Understanding lung cancer screening behavior: Racial, gender, and geographic differences among Indiana long-term smokers

Lisa Carter-Harris[a,c,*], James E. Slaven Jr[b], Patrick O. Monahan[b], Rivienne Shedd-Steele[c], Nasser Hanna[b,c], Susan M. Rawl[a,c]

[a] Indiana University School of Nursing, Indianapolis, IN, United States
[b] Indiana University School of Medicine, Indianapolis, IN, United States
[c] Indiana University Simon Cancer Center, Indianapolis, IN, United States

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ABSTRACT

Lung cancer screening is a relatively new screening option. Inequalities related to screening behavior have been documented in other types of cancer screening. Because stage at presentation drives mortality in lung cancer, it is critical to understand factors that influence screening behavior in lung cancer screening in order to intervene. However, we must first understand where disparities exist in lung cancer screening participation in order to effectively guide intervention efforts. Therefore, the purpose of this study was to determine the association of sociodemographic (including key disparity-related variables) and knowledge with lung cancer screening behavior. This cross-sectional, descriptive study used survey methodology to collect data from 438 screening-eligible individuals in the state of Indiana between January and February 2017 and measured sociodemographic variables and knowledge about lung cancer and screening. Key sociodemographic and health status characteristics associated with screening behavior included race, geographic area of residence, income, health insurance, and family history of lung cancer. Of the variables generally reflective of disparities, key differences were noted by race and geographic area of residence with total knowledge scores as well as screening behavior, respectively. Results indicate key differences in race and geographic area of residence that may perpetuate screening behavior disparities. We have a unique opportunity at this early implementation stage in lung cancer screening to learn what variables influence screening behavior from our target patient population. This knowledge can be used to design equitable patient outreach programs, meaningful, tailored patient engagement materials, and effective patient-clinician decision support tools.

1. Introduction

Lung cancer is the leading cause of all cancer-related deaths in the U.S. with > 158,000 people dying annually; approximately 4000 of those deaths occur among Indiana residents (American Cancer Society, 2017; Indiana Cancer Consortium, 2015). Cancer screening has the potential to save lives by identifying lung cancer early when individuals are asymptomatic and has been associated with decreased mortality rates in those at high-risk (Aberle et al., 2011). Individuals qualify for lung cancer screening if they are aged 55 to 80, are a current smoker or former smoker who has quit within the past 15 years, and have at least a 30 pack-year tobacco smoking history (Moyer, 2014). Lung cancer screening is performed with low-dose computed tomography (LDCT) of the chest and screening guidelines were issued in 2013 with a Grade B recommendation by the U. S. Preventive Services Task Force (USPSTF) (Moyer, 2014). Further, lung cancer screening is a preventive health

service with a zero out-of-pocket copay under the Affordable Care Act and a covered preventive service by the Centers for Medicare and Medicaid Services (CMS) for screening-eligible beneficiaries (United States Preventive Services Task Force Lung Cancer Screening Guidelines, 2013).

Inequalities related to screening behavior have been documented in established cancer screening programs such as breast and colorectal cancer screening (Liss & Baker, 2014; Chowdhury et al., 2016; Miranda et al., 2011). Historically, the availability of a new screening test increases race and socioeconomic disparities in cancer stage at diagnosis and mortality. Once the screening test becomes standard of care and is in widespread use, disparities tend to decrease but remain (Link & Phelan, 1996; Phelan et al., 2004). This is evidenced at present by racial disparities noted in breast and colorectal cancers for which screening tests have long been available (American Cancer Society, 2017). Lung cancer screening is a relatively new screening option. Of the 6.8 million

Americans who currently qualify for lung cancer screening, < 4% have been screened (Jemal & Fedewa, 2017). Identifying factors associated with screening behavior is important in order to proactively address screening disparities. In the National Lung Screening Trial on which the lung cancer screening guideline is based, LDCT of the chest reduced lung cancer mortality more in Black participants compared to their White counterparts (hazard ratio 0.61 vs. 0.86) respectively. (Tanner NT et al., 2015) In order for this benefit to be translated to the real world setting, effective screening interventions that target engagement of screening-eligible individuals as well as address race-relevant issues in lung cancer screening must be implemented. However, we must first understand where disparities exist in relation to lung cancer screening participation in order to guide intervention efforts. Having a baseline understanding of variables associated with lung cancer screening behavior as well as potential disparities is a critical prerequisite to proactively addressing equitable implementation of lung cancer screening.

