Lung Cancer Screening Uptake Under the Revised United States Preventive Service Task Force Guideline: Assessing Disparities

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Running Title: *Assessing Disparities in lung cancer screening uptake*

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Declaration of Competing Interest

The authors declare that they have no competing interest.

Abstract

Background: Scanning with low-dose computed tomography reduces lung cancer mortality by 20% among high-risk individuals. Despite its efficacy, the uptake of lung cancer screening (LCS) remains low. Our study aimed to estimate state-level and nationwide LCS rates among eligible individuals and to assess disparities in LCS uptake.

Methods: Data for this study were obtained from the 2022 BRFSS. Multivariable logistic regression models were used to model the associations between predictors and outcome variables and to examine LCS variability across states.

Results: Of the 28,071 participants eligible for LCS, 17.24% underwent LCS. Participants aged 65 -79 years were (OR: 1.75, 95%CI: 1.54 -1.99) more likely to undergo LCS than their younger counterparts. Those who were female (OR: 0.83, 95%CI: 0.73 - 0.94), divorced, separated, or widowed (OR: 0.85, 95%CI: 0.74-0.98), without health insurance (OR: 0.34, 95%CI: 0.22-0.53), without a primary care provider (OR: 0.29, 95%CI: 0.19-0.44), without COPD or those who did not disclose their COPD status ((OR: 0.35, 95%CI: 0.31-0.40) and (OR: 0.37, 95%CI: 0.19-0.73) respectively)) were less likely to undergo LCS than their respective counterparts. LCS uptake also varied significantly across U.S. states.

Conclusions: We observed low uptake of LCS overall, and significant variability in LCS uptake by sociodemographic and health-related factors as well as by state of residence.

Impact: The findings from this study have important implications for community health workers and healthcare clinicians and indicate the need to design effective interventions to increase LCS uptake targeting specific subgroups of populations and particular U.S. states.

Keywords: lung cancer screening uptake, disparities in lung cancer screening, Low-dose computed tomography, USPSTF

INTRODUCTION

Lung cancer is the leading cause of cancer mortality in the United States among both males and females [1–5]. The American Cancer Society estimates that approximately 125,070 deaths from lung cancer (65,790 in men and 59,280 in women) will occur in the U.S in 2024 [6]. Most lung cancer patients are diagnosed after the cancer has already spread to the other parts of the body, with 45% reporting spread to distant parts of the body and 23% to nearby tissues or organs by the time of diagnosis [7]. The 5-year survival rate of lung cancer patients with distant metastases is only 8%, while it is 58% for those who are diagnosed with localized disease [7]. As such, the importance of early detection to improve survival is clear. It is essential to detect lung cancer at early stages when treatment options are more likely to be effective [5].

A 2011 study conducted by the National Lung Screening Trial (NLST) research team found that scanning with low-dose computed tomography (LDCT) reduces lung cancer mortality by 20% compared to screening with chest radiology [8]. Following this finding, the United States Preventive Service Task Force (USPSTF) recommended annual screening for lung cancer among high-risk individuals (i.e., aged 50-80 years with smoking history $\geq$30 pack-years, currently smoking or who quit smoking within the past 15 years) [9]. The USPSTF updated its criteria in 2021 by reducing the minimum age to 50 years and the smoking history to 20 pack-years [5]. Despite its efficacy and the recommendation by the USPSTF, the uptake of lung cancer screening among high-risk individuals remains suboptimal [10–12].

Several studies have assessed the uptake of lung cancer screening in the United States since the USPSTF issued its 2013 recommendation [11–14]. However, these studies used data from the limited number of states with this information available. The Behavioral Risk Factor Surveillance System (BRFSS), a federally funded telephone survey, collected data in 29 states only from 2017 (when it first began surveying LCS) through 2021[15]. In its 2022 survey, the BRFSS collected data for the first time on LCS in all 50 states plus Washington DC, Puerto Rico; the US Virgin Islands; and Guam based on the revised USPSTF guideline. Moreover, previous studies largely relied on data collected in accordance with the former USPSTF guideline (i.e., the 2013 USPSTF). To our knowledge, only one prior study assessed the uptake of lung cancer screening based on the revised guideline (i.e., the 2021 USPSTF) using data covering the entire United States [16]. Findings from this descriptive study suggest that the expanded USPSTF eligibility criteria were associated with increases in eligibility aligned with reducing racial and ethnic and sex disparities in eligibility. However, it is still unclear whether LCS uptake differs based on Medicaid expansion status and whether participant characteristics remain associated with LCS uptake after adjusting for potential confounding.

