's Health, Illawarra Shoalhaven Local Health District, & VELiM, University of Sydney.

Eliason, M. J., Dibble, S. L., Gordon, R., & Soliz, G. B. (2012). The last drag: An evaluation of an LGBT-specific smoking intervention. *Journal of Homosexuality, 59*(6), 864–878.

Fallin, A., Goodin, A., Lee, Y. O., & Bennett, K. (2015). Smoking characteristics among lesbian, gay, and bisexual adults. *Preventive Medicine: An International Journal Devoted to Practice and Theory, 74*, 123–130.

Fredriksen-Goldsen, K. I., Kim, H.-J., Barkan, S. E., Balsam, K. F., & Mincer, S. L. (2010). Disparities in health-related quality of life: A comparison of lesbians and bisexual women. *American Journal of Public Health, 100*(11), 2255–2261.

Green, K. E., & Feinstein, B. A. (2012). Substance use in lesbian, gay, and bisexual populations: An update on empirical research and implications for treatment. *Psychology of Addictive Behaviors: Journal of the Society of Psychologists in Addictive Behaviors, 26*(2), 265–278. https://doi.org/10.1037/a0025424.

Greenwood, G., Hunt, C., deManincor, D., Ralston, B., Ereñeta, J., Gordon, B., & Soliz, G. (2002). *Smoking cessation interventions in San Francisco's queer communities.* San Francisco, CA: University of California.

Gruskin, E. P., Byrne, K. M., Altschuler, A., & Dibble, S. L. (2008). Smoking it all away: Influences of stress, negative emotions, and stigma on lesbian tobacco use. *Journal of LGBT Health Research, 4*(4), 167–179.

Harris, A. H. S., Bradley, K. A., Bowe, T., Henderson, P., & Moos, R. (2010). Associations between AUDIT-C and mortality vary by age and sex. *Population Health Management, 13*(5), 263–268.

Hillier, L., De Visser, R., Kavanagh, A. M., & McNair, R. P. (2003). The association between licit and illicit drug use and sexuality in young Australian women. *The Medical Journal of Australia, 179*(6), 326–327.

Hughes, T., Szalacha, L. A., & McNair, R. (2010). Substance abuse and mental health disparities: Comparisons across sexual identity groups in a national sample of young Australian women. *Social Science & Medicine, 71*(4), 824–831.

Hyde, Z., Comfort, J., McManus, A., Brown, G., & Howat, P. (2009). Alcohol, tobacco and illicit drug use amongst same-sex attracted women: Results from the Western Australian Lesbian and Bisexual Women's Health and Well-Being Survey. *BMC Public Health, 9*, 317.

Intergovernmental Committee on Drugs (2012). *National Tobacco strategy 2012-2018 (D1013).* Canberra: Department of Health and Ageing.

Johnston, I., Shahid, S., Schlumpp, A., & Wilkins, S. (2015). *The health of Australia's prisoners 2015 (PHE 207).* Canberra: Australian Institute of Health and Welfare.

Kalisch, D. (2015). *National health survey: First results 2014-15. (4364.0.55.001).* Retrieved 10th April 2018 fromhttp://www.abs.gov.au/ausstats/abs@.nsf/mf/4364.0.55.001.

Kerr, D., Ding, K., Burke, A., & Ott-Walter, K. (2015). An alcohol, tobacco, and other drug use comparison of lesbian, bisexual, and heterosexual undergraduate women. *Substance Use & Misuse, 50*(3), 340–349.

Kessler, R. C., Andrews, G., Colpe, L. J., Hiripi, E., Mroczek, D. K., Normand, S. L. T., ... Zaslavsky, A. M. (2002). Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological Medicine, 32*(6), 959–976.

Lawrence, D., Mitrou, F., & Zubrick, S. R. (2009). Smoking and mental illness: Results from population surveys in Australia and the United States. *BMC Public Health, 9*(1) 285–285.

Lea, T., de Wit, J., & Reynolds, R. (2014). Minority stress in lesbian, gay, and bisexual young adults in Australia: Associations with psychological distress, suicidality, and substance use. *Archives of Sexual Behavior, 43*(8), 1571–1578. https://doi.org/10.1007/s10508-014-0266-6.

Lee, J., Griffin, G., & Melvin, C. (2009). Tobacco use among sexual minorities in the USA, 1987 to May 2007: A systematic review. *Tobacco Control: An International Journal, 18*(4), 275–282.

Lehavot, K., & Simoni, J. M. (2011). The impact of minority stress on mental health and substance use among sexual minority women. *Journal of Consulting and Clinical Psychology, 79*(2), 159–170.

Leonard, W., Pitts, M., Mitchell, A., Lyons, A., Smith, A., Patel, S., ... Barnett, A. (2012). *Private lives 2: The second national survey of the health and wellbeing of gay, lesbian, bisexual and transgender (GLBT) Australians. Monograph Series Number 86.* Melbourne: The Australian Research Centre in Sex, Health & Society, La Trobe University.

Levinson, A. H., Hood, N., Mahajan, R., & Russ, R. (2012). Smoking cessation treatment preferences, intentions, and behaviors among a large sample of Colorado gay, lesbian, bisexual, and transgendered smokers. *Nicotine & Tobacco Research, 14*(8), 910–918.