Little is known about the relationship of sociodemographic and health status characteristics, including key variables generally reflective of disparities (i.e., race, gender, and geographic area of residence), and their association with lung cancer screening behavior. Because stage at presentation drives mortality in lung cancer (American Cancer Society, 2017), screening high-risk smokers is critical for early detection and subsequent treatment at earlier stages and has the potential to decrease mortality. Therefore, the purpose of this paper is to determine whether sociodemographic variables including key disparity-related variables (race, gender, and geographic area of residence) and knowledge are associated with lung cancer screening behavior in screening-eligible individuals in the state of Indiana. Research questions include:

1) What sociodemographic and health status characteristics (including key disparity variables) are associated with lung cancer screening behavior?
2) Does knowledge of lung cancer risk and screening differ by key disparity variables or sociodemographic characteristics?
3) Do sociodemographic and health status characteristics that are associated with lung cancer screening behavior depend on race, gender, or geographic area of residence?

2. Methods

2.1. Study design, sample, and data collection

A cross-sectional study was conducted using survey methods. Participants were recruited in the state of Indiana from January to February 2017 using two primary community-based recruitment methods, Facebook targeted advertisement and in-person recruitment efforts at four local community senior centers. Power analysis indicated that 300 participants were needed to detect an odds ratio of 2.64 or higher when analyzing categorical variables and an effect size of 0.60 or higher when analyzing continuous variables. Inclusion criteria mirrored USPSTF lung cancer screening eligibility criteria: 1) age 55 to 80 years; 2) minimum 30-pack-year tobacco smoking history; 3) current smoker or former smoker who quit within the past 15 years; and 4) not diagnosed with lung cancer.

Institutional review board approval was obtained from Indiana University prior to participant recruitment. Data were collected via a one-time, web-based survey using REDCap (**R**esearch **E**lectronic **D**ata **Cap**ture). For participants recruited in-person who did not wish to complete the survey online, a paper copy of the survey was provided (*n* = 52).

2.2. Measures

Guided by the Conceptual Model on Lung Cancer Screening

Participation (Carter-Harris et al., 2016), data were collected using a compilation of items and scales to assess lung cancer screening behavior, sociodemographic and health status characteristics (age, gender, race, geographic area of residence, income, education, insurance status, smoking status, and family history of lung cancer), and knowledge of lung cancer and screening. Geographic area of residence was categorized using address and zip code data to classify participants as residing in urban, suburban, or rural areas.

2.3. Lung cancer screening behavior

The stage theory, Precaution Adoption Process Model (PAPM) ("The Precaution Adoption Process Model" by Neil D. Weinstein, Peter M. Sandman, and Susan J. Blalock, et al., 2008), was used to create an algorithm of questions to assess the primary outcome variable of an individuals' stage of adoption for lung screening behavior, which included intent to screen for lung cancer in the next six months. The PAPM involves seven stages ranging from Stage 1 (unaware) to Stage 7 (maintenance) ("The Precaution Adoption Process Model" by Neil D. Weinstein, Peter M. Sandman, and Susan J. Blalock, et al., 2008). "Screeners" are defined in this study as those individuals who indicated they either intended to screen for lung cancer (Stage 5), had recently completed lung cancer screening (Stage 6), or were screening annually (Stage 7).