Our study aimed to estimate state-level and nationwide LCS rates among eligible individuals and to assess disparities in LCS uptake according to sociodemographic and health-related factors adjusting for confounders using the 2022 BRFSS dataset that collected data on LCS in all the 50 states.

MATERIALS AND METHODS

Data source and study population.

The Behavioral Risk Factor Surveillance System (BRFSS) is a federally funded population-based survey administered via cell phone and landline and conducted annually by the CDC in collaboration with state health departments in all 50 states, Washington, D.C., and the U.S. territories (i.e., Puerto Rico, the US Virgin Islands, and Guam). It collects data on health conditions, preventive health practices, and risk behaviors of adults. The BRFSS methods (sample selection, including the weighting procedure and technical information) are described elsewhere [17]. Data for this study were obtained from the 2022 BRFSS. All BRFSS questionnaires, data, and reports are available at http://www.cdc.gov/brfss/ [18].

Eligibility Assessment

Eligibility for LCS in this study is based on the revised guideline of the USPSTF (i.e., 2021 USPSTF). Accordingly, screening-eligible individuals are those aged 50–80 years with a ≥20 pack-year smoking history (currently smoking or quit smoking within the past 15 years). As the BRFSS data collapsed all people older than 80 years into the 80-year-old age group, we excluded this age group to avoid the inclusion of individuals older than 80 years old who are ineligible for screening per USPSTF recommendation; this strategy may have excluded individuals aged exactly 80 years who would otherwise have been eligible [11]. Individuals from the U.S. territories were excluded to restrict our study to the 50 states plus Washington DC. Individuals with previous history of lung cancer were also excluded from the analysis. 28,071 participants were included in the final analysis after excluding ineligible individuals. Selection of the participants is shown in the flow chart (see **Figure 1**).

Outcome of interest

The outcome of interest was the uptake of LCS under the revised guideline using LDCT within the past 12 months, dichotomized (Yes or No). In the 2022 BRFSS, LCS uptake was assessed by asking: *Have you ever had a CT or CAT scan of your chest area?* For those who responded *YES*, the follow-up question was: *Were any of the CT or CAT scans of your chest area done mainly to check or screen for lung cancer?* For those who responded *YES* to this question, the next question was: *When did you have your most recent CT or CAT scan of your chest area mainly to check or screen for lung cancer?* Those who responded *YES* to the first two questions and responded *Within the past year (anytime less than 12 months ago*) to the third question were considered individuals who underwent LCS. Otherwise, participants were categorized as not undergoing LCS.

Predictors of interest

Based on our prior knowledge of factors associated with LCS uptake, we considered sociodemographic variables (i.e., age, gender, marital status, level of education, income, insurance, and race/ethnicity) and health-related variables (i.e., chronic obstructive pulmonary disease (COPD), smoking history, and having primary care provider) as predictors of interest. Race/ethnicity included non-Hispanic White, non-Hispanic Black, Hispanic, and other, which referred to racial/ethnic minorities other than Black and Hispanic (such as American Indian, Asian Indian or Pakistani, and Other Asian).

Statistical analysis

We calculated frequencies and percentages to describe the study population by LCS status. Survey weights provided by BRFSS were used to account for the complex sampling design. Multivariable logistic regression models were used to model the associations between the predictors and the outcome variable accounting for survey weights, sampling cluster, and strata. We included all predictor variables in the model to adjust for their confounding effects. We also used multivariable logistic regression models to examine LCS variability across states. All analyses were conducted in SAS 9.4 (SAS Institute, Cary, NC, USA) using SAS survey procedures (PROC SURVEYLOGISTIC).

Data availability

The data generated in this study are publicly available in BRFSS at https://www.cdc.gov/brfss/annual_data/annual_2022.html.

RESULTS

Characteristics of the Study Population.

