



LDCT lung cancer screening eligibility and use of CT scans for lung cancer among sexual minorities

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ABSTRACT

Objective: To compare eligibility for lung cancer screening and receipt of a CT scan for lung cancer among sexual minorities.

Methods: Secondary data analysis of cross-sectional data from older U.S. adults in the Behavioral Risk Factor Surveillance System survey during the 2017 cycle (n = 20,685).

Results: Rates of eligibility for low-dose helical computed tomography (LDCT) were roughly twice as high among sexual minorities than among heterosexuals (21.1% vs. 11.7%). The odds of gay men and lesbian women indicating eligibility for LDCT screening were four to five times higher when compared to their heterosexual peers. No statistically significant differences were found between sexual minorities and heterosexuals with respect to having a CT scan for lung cancer in the past year.

Conclusions: There are potential sexual-identity-related disparities in the utilization of lung cancer screening among eligible smokers. Interventions are needed to increase awareness and uptake of lung cancer screening in order to detect and manage this common form of cancer in the U.S.

1. Introduction

Lung cancer is the leading cause of cancer-related deaths among both men and women in the U.S. [1]. A recent study estimated that 8 million Americans are at high risk for lung cancer due to chronic high frequency smoking [2]. The National Lung Screening Trial (NLST) demonstrated that low-dose helical computed tomography (LDCT) lung cancer early detection screening demonstrated a relative reduction in mortality by 20% among high risk smokers [3]. However, efforts to identify and target high-risk populations for outreach and engagement in early detection screening are in their infancy. Sexual minorities (e.g., those who identify as lesbian, gay, bisexual, or 'not sure') are at greater risk of cigarette smoking and tobacco use disorders than heterosexuals [4–6]. We found only one published study reporting the prevalence of eligibility for low-dose computed tomography (LDCT) lung cancer

screening based on sexual orientation.⁷ No study, to our knowledge, has examined actual rates of lung cancer screening in this population. Gaining a better understanding of potential sexual-orientation-related differences in LDCT eligibility and engagement in lung cancer screening could guide efforts to reduce the risk of lung cancer among sexual minorities. The purpose of this study was to compare rates of eligibility for LDCT lung cancer screening and receipt of a CT scan for lung cancer in a five-state U.S. sample of sexual minority and heterosexual adults aged 55–77. Given their greater risk for cigarette smoking and tobacco use [4–6], it is expected that sexual minority adults will report proportionately higher rates of eligibility for LDCT lung screening and therefore have higher rates of CT scans to check for lung cancer during the past year than their heterosexual counterparts.

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2. Methods

2.1. Study design

The Behavioral Risk Factor Surveillance System (BRFSS) is a nationally survey of U.S. adults 18 years of age or older [8] that collects data on health-related risk behaviors and conditions. The 2017 BRFSS response rate for the landline sample was 45.3% and the response rate for the cell phone sample was 44.5%. More details on the BRFSS can be found elsewhere [8].

2.2. Sample

In 2017, five states included measures of LDCT eligibility and screening as well as sexual orientation identity (Florida, Georgia, Nevada, Oklahoma, and Vermont). The current analytic sample consisted of 20,685 respondents to the BRFSS who were between the ages of 55 and 77 and resided in these states.

2.3. Measures

Eligibility for LDCT lung cancer screening. The Centers for Medicare and Medicaid Services (CMS) guidelines [9] recommend yearly LDCT screens based on the following criteria: (1) individuals who are 55–77 years old; (2) current smokers or former smokers who have quit smoking within the past 15 years; (3) tobacco smoking history of at least 30 pack-years (one pack-year = smoking one pack per day × 1 year; 1 pack = 20 cigarettes); and, (4) no diagnosis or symptoms of lung cancer. Five items in the 2017 BRFSS were used to construct LDCT eligibility and included respondent’s age, a composite measure of smoking history (i.e., “Everyday smoker”, “Someday smoker”, “Former smoker”, and “Non-smoker”), age when regular smoking began, age last smoked regularly, average number of cigarettes smoked when the respondent smoked regularly, and never diagnosed with cancer.