3. Data analyses

Data were exported from REDCap into SAS version 9.4 (SAS Institute, Cary, North Carolina) and cleaned by examining frequency tables and removing invalid data. Data were evaluated for outliers and to determine if the data were normally distributed. Missing, multiple responses, "inapplicable", and "don't know" answers were recoded as missing for analytic purposes. Due to the low frequencies of non-Black and non-White races (*n* = 16), these were omitted in order to prevent spurious results. Two participants did not answer the PAPM and were also removed from analysis. For research question one, data were analyzed comparing screened and non-screened groups using the Pearson Chi-Square test to compare unordered categorical variables and the 1*df* Mantel-Haenszel Chi-Square test of trend to compare ordinal categorical variables such as education and income. For research question two, the three key disparity variables (race, gender, and geographic area of residence) were first analyzed with knowledge scores in a bivariate manner, to determine if any had a significant association. Next, a multivariable model incorporating all three of the key disparity variables was used to determine if any disparity variable was driving the association compared to others. Finally, a multivariable model that included the key disparity variables and demographic variables was analyzed to determine if sociodemographic variables would attenuate significant associations between disparity variables and total knowledge scores. For research question three, factorial ANOVA models were performed to determine if there were significant interaction effects and to determine if there was significant moderation between the disparity variables and demographic variables. Although various fields use higher *p*-values for interaction terms, due to the lower power to detect a significant association, we considered a *p*-value of 0.05 to be a significant moderating association in order to prevent inflated type I error rates. All analyses were conducted using *p* < 0.05 as the significance level.

4. Results

4.1. Sample description

A full description of participant sociodemographic and health status characteristics is shown in Table 1. Participants (*N* = 438) ranged in age from 55 to 79 years (mean, 62.6 [SD 5.8]), and slightly more than

Table 1
Sociodemographic and health status characteristics and lung cancer screening behavior.

Characteristics	Total sample (*n* = 438)	Screeners (*n* = 274)	Non-screeners (*n* = 164)	*p*-Value
Mean age (continuous)	62.65 (5.76	62.12 (5.56)	62.96 (5.87)	0.141
Age (categorical) *n* (%)				
55–64 years old	288 (65.8)	115 (70.1)	173 (63.1)	0.136
65 years or older	150 (34.2)	49 (29.9)	101 (36.9)	
Sex *n* (%)				
Male	187 (42.7)	65 (39.6)	122 (44.5)	0.317
Female	251 (57.3)	99 (60.4)	152 (55.5)	
Race *n* (%)				
White	254 (58.0)	111 (67.7)	143 (52.2)	**0.002***
Black	184 (42.0)	53 (32.3)	131 (47.8)	
Geographic Region *n* (%)				
Urban	241 (55.0)	78 (47.6)	163 (59.5)	**0.047***
Suburban	56 (12.8)	23 (14.0)	33 (12.0)	
Rural	141 (32.2)	63 (38.4)	78 (28.5)	
Education *n* (%)				
Less than high school	40 (9.1)	11 (6.7)	29 (10.6)	0.188
High school graduate	132 (30.1)	46 (28.1)	86 (31.4)	
Some college	144 (32.9)	60 (36.6)	84 (30.7)	
College graduate or higher	122 (27.9)	47 (28.7)	75 (27.4)	
Income *n* (%)				
< $25,000	236 (53.9)	78 (47.6)	158 (57.7)	**0.026***
$25,000–$50,000	115 (26.3)	46 (28.1)	69 (25.2)	
> $50,000	87 (19.9)	40 (24.4)	47 (17.2)	
Health insurance *n* (%)				
Government	279 (63.7)	86 (52.4)	193 (70.4)	**< 0.001***
Private	120 (27.4)	54 (32.9)	66 (24.1)	
Government + Private	21 (4.8)	13 (7.9)	8 (2.9)	
None	18 (4.1)	11 (6.7)	7 (2.6)	
Smoking status *n* (%)				
Current smoker	214 (48.9)	84 (51.2)	130 (47.5)	0.4444
Family history of lung cancer *n* (%)				
Yes	130 (29.7)	60 (36.6)	70 (25.6)	**0.014***