Table 1 describes the sample characteristics of the study population by LCS uptake (n=28,071). Slightly more than half (53.30%) of the sample were aged between 50 and 64 years. The proportions of male and female individuals were similar (51.69% vs. 48.31% respectively). The majority of individuals in the sample were Whites (83.43%), had health insurance coverage (92.21%), were without COPD (65.21%), were currently smoking (61.41%), and had a primary care provider (89.69%). The largest group of participants reported an annual family income between $25,000.00 and $50,000.00 (26.72%), their marital status as divorced/separated/widowed (44.69%), and their level of education as high school or equivalent (43.55%).

Among the older age group (65 – 79 years), 22.27% underwent LCS, while only 12.83% of those aged 50 – 64 years underwent LCS. 17.75% of males and 16.70% of females underwent LCS. LCS uptake was similar among Black and White racial/ethnic groups (Whites: 17.69% vs. Blacks: 17.59%), marital status (married: 17.73% vs. divorced/separated/widowed: 17.42%), level of education (less than high school: 16.79% vs. college graduate and above: 17.73%) and level of income (<$25,000.00: 18.01% vs. $50,000.00-$100,000.00: 17.73%). 18.03% of individuals who had health insurance coverage underwent LCS, while only 3.14% of those who did not have health insurance coverage underwent LCS. Among individuals with COPD, 27.45% underwent LCS, while only 11.97% of those who were without COPD underwent LCS. 18.63%

of those who had a primary care provider underwent LCS, compared with only 4.52% of those who did not have a primary care provider.

National and State-Level Lung Cancer Screening Uptake and Variability by State

Of the 28,071 participants eligible for LCS per the 2021 USPSTF guideline, 17.24% underwent LCS. Rhode Island had the highest (30%), while Wyoming (10.23%) and Colorado (10.44%) had the lowest LCS uptake. **Table 2** shows state-level lung cancer mortality (per 100,000 people), state-level LCS uptake, and screening uptake for each state relative to the state with the national average for lung cancer mortality rate. The state of Florida was used as a reference to compare LCS uptake among the states, because it most closely represents the national average in LCS rate (17.24% vs. 17.35%) relative to other states. Participants in some states such as Connecticut (OR:1.860, 95% CI: 1.173- 2.949), Massachusetts (OR:1.685, 95% CI: 1.070- 2.654), and Rhode Island (OR: 2.331, 95% CI: 1.472- 3.689) were significantly more likely to undergo LCS than those in Florida. On the other hand, participants in Oklahoma (OR: 0.467, 95% CI: 0.295- 0.740), Oregon (OR: 0.574, 95% CI: 0.345- 0.953), Texas (OR: 0.592, 95% CI: 0.351- 0.998), and Wyoming (OR: 0.507, 95% CI: 0.301- 0.852) were significantly less likely to undergo LCS than those in Florida. Participants in all the remaining states were not significantly different in LCS uptake compared with Florida.

Factors associated with lung cancer screening uptake

Table 3 shows unadjusted and adjusted odds ratios for sociodemographic and health-related factors that were considered possible predictors of LCS uptake. In the adjusted model, participants aged 65 -79 years were 75% (OR: 1.75, 95% CI: 1.54 - 1.99) more likely to undergo LCS than their younger counterparts (i.e., 50 – 64 years). Female participants were 17% (OR: 0.83, 95% CI: 0.73 - 0.94) less likely to undergo LCS than their male counterparts. Those who were divorced, separated, or widowed were 15% (OR: 0.85, 95% CI: 0.74-0.98) less likely to undergo LCS than married individuals. Individuals who did not disclose their annual family income were 21% (OR: 0.79, 95% CI: 0.65-0.97) less likely to undergo LCS than those whose annual family incomes were less than $25,000.00. Individuals without health insurance were 66% (OR: 0.34, 95% CI: 0.22-0.53) less likely to undergo LCS than those with health insurance. Individuals without COPD or those who did not disclose their COPD status were 65% (OR: 0.35, 95% CI: 0.31-0.40) and 63% (OR: 0.37, 95% CI: 0.19-0.73) less likely to undergo LCS, respectively, than those with COPD. Individuals without a primary care provider were 71% (OR: 0.29, 95% CI: 0.19-0.44) less likely to undergo LCS than those with a primary care provider. Individuals in the states with Medicaid expansion were 20% (OR: 1.20, 95% CI: 1.03 - 1.39) more likely to undergo LCS than individuals in the states without Medicaid expansion. Other

variables such as race/ethnicity, level of education, and smoking status were not significantly associated with LCS uptake.