Past 12-month CT scan for lung cancer was assessed using the following questions: “In the last 12 months, did you have a CT or CAT scan? Response options were: “Yes, to check for lung cancer”, “No (did not have a CT scan)”, “Had a CT scan, but for some other reason”, “Don’t know/Not sure”. The response categories were recoded into a binary variable (1 = had a CT or CAT scan to check for lung cancer, 0 = did not).

Sexual identity was assessed by asking, “Do you consider yourself to be: 1. straight, 2. lesbian or gay, or 3. bisexual?” For respondents, who were unsure, did not wish to answer the question, or felt the options did not represent them, interviewers could code responses as “other”, “don’t know/not sure”, or “refused”.

2.4. Data analysis

We examined differences in LDCT eligibility/CT scan for lung cancer in sexual minority and heterosexual respondents (stratified by sex) using bivariate and multivariable logistic regression. Adjusted odds ratios (AORs) accounted for race, level of education, personal income, and marital status. All analyses accounted for the complex sample design using Stata 15.0 in order to account for differences in the probability of selection into the sample (weights provided by the BRFSS were also used in all of the analyses). Supplemental analyses were conducted that excluded respondents who did not identify with a specific sexual identity (i.e., “other/don’t know/not sure – See supplemental Tables C and D).

3. Results

Supplemental Table 1 displays the demographic characteristics of the sample. Overall, 10.6% of the sample met eligibility criteria for LDCT early detection screening, and 8.4% indicated receiving a CT scan

Table 1

Sample characteristics of respondents between the ages of 55 and 77, five U.S. states, 2017.

Sex	Total (n = 20,685) % (n)	%(n) Missing
Male	46.6% (8772)	0.02% (5)
Female	53.4% (11,908)	
Sexual Identity		
Heterosexual	96.7% (16,935)	15.5% (3206)
Gay/Lesbian	1.3% (233)	
Bisexual	0.6% (141)	
Other/Don't know/Not Sure	1.4% (170)	
Race/Ethnicity		
White	69.9% (16,819)	0.0% (0)
Black	13.2% (1882)	
Hispanic	12.1% (907)	
Other race/ethnicity	4.8% (1077)	
Education		
High school degree or less	42.6% (7534)	0.4% (73)
Some college	31.4% (5970)	
College degree or higher	26.0% (7108)	
Personal Income		
\$75,000 or higher	22.4% (4450)	0.8% (162)
\$0 to \$74,999	58.7% (12,335)	
Don't know/Not Sure	7.6% (1427)	
Refused	11.3% (2311)	
Marital Status		
Not married	41.8% (6122)	.7%
Married	58.2% (6086)	
LDCT eligibility		
No	89.4% (16,859)	9.5% (1961)
Yes	10.6% (1865)	
CT scan for lung cancer (past 12 months)		
No	91.6% (16,709)	12.9% (2663)
Yes	8.4% (1313)	

Sample sizes vary due to missing data. Unweighted sample sizes are provided. Percentages incorporate survey weights provided by the BRFSS.

for lung cancer during the past year.

Table 2 shows the unadjusted and adjusted associations of LDCT eligibility and past-year CT scan for lung cancer by sexual identity (see Supplemental Table A and C for dichotomous comparison of heterosexuals versus sexual minorities). The odds of gay men indicating eligibility for LDCT screening were higher than odds for heterosexual men (AOR = 3.58, 95% CI = 1.25, 10.3) and the odds of lesbian women indicating eligibility for LDCT screening were higher than those of heterosexual women (AOR = 4.95, 95% CI = 1.82, 13.4). Bisexual men (AOR = 1.99, 95% CI = .829, 4.78) and women (AOR = 1.39, 95% CI = .286, 6.75) did not differ significantly from their heterosexual counterparts in the adjusted models related to LDCT screening eligibility. Moreover, no significant differences were found between heterosexuals and sexual minorities (i.e., gay/lesbian and bisexual) with respect to receiving a CT scan for lung cancer during the past 12 months. Results of adjusted models indicated that the odds of LDCT screening eligibility but not receiving a CT scan for lung cancer during the past 12 months were higher for gay/lesbian participants than heterosexuals participants (AOR = 3.31, 95% CI = 1.38, 7.94). When stratifying by sex, this difference remained significant for lesbian women when compared to heterosexual women (AOR = 4.91, 95% CI = 1.60, 15.1); no statistically significant difference was found between gay men and heterosexual men (AOR = 2.30, 95% CI = .670, 7.90).