Characteristics	Total sample (*n* = 438)	Screeners (*n* = 274)	Non-screeners (*n* = 164)	*p*-Value
	Mean (SD); Median (Range)	Mean (SD); Median (Range)	Mean (SD); Median (Range)	
Pack-years tobacco smoking	48.16 (19.97); 40 (30–176)	47.98 (19.49); 40 (30–140)	48.28 (20.30); 40 (30–176)	0.879
Packs smoked daily	1.31 (0.53); 1 (0.5–5)	1.32 (0.52); 1 (0.75–4)	1.31 (0.54); 1 (0.5–5)	0.752
Years smoked	37.65 (8.76); 38 (15–65)	37.22 (8.60); 37 (15–60)	37.90 (8.87); 38.5 (15–65)	0.435
Years since quitting (*n* = 223)	8.26 (4.76); 9 (0–17)	7.75 (4.87); 8.5 (0–15)	8.54 (4.69); 9 (0–17)	0.236
Age	62.65 (5.76); 61.5 (55–79)	62.12 (5.56); 61 (55–79)	62.96 (5.87); 62 (55–78)	0.141

Data collected between January and February 2017 from participants in the State of Indiana.
Values are frequency (percentage) for categorical variables and mean (standard deviation); median (range) for continuous variables. *P*-values were derived from Pearson Chi-Square tests for categorical variables, Mantel-Haenszel 1 *df* Chi-Square test for ordinal variables (i.e. education and income), and Wilcoxon Rank-Sum tests for continuous variables.
p-values less than 0.05 are bolded to indicate statistical significance.

half were female (57.3%; *n* = 251). Participants were fairly evenly distributed by race with 58.0% (*n* = 254) White and 42.0% Black (*n* = 184). Slightly more than half lived in urban areas in the state of Indiana (55.0%, *n* = 241). Participants were mostly well educated with 60.7% (*n* = 266) completing some college or higher. The average number of years smoked was 37.6 (SD 8.8), and the average number of packs of cigarettes smoked daily was 1.3 (SD 0.5).

4.2. Sociodemographic and health status characteristics associated with lung cancer screening behavior

Key sociodemographic and health status characteristics that were associated with screening behavior included race, geographic area of residence, income, health insurance, and family history of lung cancer (see Table 1). White participants were more likely to intend to screen or to have been screened compared to Black participants (*p* = 0.002).

When examining race by stage of adoption guided by the PAPM, race was significantly different (*p* = 0.0003). Black participants were unaware of lung cancer screening (54.8%, *n* = 91) whereas White participants were more likely to intend to screen (73.9%, *n* = 82). In addition, participants who were unaware of lung cancer screening were mainly comprised of participants living in urban areas (64.5%, *n* = 107) compared to those living in suburban (10.2%; *n* = 17) and rural (25.3%; *n* = 42) areas. Similarly, individuals who reported being aware of lung cancer screening but had never considered this screening option for themselves mainly lived in urban areas (55.6%; *n* = 25). Participants who reported they were undecided about lung cancer screening were also more likely to live in urban areas (53.1%; *n* = 26). Of those who reported they intended to screen for lung cancer in the next six months, the majority lived in rural areas (44.1%; *n* = 49). However, of those who had either had an LDCT to screen for lung cancer in the past year and those who reported they were having annual scans, both were

more likely to live in urban areas (63%; *n* = 17 and 57.7%; *n* = 15 respectively). There was a significant difference in income between participants who indicated they either intended to screen or had recently completed lung cancer screening compared to those who had not been screened (*p* = 0.026). Participants who had not been screened reported annual income levels less than $25,000 (57.7%; *n* = 158). There was also a significant difference between these two groups (i.e., screeners versus non-screeners) by insurance status (*p* < 0.001). Participants with government-based health insurance in this study were less likely to have been screened or intended to screen, mainly because they were unaware of lung cancer screening (73.5%, *n* = 122). Finally, 29.7% (*n* = 130) of the total sample reported a family history of lung cancer. Among those, there was a significant difference between those who reported intending to screen or having recently been screened (36.6%; *n* = 60) compared to those who had not been screened (25.6%; *n* = 70). There were no statistically significant differences between screeners and non-screeners by age, gender, education, or smoking status noted.