DISCUSSION

Our study estimated LCS uptake in the U.S., overall and by state, and also assessed disparities in LCS uptake according to sociodemographic and health-related factors. We used the 2022 BRFSS dataset which differed from the preceding surveys in multiple ways: (1) unlike the previous years which restricted their surveys to only few states, the 2022 BRFSS survey collected data on LCS in all 50 states for the first time, (2) BRFSS collected data in accordance with the revised USPSTF guideline recommendation for the first time, and (3) the sample size for LCS-eligible participants is the largest of all prior BRFSS surveys. Our current study found that older age (i.e., 65-79 years) was significantly associated with higher rates of LCS uptake. On the other hand, female individuals, those who were divorced/separated/widowed, those who did not disclose their annual family income, those without health insurance coverage, those without COPD (or who did not disclose their COPD status), and those without a PCP were significantly less likely to undergo LCS. LCS uptake also varied significantly across U.S. states.

Under the 2013 USPSTF guideline, the uptake of LCS among eligible individuals was 14.4% in 2017 [14,20] and 17.7% in 2018 [12]. Because the revised USPSTF guideline increased the number of eligible individuals compared with the 2013 guideline [21], we anticipated higher rates of LCS uptake in the 2022 BRFSS survey. However, the estimate of LCS under the revised guideline in 2022 (i.e., 17.24%) is not different from that of the previous study under the 2013 guideline (i.e., 17.7%) [12]. This finding, however, may not warrant the conclusion that LCS uptake is not increasing. Because (unlike the 2022 BRFSS survey) reports for previous years relied on small sample sizes and surveys conducted in fewer states (e.g., 10 states in 2017, and 8 states in 2018), they may not provide a good estimate for nationwide LCS uptake. Nevertheless, the LCS rate is substantially lower than those for other cancers such as breast (75.7%), cervical (75.2%%), and colorectal cancers (72.2%%) [22]. Interventions to increase LCS uptake are clearly justified.

Consistent with previous studies [10,11], our findings demonstrate significant variability in LCS uptake across U.S. states. Among the five states with the highest age-adjusted lung cancer mortality rates, except for Kentucky (21.39%), the remaining four states (West Virginia: 15.60%; Mississippi:13.40%; Arkansas:16.37%; and Oklahoma:11.14%) reported LCS rates lower than the national average (17.24%)). This implies that state-level LCS uptake is not proportional to their respective lung cancer mortality rate. Interventions are needed to improve LCS uptake with particular emphasis on those states with higher rates of lung cancer mortality but lower rates of LCS.

Findings from previous studies are inconsistent regarding the association between age and LCS uptake. Several studies found no significant association between age and LCS uptake [11,20].

Results from our current study, however, are consistent with those from a study by Zgodic et al., [14], that observed higher rates of LCS uptake among the older age group (i.e., Medicare age group) compared to the younger one. Being in the age group eligible for Medicare may increase the likelihood of undergoing LCS partly because older individuals may be more concerned about their health [14]. The younger age group (i.e., non-Medicare group) generally feels healthier and less concerned about their health. Moreover, younger individuals may not have insurance coverage for screening, which possibly leads to less uptake of LCS by this group. Although several previous studies did not observe differences in LCS uptake according to gender [11,12,14,20], our study finding of lower LCS uptake among females is consistent with those from the study by Poghosyan et al [13].

In line with results from several previous studies [11–14], our study also observed significantly lower odds of LCS uptake among individuals without health insurance, without COPD, and without a PCP. Lack of insurance coverage is associated with a significantly lower rate of LCS [11] as well as for other cancers [23]. Having a diagnosis of COPD is associated with increased perceived risk of developing lung cancer, which may lead to a high likelihood of referral for screening by a PCP [24]. Unlike individuals with COPD, those without COPD do not often visit their PCP and may be less likely to receive a screening recommendation or referral from their PCP [14,25,26].