Lunn, M. R., Cui, W., Zack, M. M., Thompson, W. W., Blank, M. B., & Yehia, B. R. (2017). Sociodemographic characteristics and health outcomes among lesbian, gay, and bisexual US adults using Healthy People 2020 leading health indicators. *LGBT Health, 4*(4), 283–294.

Matthews, A. K., Hotton, A., DuBois, S., Fingerhut, D., & Kuhns, L. M. (2011). Demographic, psychosocial, and contextual correlates of tobacco use in sexual minority women. *Research in Nursing & Health, 34*(2), 141–152.

Matthews, A. K., Riley, B. B., Everett, B., Hughes, T. L., Aranda, F., & Johnson, T. (2014). A longitudinal study of the correlates of persistent smoking among sexual minority women. *Nicotine & Tobacco Research, 16*(9), 1199–1206.

Matthews, A. K., Steffen, A., Hughes, T., Aranda, F., & Martin, K. (2017). Demographic, healthcare, and contextual factors associated with smoking status among sexual minority women. *LGBT Health, 4*(1), 17–23.

McCabe, S. E., Hughes, T. L., Bostwick, W. B., West, B. T., & Boyd, C. J. (2009). Sexual orientation, substance use behaviors and substance dependence in the United States. *Addiction, 104*(8), 1333–1345.

McCabe, S. E., Matthews, A. K., Lee, J. G. L., Veliz, P., Hughes, T. L., & Boyd, C. J. (2018). Tobacco use and sexual orientation in a national cross-sectional study: Age, race/ethnicity, and sexual identity–attraction differences. *American Journal of Preventive Medicine, 54*(6), 736–745.

Meads, C., Buckley, E., & Sanderson, P. (2007). Ten years of lesbian health survey research in the UK West Midlands. *BMC Public Health, 7*, 251.

Meyer, I. H. (2003). Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: Conceptual issues and research evidence. *Psychological Bulletin, 129*(5), 674–697.

Mohr, J. J. (2004). Attitudes toward bisexual women and men AU - Israel, Tania. *Journal of Bisexuality, 4*(1–2), 117–134.

Pink, B. (2011). *Australian Statistical Geography Standard (ASGS): Volume 5 - remoteness structure (1270.0.55.005).* Canberra: Australian Bureau of Statistics.

Pink, B. (2013). *Socio-Economic Indexes for Areas (SEIFA) 2011 (2033.0.55.001).* Canberra: Australian Bureau of Statistics.

Platt, L. F., & Scheitle, C. P. (2018). Sexual orientation and psychological distress: Differences by race and gender. *Journal of Gay & Lesbian Mental Health, 22*(3), 204–225.

Reitsma, M. B., Fullman, N., Ng, M., Salama, J. S., Abajobir, A., Abate, K. H., ... Gakidou, E. (2015). Smoking prevalence and attributable disease burden in 195 countries and territories, 1990-2013: A systematic analysis from the Global Burden of Disease Study 2015. *The Lancet, 389*(10082), 1885–1906.

Richters, J., Altman, D., Badcock, P. B., Smith, A. M., de Visser, R. O., Grulich, A. E., ... Simpson, J. M. (2014). Sexual identity, sexual attraction and sexual experience: The Second Australian Study of Health and Relationships. *Sexual Health, 11*(5), 451–460.

Roxburgh, A., Lea, T., de Wit, J., & Degenhardt, L. (2016). Sexual identity and prevalence of alcohol and other drug use among Australians in the general population. *The International Journal of Drug Policy, 28*, 76–82.

Roy Morgan Research (2014). *National drug strategy household survey 2013 final technical report*Melbourne: Roy Morgan Research.

Sabia, J. J., Wooden, M., & Nguyen, T. T. (2018). Sexual identity, same-same relationships, and health dynamics: New evidence from Australia. *Economics and Human Biology, 30*, 24–36.

Simon Rosser, B. R., West, W., & Weinmeyer, R. (2008). Are gay communities dying or just in transition? Results from an international consultation examining possible structural change in gay communities. *AIDS Care, 20*(5), 588–595.

Smith, I. P., Oades, L., & McCarthy, G. (2013). The Australian corporate closet, why it's still so full: A review of incidence rates for sexual orientation discrimination and gender identity discrimination in the workplace. *Gay and Lesbian Issues and Psychology Review, 9*(1), 51.

Steele, L. S., Ross, L. E., Dobinson, C., Veldhuizen, S., & Tinmouth, J. M. (2009). Women's sexual orientation and health: Results from a Canadian population-based survey. *Women & Health, 49*(5), 353–367.

Wheldon, C. W., Kaufman, A. R., Kasza, K. A., & Moser, R. P. (2018). Tobacco use among adults by sexual orientation: Findings from the population assessment of tobacco and health study. *LGBT Health, 5*(1), 33.

Youatt, E. J., Johns, M. M., Pingel, E. S., Soler, J. H., & Bauermeister, J. A. (2015). Exploring young adult sexual minority women's perspectives on LGBTQ smoking. *Journal of LGBT Youth, 12*(3), 323–342.

Zurbrügg, L., & Miner, K. N. (2016). Gender, sexual orientation, and workplace incivility: Who is most targeted and who is most harmed? *Frontiers in Psychology, 7*, 565.