4.3. Differences in knowledge of lung cancer risk and lung cancer screening behavior by key disparity variables and sociodemographic characteristics

Total knowledge of lung cancer and screening scores were examined by race, gender, geographic area of residence and other sociodemographic variables and were associated with race and geographic area of residence. Simple bivariate analyses revealed a significant association between total knowledge scores and race, with White participants having slightly higher total knowledge scores (4.02 [0.10]; *p* < 0.001) compared to Black participants (3.19 [0.12]). Geographically, participants living in suburban areas had the highest total knowledge scores (*p* < 0.001) compared to rural and urban participants. However, when all three disparity variables were included in the model, only race remained significant, with similar results; the association of geographic area of residence with total knowledge scores was attenuated (*p* = 0.077), with suburban participants still retaining the highest scores. This attenuation is not surprising, as in our data, Black participants lived in urban areas at significantly higher proportions than White participants. Even after adjusting for sociodemographic variables, race remained significant, with White participants having higher total knowledge scores. Geographic area of residence was no longer significant, but education showed a significant association with total knowledge scores (*p* = 0.014), with the highest mean total knowledge score belonging to those with less than a high school diploma, which was an unexpected finding, and the lowest mean score to those with some college. As mentioned, although a significant difference was noted between the four groups (*p* = 0.014), there was very little variability across the total sample. Total knowledge scores ranged from 0 to 9; those with less than a high school education had a mean total knowledge score of 4.18 (0.20), high school graduates had a mean total knowledge score of 3.51 (0.20), participants with some college had a mean total knowledge score of 3.41 (0.31), and college graduates had a mean total knowledge score of 3.90 (0.19). It is plausible that marketing efforts for lung screening during this time were concentrated in more urban areas with higher numbers of participants with less than a high school education. See Table 2.

4.4. Do sociodemographic and health status characteristics that are associated with lung cancer screening behavior depend on race, gender, or geographic area of residence?

Although there were marginally significant interaction effects between race and age (*p* = 0.054) and between geographic area of residence and income (*p* = 0.077), none of the factorial models reached the necessary significance level of 0.05 to be considered a significant moderating association.

Table 2
Sociodemographic characteristics by total knowledge scores (N = 438).

	Bivariate	Adjusted for three main predictors	Full model
Gender			
Female	3.70 (0.10)	3.70 (0.12)	3.74 (0.18)
Male	3.64 (0.12)	3.73 (0.13)	3.77 (0.19)
p-value	0.734	0.819	0.838
Race			
Black	3.19 (0.12)	3.32 (0.16)	3.48 (0.22)
White	4.02 (0.10)	4.11 (0.11)	4.02 (0.17)
p-value	< **0.001***	< **0.001***	**0.005***
Geographic Region			
Rural	3.81 (0.14)	3.51 (0.15)	3.54 (0.20)
Suburban	4.32 (0.22)	4.07 (0.22)	4.07 (0.27)
Urban	3.45 (0.11)	3.57 (0.11)	3.65 (0.18)
p-value	< **0.001***	0.077	0.123
Age			
55–64 years			3.71 (0.18)
65+ years			3.79 (0.20)
p-value			0.556
Education			
< High school			4.18 (0.20)
High school diploma			3.51 (0.20)
Some college			3.41 (0.31)
College graduate			3.90 (0.19)
p-value			**0.014***
Income (annual)			
< $25 k			3.92 (0.21)
$25–50 k			3.71 (0.24)
> $50 k			3.62 (0.21)
p-value			0.326
Insurance			
Government			3.69 (0.14)
Private			3.65 (0.20)
None			3.19 (0.41)
Government & private			4.48 (0.37)
p-value			0.106

Data collected between January and February 2017 from participants in the State of Indiana.
Values are least square means (standard errors), with *p*-values from ANOVAs. Bivariate analysis include each of the three predictors (gender, race, region) in separate models.