Despite its important findings, we acknowledge that our study has some limitations. First, BRFSS data were self-reported and may be subject to recall bias. Second, generalizability of the findings could be limited due to the fact that BRFSS data are restricted to non-institutionalized individuals who have access to a telephone. Third, generalizability of the findings could also be limited due to the higher number of White participants compared to other racial/ethnic groups in this study compared to the U.S population. Fourth, individuals who agree to complete the survey and/or those with missing data on LCS eligibility criteria may be more or less likely to undergo LCS.

In conclusion, we observed low uptake of LCS overall, and significant variability in LCS uptake by sociodemographic and health-related factors as well as by state of residence. Factors significantly associated with lower uptake of LCS include female gender, having been divorced/separated/widowed, lack of health insurance coverage, no COPD diagnosis, lack of a PCP, and residence in the states of Oklahoma, Oregon, Texas, and Wyoming. The findings from this study have important implications for community health workers and healthcare clinicians and indicate the need to design effective interventions to increase LCS uptake targeting specific subgroups of populations and particular U.S. states.

Acknowledgments

Funding: *A.T. Gudina was supported by the University of Rochester CTSA award number TL1 TR002000 from the National Center for Advancing Translational Sciences of the National Institutes of Health.*

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Table 1. Characteristics of the study population by screening status using LDCT (n=28,071)

Characteristic	Screening Status, n (%)			
	Overall, 28,071 (100)	Screened with LDCT, 4,839 (17.24)	Did not get screened with LDCT, 23,232 (82.76)	P-value
Age (in year)				<.0001
50 - 64	14961 (53.30)	1920 (12.83)	13041 (87.17)	
65 – 79	13110 (46.70)	2919 (22.27)	10191 (77.73)	
Gender				0.0201
Male	14511 (51.69)	2575 (17.75)	11936 (82.25)	
Female	13560 (48.31)	2264 (16.70)	11296 (83.30)	
Race/Ethnicity				<.0001
White	23419 (83.43)	4143 (17.69)	19276(82.31)	
Black	1461(5.20)	257(17.59)	1204(82.41)	
Hispanic	843(3.00)	120(14.23)	723(85.77)	
Other	1592(5.67)	212(13.32)	1380(86.68)	
Refused/do not know/not sure	756(2.69)	107(14.15)	649(85.85)	
Marital status				0.0023
Married couple	11799 (42.03)	2092 (17.73)	9707 (82.27)	
Divorced/separated/widowed	12545 (44.69)	2185(17.42)	10360(82.58)	
Never married	3575 (12.74)	539(15.08)	3036(84.92)	
Refused/do not know/not sure	152 (0.54)	23(15.13)	129(84.87)	
Education,				0.2906
Less than high school	661 (2.35)	111 (16.79)	550 (83.21)	
High school or equivalent	12226 (43.55)	2042 (16.70)	10184 (83.30)	
Some college	9499 (33.84)	1680 (17.69)	7819 (82.31)	
College graduate and above	5602 (19.96)	993 (17.73)	4609 (82.27)	
Refused/do not know/not sure	83 (0.30)	13 (15.66)	70(84.34)	
Income				<.0001
<$25,000.0	7219 (25.72)	1300 (18.01)	5919 (81.99)	
$25,000.00-$50,000.00	7501 (26.72)	1341 (17.88)	6160 (82.12)	
$50,000.00-$100,000.00	6181 (22.02)	1096 (17.73)	5085 (82.27)	
>$100,000.00	3070 (10.94)	450 (14.66)	2620 (85.34)	
Refused/do not know/not sure	4100(14.61)	652 (15.90)	3448 (84.10)	
				<.0001
Insurance (Health Care Coverage)	25885 (92.21)	4667 (18.03)	21218 (81.97)	
Yes	1306 (4.65)	41 (3.14)	1265 (96.86)	
No	880 (3.13)	131 (14.89)	749 (85.11)	