4. Discussion

Using a large sample of older sexual minority and heterosexual

Table 2
Assessing differences for LDCT eligibility and CT scan for lung cancer in the past 12 months among respondents between the ages of 55 and 77, five U.S. states, 2017.

Total	Eligible for LCDT Screen			Completed CT Scan for Lung Cancer			Eligible for LCDT Screen and No CT Scan		
	%	OR 95% CI (n = 16,303)	AOR 95% CI (n = 16,219)	%	OR 95% CI (n = 17,439)	AOR 95% CI (n = 17,337)	%	OR 95% CI (n = 16,300)	AOR 95% CI (n = 16,217)
Hetero.	11.7	Ref.	Ref.	8.4	Ref.	Ref.	10.1	Ref.	Ref.
Gay/Les.	36.2	4.28 (2.10,8.72) ^c	4.31 (2.03,9.15) ^c	14.9	1.90 (.858,4.23)	1.75 (.758,4.03)	27.1	3.29 (1.42,7.64) ^b	3.31 (1.38,7.94) ^b
Bisexual	23.4	2.17 (1.00,4.71) ^a	1.72 (.760,3.92)	5.3	.613 (.184,2.03)	.555 (.168,1.82)	21.5	2.43 (1.10,5.36) ^a	2.00 (.870,4.61)
Other/NS	6.1	.486 (.198,1.19)	.652 (.281,1.51)	3.2	.357 (.158,.808) ^a	.301 (.122,.743) ^b	6.1	.570 (.233,1.39)	.755 (.323,1.76)
Men	Eligible for LCDT Screen			Completed CT Scan for Lung Cancer			Eligible for LCDT Screen and No CT Scan		
	%	OR 95% CI (n = 6,816)	AOR 95% CI (n = 6,794)	%	OR 95% CI (n = 7,304)	AOR 95% CI (n = 7,273)	%	OR 95% CI (n = 6,816)	AOR 95% CI (n = 6,793)
Hetero.	15.1	Ref.	Ref.	9.8	Ref.	Ref.	13.0	Ref.	Ref.
Gay	39.7	3.72 (1.54,8.94) ^b	3.58 (1.25,10.3) ^a	17.7	1.97 (.685,5.69)	1.90 (.641,5.64)	26.4	2.37 (.804,7.03)	2.30 (.670,7.90)
Bisexual	29.9	2.41 (1.02,5.66) ^a	1.99 (.829,4.78)	6.1	.595 (.126,2.79)	.524 (.110,2.49)	28.7	2.67 (1.11,6.40) ^a	2.31 (.942,5.70)
Other/NS	4.5	.268 (.046,1.54)	.316 (.063,1.58)	2.1	.197 (.036,1.06)	.193 (.033,1.11)	4.5	.315 (.054,1.82)	.353 (.067,1.83)
Women	Eligible for LCDT Screen			Completed CT Scan for Lung Cancer			Eligible for LCDT Screen and No CT Scan		
	%	OR 95% CI (n = 9,483)	AOR 95% CI (n = 9,422)	%	OR 95% CI (n = 10,131)	AOR 95% CI (n = 10,060)	%	OR 95% CI (n = 9,481)	AOR 95% CI (n = 9,421)
Hetero.	8.8	Ref.	Ref.	7.1	Ref.	Ref.	7.6	Ref.	Ref.
Lesbian	31.9	4.85 (1.48,15.8) ^b	4.95 (1.82,13.4) ^b	11.1	1.62 (.547,4.84)	1.45 (.453,4.68)	28.0	4.73 (1.27,17.5) ^a	4.91 (1.60,15.1) ^b
Bisexual	15.3	1.86 (.424,8.14)	1.39 (.286,6.75)	4.6	.628 (.097,4.04)	.616 (.096,3.94)	14.8	2.10 (.463,9.56)	1.60 (.322,7.99)
Other/NS	6.9	.769 (.275,2.14)	1.13 (.413,3.13)	3.7	.510 (.203,1.27)	.390 (.135,1.12)	6.9	.904 (.323,2.52)	1.38 (.504,3.82)

