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The Effects of Health Disparities on Perceptions About Lung Cancer Screening (LCS): Survey Results of a Patient Sample

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Abstract

Lung cancer screening (LCS) is currently advocated in a subset of current or former smokers with a thirty pack-year smoking history or higher. Studies report that few patients meeting the criteria for screening are undergoing LCS. We conducted a survey to assess if barriers to LCS (race, ethnicity, and socioeconomic status) affect the perceptions about LCS that could influence screening uptake. We did not detect different perceptions based on race, ethnicity, or socioeconomic status; however, our survey found that fewer barriers and more benefits to LCS may be perceived in patients who undergo other types of health screening and more benefits for those with internet capable devices.

Keywords Lung cancer screening · Preventative medicine · Patient survey screening

Introduction

Lung cancer is the leading cause of cancer death, and recent results from the National Lung Screening Trial demonstrate a 20% relative reduction in mortality, a benefit from lung cancer screening (LCS) [1]. As a result of improved survival, low dose CT (computed tomography) for lung cancer screening was approved by the Centers for Medicare and Medicaid Services in 2015 [2]. While several studies have demonstrated that persons from lower socioeconomic groups and racial and ethnic minorities are less likely to be screened for breast and colorectal cancer [3–7], one national survey found no difference in screening based on income, education, and race [8]. We found no US surveys addressing patient perceptions of lung cancer screening. We conducted a national survey to evaluate whether race, ethnicity, and socioeconomic status affect perceptions about LCS that could influence the screening uptake.

Methods

A web-based survey was distributed nationally via SurveyMonkey and Cint databases (web-based survey platform, www.cint.com) to approximately 8,700 current or former smokers aged 55–80 years. The survey included demographic questions and health information utilization questions adapted from the Health Information National Trends Survey, [9] and a modified version of the Champion Barrier Scale (CBS) [10] consisting of 23 items about lung cancer susceptibility and the benefits and barriers to LCS (for example, "How likely do you feel it is that if lung cancer was found early, it can be successfully treated?" or "How likely do you feel it is that the trouble of having a CT lung screen would keep me from getting one?"). All individual items on the CBS are scored on a 4-point Likert scale, ranging from 1 (very likely) to 4 (very unlikely). We created an average summary score for each subscale. Items were reverse coded as needed so that higher scores indicated greater perceived benefits, greater barriers, or greater susceptibility to develop lung cancer.

We defined low SES (socioeconomic status) as having an income less than the federal poverty level based on the

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number in the household or educational attainment of high school diploma or less.

Frequencies of demographic and descriptive characteristics were calculated in order to describe the sample. We used analysis of variance to examine whether average scores for susceptibility, barriers, and benefits differed by SES, race, smoking history, health care utilization (doctors' visits and other health screening), or health information utilization. A multivariable model was then created which included some predetermined covariates (gender, education, income, insurance, and race) as well as some variables that showed some association in the bivariate analysis (health care utilization, smoking status, and internet usage for health information). All analyses were performed with SAS 9.4 (SAS Institute Inc., Cary, NC).

Results

Out of 8700 emailed invitations, a total of 756 responses were received (response rate 8.7%). Demographics are shown in Table 1. Together, 26% of our sample had low SES (22.8% had a high school diploma or less, and 6.4% had incomes lower than the federal poverty level). Participants susceptibility scores ranged from 1.1 to 3.9 with a mean (standard deviation) score of 2.1 (0.7). The barriers and benefits subscales both ranged from 1 to 4 with mean (standard deviation) scores of 1.8 (0.6) and 3.1 (0.7) respectively.

Table 2 shows the bivariate associations between the demographic characteristics and perceived susceptibility to developing lung cancer, and the perceived barriers and benefits to lung cancer screening. Patients with insurance other than Medicare and current smokers reported that they were more likely to be susceptible to developing lung cancer and perceived more barriers to LCS. If patients were compliant with other health screening (breast and colon) they perceived more benefit and fewer barriers to LCS. Those with access to internet capable devices (e.g., smartphone) perceived more benefit to screening, as did those who used such devices to look for health information on the internet. Gender and low socioeconomic status did not affect perceived susceptibility, benefits, or barriers.