5. Discussion

Consistent with findings in more established cancer screening programs (Burnett-Hartman et al., 2016; Lee et al., 2017; Peppercorn et al., 2015), differences exist for lung cancer screening by race and geographic area of residence. Recent attention has been paid to the influence of where an individual lives as a key social determinant of health (World Health Organization, Commission on Social Determinants of Health, n.d.; Secretary's Advisory Committee on Health Promotion and Disease Prevention Objectives for 2020, 2010). Geographically, in this study, urban residents were likely to be unscreened, and they were also most likely to be unaware of screening. In order to be proactive in addressing disparities in lung cancer screening behavior, it is critical to identify where differences exist, but more importantly, why they exist. Urban areas in the state of Indiana have the highest concentration of facilities that perform lung cancer screening compared to rural areas within the state. However, rural participants were more likely to be screeners. It is possible there are other structural or perceived barriers not assessed to explain this geographic disparity.

Race has historically been a proxy for multiple disparities evidenced in the cancer care continuum, and reasons are multifactorial (i.e., socioeconomic status, access to care, behavioral, education) (Fine et al., 2005). In this study, racial disparities in the context of lung cancer screening behavior highlight knowledge gaps with Black participants having lower total knowledge scores than White participants. The range of possible scores on the knowledge scale was 0 to 9 with higher scores reflecting greater knowledge. Comparisons between groups revealed

low scores across both groups, but lower among Black participants which is directly related to awareness. Black participants were more likely to be unscreened for lung cancer primarily because they were unaware of this relatively new screening test. Low levels of knowledge in underrepresented individuals is a key barrier to cancer screening. If an individual is unaware of a cancer screening option, there is increased probability of a missed opportunity to engage in a discussion about that screening. Further, if people are unaware of, or underestimate, their personal risk of developing lung cancer, eligibility criteria for lung cancer screening, or the process of screening itself, this may result in lung cancer screening not being considered by a screening-eligible individual.

In 2015, CMS issued its national coverage determination for lung cancer screening, which requires a shared decision-making and counseling visit for reimbursement (Centers for Medicare & Medicaid Services, n.d.). In addition to the benefits and potential harms of lung cancer screening, as screening continues to be implemented nationwide, it is essential that all screening-eligible individuals are educated about risks for lung cancer, ways to reduce those risks (i.e., smoking cessation, radon mitigation, decreasing occupational exposure) as well as the option of screening for early detection. Of equal importance, patient-clinician discussions about lung cancer screening offer the opportunity to intervene with current smokers to assess stage of readiness for a quit attempt. The lung cancer screening discussion can then serve as a potentially teachable moment to intervene with, and help, current smokers move toward smoking cessation (Brain et al., 2017). As lung cancer screening implementation progresses forward, it will be essential for screening programs to ensure all eligible individuals are aware of the option to screen. More importantly, efforts to increase awareness in underrepresented and geographically dispersed patient populations is critical in efforts to both increase awareness of this new cancer screening option, foster dialogue between patients and clinicians about the option of screening, and decrease disparities in lung cancer screening participation. As mentioned, the PAPM is a stage theory that highlights the progression from being unaware (stage 1) of a health behavior choice to action (stage 6) and maintenance (stage 7) ("The Precaution Adoption Process Model" by Neil D. Weinstein, Peter M. Sandman, and Susan J. Blalock, et al., 2008). A key stage that distinguishes the PAPM from other stage theories like the Transtheoretical Model is a stage reflecting the decision not to act (stage 4) ("The Precaution Adoption Process Model" by Neil D. Weinstein, Peter M. Sandman, and Susan J. Blalock, et al., 2008). Therefore, to be unscreened because an individual makes the decision to not be screened after discussing the option with their clinician and weighing the risks and benefits before coming to an informed decision is very different than being unscreened because one is unaware of the option to screen. Therefore, decision support interventions that support the patient and clinician to engage in discussions about lung cancer screening that result in an informed decision are essential.