Refused/do not know/not sure				
COPD				<.0001
Yes	9545 (34.00)	2620 (27.45)	6925(72.55)	
No	18305 (65.21)	2191 (11.97)	16114 (88.03)	
Refused/do not know/not sure	221 (0.79)	28(12.67)	193 (87.33)	
Smoking history				0.0015
Formerly smoked	10832 (38.59)	1965 (18.14)	8867 (81.86)	
Currently smoking	17239 (61.41)	2874 (16.67)	14365 (83.33)	
Primary Care Provider				<.0001
Yes	25177 (89.69)	4691 (18.63)	20486 (81.37)	
No	2698 (9.61)	122 (4.52)	2576 (95.48)	
Refused/do not know/not sure	196 (0.70)	26(13.27)	170 (86.73)	
Medicaid status				0.0021
States without Medicaid expansion[@]	6325(22.53)	1009(15.95)	5316(84.05)	
States with Medicaid expansion	21746(77.47)	3830(17.61)	17916(82.39)	
Insurance Type				<.0001
Private	7920(28.21)	1036(13.08)	6884(86.92)	
Public	17965(64.00)	3631(20.21)	14334(79.79)	
No insurance	1306(4.65)	41(3.14)	1265(96.86)	
Refused/do not know/not sure	880(3.13)	131(14.89)	749(85.11)	

[@]States without Medicaid expansion: Alabama, Florida, Georgia, Kansas, Mississippi, South Carolina, Tennessee, Texas, Wisconsin, and Wyoming.

Table 2. State-level lung cancer screening uptake and variability by State among eligible individuals

States	Lung cancer mortality*	Lung Cancer Screening		
	(Per 100,000 people)	Screening uptake (%)	Odds Ratio	(95%CI)
Alabama	45	19.35	1.163	(0.733- 1.846)
Alaska	33	12.69	0.797	(0.478- 1.328)
Arizona	28	13.62	0.789	(0.493- 1.264)
Arkansas	48	16.37	0.829	(0.536- 1.281)
California	25	12.83	0.885	(0.524- 1.496)
Colorado	24	10.44	0.592	(0.347- 1.011)
Connecticut	30	22.78	**1.860**	**(1.173- 2.949)**
Delaware	39	20.80	1.600	(0.955- 2.681)
District of Columbia	27	23.33	1.649	(0.646- 4.211)
Florida	34	17.35	Reference	Reference
Georgia	37	15.65	0.817	(0.520- 1.285)
Hawaii	27	12.92	0.924	(0.499- 1.713)
Idaho	29	13.03	0.933	(0.525- 1.658)
Illinois	37	16.26	1.163	(0.638- 2.119)
Indiana	45	18.73	1.064	(0.726- 1.559)
Iowa	38	16.46	0.998	(0.661- 1.507)
Kansas	38	17.53	1.153	(0.769- 1.728)
Kentucky	55	21.39	1.147	(0.713- 1.845)
Louisiana	44	16.30	0.870	(0.556- 1.362)
Maine	44	21.62	1.394	(0.946- 2.055)
Maryland	34	20.41	1.174	(0.771- 1.786)
Massachusetts	34	23.28	**1.685**	**(1.070- 2.654)**
Michigan	41	19.80	1.146	(0.778- 1.688)
Minnesota	32	16.49	1.111	(0.747- 1.652)
Mississippi	50	13.40	0.697	(0.414- 1.173)
Missouri	45	17.75	1.030	(0.670- 1.584)
Montana	31	13.99	0.750	(0.453- 1.243)
Nebraska	34	19.93	1.509	(0.980- 2.323)
Nevada	35	14.68	0.696	(0.393- 1.233)
New Hampshire	37	18.68	1.045	(0.662- 1.650)
New Jersey	30	15.60	1.412	(0.783- 2.547)
New Mexico	24	12.12	0.570	(0.295- 1.103)
New York	30	22.90	1.388	(0.933- 2.065)
North Carolina	40	20.39	1.085	(0.650- 1.812)
North Dakota	33	19.60	1.304	(0.809- 2.102)
Ohio	43	17.33	1.037	(0.714- 1.505)
Oklahoma	47	11.14	**0.467**	**(0.295- 0.740)**
Oregon	33	14.01	**0.574**	**(0.345- 0.953)**
Pennsylvania	37	21.83	1.047	(0.650- 1.688)
Rhode Island	38	30.00	**2.331**	**(1.472- 3.689)**
South Carolina	39	16.99	1.056	(0.688- 1.620)
South Dakota	36	12.70	1.058	(0.489- 2.289)
Tennessee	47	12.73	0.723	(0.446- 1.172)
Texas	31	11.44	**0.592**	**(0.351- 0.998)**
Utah	17	12.73	0.733	(0.416- 1.289)
Vermont	36	19.52	1.281	(0.755- 2.172)
Virginia	35	19.05	1.068	(0.710- 1.607)
Washington	32	15.49	0.887	(0.614- 1.280)
West Virginia	50	15.60	0.728	(0.478- 1.107)
Wisconsin	36	20.12	1.327	(0.898- 1.959)
Wyoming	29	10.23	**0.507**	**(0.301- 0.852)**

*Lung cancer mortality is based on the recent estimate of the U.S. Cancer Statistics Working Group [19].