Table 3 shows the results of the multivariable models for each of the three outcomes. Respondents who had no insurance reported being the most susceptible to lung cancer and the most barriers to LCS, while those on Medicare reported the lowest susceptibility and fewest barriers. Those compliant with recommended screenings see slightly fewer barriers and the most benefit to LCS. All of the survey respondents had previously smoked, but those who were not currently smoking reported less susceptibility. Lower susceptibility was also seen in respondents who had not used the internet to look up information regarding health. The more recent a person's routine checkup, the more perceived benefit.

Discussion

Jemal et al. [8] found that the percentage of eligible current or former smokers who have undergone LCS remains low (3.3% to 3.9% from 2010 to 2015). This same study found no difference in screening likelihood based on age, gender, type of insurance, or education level.

We found one previous patient survey regarding perceived benefits and barriers to LCS. A study of 1007 adults in Wales found that people with negative beliefs were more likely to avoid LCS. Low perceived effectiveness of LCS was associated with fatalism [11].

In our study, mean scores for susceptibility and barriers did not differ significantly by race, gender, income, or educational status. Patients who undergo other types of health screenings perceive less barriers and more benefits to lung cancer screening. Former smokers reported fewer barriers but the difference in ratings was only 0.1. Those without internet capable devices and those who do not look for health information on the internet reported less benefit to LCS compared to those who looked for information and/or had internet capable devices. Those who do not engage in routine physician checkups reported fewer barriers and less benefit to LCS. Oddly, a few respondents reported no internet access (1.2%) though this was a web-based survey.

Patients who undergo other screening modalities were more likely to view lung cancer screening favorably. This may be because patients already perceive a benefit to health screening in general. They may also take a proactive approach to their health, including undergoing multiple modalities of screening [12].

This is a limited survey of respondents with computer access to complete an online survey, and the low response rate may affect the generalizability of these data. Although there were no detected differences in benefits and barriers by SES, only 26% met criteria for low SES.

Conclusions

Our survey suggests that fewer barriers and more benefits to LCS may be perceived in patients who undergo other types of health screening. Although our survey did not detect ethnic, racial, or low socioeconomic status barriers to utilization of lung cancer screening, further studies may be helpful to ensure that appropriate outreach mechanisms can be instituted to facilitate screening across diverse populations.

Table 1 Demographics

	N	%
Gender		
Female	386	51.3
Male	366	48.7
Race/ethnicity		
White, non-Hispanic	5689	75.5
African American	104	13.8
Hispanic	48	6.4
Other	32	4.3
Insurance		
Medicare	321	42.7
Medicaid, Indian Health service	89	11.8
None	57	7.6
Commercial or military insurance	285	37.9
Smoking Status		
Current	286	38.0
Former	466	62.0
Education Level		
High School or less	171	22.7
Some College/Vocational Training	324	43.1
Bachelor's Degree or higher	257	34.2
Income level		
$0 - $19,999	139	18.5
$20,000–$34,999	173	23.0
$35,000–$49,999	130	17.3
$50,000–$74,999	152	20.2
$75,000 or more	158	21.0
Owns at least one internet capable device (smart phone, tablet, cell phone)		
Yes	687	91.4
No	65	8.6
Accesses the Internet		
Yes	739	98.3
No	13	1.7
Use of Internet in the past 12 months to look for health information		
Yes	528	70.6
No	220	29.4
Time since last doctors visit for a routine checkup		
< 1 year	598	79.5
1–2 years	51	6.8
2–5 years	30	4.0
5 or more years	50	6.7
Never	8	1.1
Don't Know	15	2.0

Table 2 Bivariate association of main effects of patient perceived barriers and benefits to lung cancer screening