^ap < .05; ^bp < .01; ^cp < .001; % = Prevalence Rate; Hetero. = Heterosexual; NS = Not Sure; Ref. = Reference Group; OR = Odds Ratio; AOR = Adjusted Odds Ratio.

Sample sizes vary due to missing data. Unweighted sample sizes are provided. Analysis incorporate survey weights provided by the BRFSS. All models estimating adjusted odds ratios (AOR) account for race, level of education, personal income, and marital status.

adults in five U.S. states, we found that eligibility for LDCT lung cancer screening was highest among gay men and lesbian women. Consistent with research using the 2012–2013 National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III) [7] in which sexual minority-identified adults had the highest rates of eligibility for LDCT lung cancer screening, we similarly found notably higher rates of eligibility for LDCT lung cancer screening among sexual minority-identified adults than among heterosexuals.

These substantial and significant differences in eligibility based on sexual identity contrast with the relatively minimal differences in receiving a CT scan for lung cancer during the past year. Our findings suggest a potential need to increase LDCT screening utilization among all those eligible, regardless of sexual identity. This low level of utilization of CT scans to screen for lung cancer is particularly troubling in the context of a substantial sexual-orientation-related disparity in eligibility and indicates LDCT screening may be disproportionately benefitting heterosexual adults. Indeed, prior research shows that healthcare interventions can exacerbate inequalities [10], making it critical that health policymakers be aware of the discrepancy between rates of LDCT eligibility and the use of CT scans for lung cancer to more effectively detect and manage lung cancer among sexual minorities.

Several limitations of the current study should be noted. First, data were cross-sectional and thus causality cannot be determined. Second, the question about CT scans for lung cancer were based on the past-year and do not take into consideration prior-to-past year screening. Moreover, the survey questions do not specifically address whether the CT scan was performed as part of a lung cancer screening program; the scans could have been performed for diagnostic purposes under non-low dose protocols. Third, sample sizes were relatively small in analyses stratified by sex; several differences of considerable magnitude in rates of LDCT eligibility and CT scans for lung cancer lacked power to reach statistical significance. Fourth, information about sexual identity was missing for 15.5% of respondents, which is substantially higher than in prior studies using BRFSS data from different states [11]. Finally, given that the questions used for this study were optional and only five states included them, the results are not representative of the entire U.S. Despite these limitations, our results can help inform health services research and health care providers about the potential risks for lung

cancer among older sexual minorities. More research is needed to identify potential barriers to receiving LDCT screens within this population.

In conclusion, interventions are needed to increase awareness and utilization of LDCT screening among high-risk smokers, particularly sexual minority smokers. Further research is needed to better understand reasons for the low levels of utilization of CT scans for lung cancer particularly among sexual minorities who tend to have a higher rate of eligibility. Insurance coverage and affordability may partly explain this discrepancy. In particular, sexual minority respondents are more likely to report challenges affording care than their heterosexual counterparts [12] and have been shown to have less access to health care due to sexual orientation discrimination [13–15]. Accordingly, greater efforts are needed to increase access to health care services that promote early detection and treatment of lung cancer in this vulnerable population.

Author contributions

All authors contributed equally to the analysis and write-up of the manuscript.

Conflict of interest statement

All authors have no conflict of interests to report.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.canep.2019.03.009>.

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