Lung cancer screening is still relatively new and the number of screening-eligible individuals in the U.S. who have been screened is low. As mentioned, in February 2017, Jemal and Fedewa noted, "of the 6.8 million smokers eligible for LDCT screening in 2015, only 262,700 received it", equating to a 3.9% screening rate nationwide (Jemal & Fedewa, 2017). Therefore, it is concerning that racial and geographic disparities exist at this early stage. The most effective treatment options for lung cancer associated with the highest survival rates are for early stage tumors. Screening to detect lung cancer at an early stage is critical to decreasing mortality rates and the success of lung cancer screening overall. It is important for the benefit of early detection to be realized for all eligible, and critical for patient education and outreach efforts to ensure equity across population groups in lung cancer screening.

6. Strengths and limitations

To our knowledge, this is the first study to examine key variables generally reflective of disparities (i.e., race, gender, and geographic area of residence) in lung cancer screening behavior among screening-eligible individuals. This study expands current knowledge on the screening-eligible population by identifying sociodemographic and health status characteristics that are associated with screening behavior among racially and geographically diverse men and women. As mentioned previously, benchmarking variables associated with lung cancer screening behavior as well as potential disparities is a critical prerequisite at this early stage of lung cancer screening to proactively address equitable implementation of lung cancer screening.

As with all studies, this study is not without limitations. This study involved screening-eligible individuals from the state of Indiana. While Indiana has a relatively high smoking rate and thus sizable lung cancer screening-eligible population, the results may not be generalizable to other areas of the country. Further research is needed to examine racial, gender, and geographic disparities on a national level to determine if the findings of this study extend nationwide or if there are other variables that are more salient in other geographic areas of the country. Because lung cancer screening is still nascent, individuals in Stage 5 (intending to screen) are larger than those in Stages 6 (having recently been screened) and 7 (screening annually). This study was limited statistically by low participant numbers in Stage 5. Although intent has been used in other studies as proxies for behavior (Ajzen et al., 2004), this is not always a reliable proxy and intending to screen is different from actual behavior. As lung screening implementation grows nationwide, it is important to replicate disparities-focused studies to examine potential differences between intention and behavior. In addition, although being able to identify individuals at their current stage of adoption for the decision to screen, or not, for lung cancer is incredibly important, most screening-eligible individuals remain unaware lung cancer screening exists. This limits our statistical capabilities beyond descriptive analyses by stage. As lung screening becomes more widely implemented and awareness increases, it is essential that potential disparities in screening behavior are examined to identify persistence and trends. The current study provides a baseline at a relatively new stage of lung cancer screening implementation on which to benchmark future results. Finally, we did not define insurance status beyond government-based, private, government-based plus supplement, and uninsured. Future studies examining differences by specific insurance types are warranted to fully understand lung screening behavior.

7. Conclusion

Lung cancer screening has the potential to decrease lung cancer-related mortality in appropriate, high-risk individuals. However, individuals need to be aware of this screening option, be engaged in a discussion with an informed clinician, and if the decision is to screen, structural, logistical and perceived barriers need to be addressed. We have a unique opportunity at this relatively early stage of lung cancer screening implementation to learn from previous screening implementation in other cancers as well as from our target patient population as to what variables influence screening behavior. This knowledge can be used to design equitable patient outreach programs, meaningful patient engagement materials, and effective decision support for patients and clinicians.

Conflict of interest statement

All authors have nothing to disclose relating to this project.

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