Table 3. Characteristics of the 2021 USPSTF Criteria-Eligible Participants and Uptake of Lung Cancer Screening using LDCT (n=28,071)

Characteristic	Unadjusted		Adjusted	
	Odds Ratio	95%CI	Odds Ratio	95%CI
Age (in year)				
50 - 64	Reference	Reference	Reference	Reference
65 – 79	2.09	1.84 - 2.37	**1.75**	1.54 - 1.99
Gender				
Male	Reference	Reference	Reference	Reference
Female	0.97	0.85 - 1.09	**0.83**	0.73 - 0.94
Race/Ethnicity				
White	Reference	Reference	Reference	Reference
Black	1.05	0.82-1.35	1.15	0.89 - 1.48
Hispanic	0.95	0.67- 1.36	1.25	0.88 -1.79
Other	0.80	0.54- 1.19	0.81	0.54 - 1.23
Refused/do not know/not sure	0.78	0.57- 1.05	0.86	0.62 -1.20
Marital status				
Married	Reference	Reference	Reference	Reference
Divorced/separated/widowed	0.92	0.81 -1.05	**0.85**	0.74 - 0.98
Never married	0.80	0.65-1.00	0.85	0.68 -1.07
Refused/do not know/not sure	0.66	0.35-1.24	0.72	0.35 -1.49
Education				
Less than high school	Reference	Reference	Reference	Reference
High school or equivalent	1.16	0.85 -1.58	1.13	0.83-1.55
Some college	1.27	0.92-1.74	1.23	0.89-1.70
College graduate and above	1.22	0.87 -1.71	1.28	0.90-1.81
Refused/do not know/not sure	1.27	0.54-3.02	1.88	0.79-4.48
Income				
<$25,000.0	Reference	Reference	Reference	Reference
$25,000.00-$50,000.00	1.05	0.88-1.24	1.01	0.86-1.20
$50,000.00-$100,000.00	0.87	0.72-1.03	0.93	0.77 -1.12
>$100,000.00	0.80	0.62-1.03	0.99	0.75 -1.31
Refused/do not know/not sure	0.77	0.64-0.94	**0.79**	0.65-0.97
Insurance (Health Care Coverage)				
Yes	Reference	Reference	Reference	Reference
No	0.17	0.11-0.26	**0.34**	0.22-0.53
Refused/do not know/not sure	0.82	0.58-1.16	0.95	0.65-1.38
COPD				
Yes	Reference	Reference	Reference	Reference
No	0.33	0.29-0.37	**0.35**	0.31-0.40
Refused/do not know/not sure	0.33	0.16-0.66	**0.37**	0.19-0.73
Smoking history				
Formerly smoked	Reference	Reference	Reference	Reference
Currently smoking	0.82	0.72-0.94	0.90	0.78-1.03
Primary Care Provider				
Yes	Reference	Reference	Reference	Reference
No	0.22	0.15-0.34	**0.29**	0.19-0.44
Refused/do not know/not sure	0.48	0.25-0.92	0.55	0.28-1.05
Medicaid status				
States without Medicaid expansion	Reference	Reference	Reference	Reference
States with Medicaid expansion	1.17	1.00-1.36	1.20	1.03 - 1.39
Insurance Type				
Private	Reference	Reference	Reference	Reference

Public	1.53	1.32- 1.78	0.98	0.83- 1.15
No insurance	0.23	0.14- 0.36	**0.33**	0.21- 0.53
Refused/do not know/not sure	1.11	0.77- 1.59	0.94	0.63- 1.39

Figure 1. Sample selection for LCS eligible individuals. Flow Chart of the study population and sample size

Figure 1