	Susceptibility	Barriers	Benefits
Insurance	0.0058	0.0001	0.2392
Medicare	2.0 (0.7)	1.7 (0.6)	3.1 (0.7)
Medicaid, Indian Health Service	2.2 (0.8)	1.9 (0.6)	3.1 (0.7)
None	2.3 (0.8)	2.1 (0.5)	3.0 (0.8)
Commercial or military insurance	2.2 (0.7)	1.9 (0.6)	3.2 (0.7)
Gender	0.7342	0.1136	0.3276
Female	2.1 (0.7)	1.9 (0.6)	3.1 (0.7)
Male	2.2 (0.7)	1.8 (0.6)	3.1 (0.7)
Race/Ethnicity	0.6144	0.088	0.0069
White, non-Hispanic	2.2 (0.7)	1.8 (0.6)	3.1 (0.7)
African American	2.1 (0.8)	1.9 (0.7)	3.3 (0.7)
Hispanic	2.1 (0.8)	2.0 (0.7)	3.2 (0.6)
Other	2.0 (0.7)	1.9 (0.5)	2.9 (0.7)
Education Level	0.5719	0.3832	0.4265
High School or less	2.2 (0.7)	1.8 (0.6)	3.1 (0.8)
Some College/Vocational Training	2.2 (0.7)	1.9 (0.6)	3.1 (0.7)
Bachelor's Degree or higher	2.1 (0.7)	1.8 (0.6)	3.1 (0.7)
Income Level	0.8496	0.1061	0.3003
$0–$19,999	2.2 (0.7)	1.9 (0.6)	3.0 (0.8)
$20,000–$34,999	2.1 (0.7)	1.9 (0.6)	3.0 (0.7)
$35,000–$49,999	2.1 (0.7)	1.9 (0.6)	3.1 (0.8)
$50,000–$74,999	2.2 (0.8)	1.8 (0.6)	3.2 (0.6)
$75,000 or more	2.1 (0.7)	1.7 (0.6)	3.1 (0.7)
Compliance with other recommended screening	0.9129	0.0001	< 0.0001
Yes	2.1 (0.7)	1.8 (0.6)	3.2 (0.6)
No	2.1 (0.7)	2.0 (0.6)	2.9 (0.8)
Are you currently smoking	< 0.0001	0.0014	0.5722
Yes	2.4 (0.7)	1.9 (0.6)	3.1 (0.7)
No (Former Smoker)	2.0 (0.6)	1.8 (0.5)	3.1 (0.7)
At least one internet capable device (smart phone, tablet, cell phone)	0.0448	0.6895	0.0006
Yes	2.2 (0.7)	1.8 (0.6)	3.1 (0.7)
No	2.0 (0.7)	1.9 (0.5)	2.8 (0.9)
In the past 12 months used internet to look for health info for self	0.047	0.8973	0.002
Yes	2.2 (0.7)	1.8 (0.6)	3.2 (0.7)
No	2.1 (0.7)	1.8 (0.6)	3.0 (0.8)
How long has it been since you last visited a doctor for a routine checkup	0.7573	0.0006	< 0.0001
< 1 year	2.2 (0.7)	1.8 (0.6)	3.2 (0.6)
1–5 years	2.1 (0.7)	1.9 (0.6)	3.0 (0.8)
5+ years, never, DK	2.1 (0.7)	2.0 (0.6)	2.6 (0.9)
Low SES	0.8278	0.6486	0.3071
< federal poverty level OR < HS education	2.1 (0.7)	1.9 (0.6)	3.1 (0.8)
Other	2.1 (0.7)	1.8 (0.6)	3.1 (0.7)

Means (standard deviations) are presented for susceptibility, barriers, and benefits

p-values for each characteristic/outcome combination are shown in the shaded rows

Table 3 Multivariable association of main effects of patient perceived barriers and benefits to lung cancer screening

	Susceptibility	Barriers	Benefits
Insurance	0.0240	0.0131	0.7232
Medicare	1.98 (0.06)	1.88 (0.05)	2.90 (0.06)
Medicaid, Indian Health Service	2.03 (0.09)	1.96 (0.07)	2.91 (0.09)
None	2.22 (0.10)	2.09 (0.08)	3.02 (0.10)
Commercial or military insurance	2.12 (0.06)	2.02 (0.05)	2.90 (0.07)
Race/Ethnicity	0.0893	0.1387	0.0633
White, non-Hispanic	2.20 (0.04)	1.92 (0.04)	2.90 (0.04)
African American	2.05 (0.07)	1.93 (0.06)	3.08 (0.08)
Hispanic	2.06 (0.10)	2.12 (0.09)	2.98 (0.10)
Other	2.05 (0.12)	1.97 (0.10)	2.77 (0.13)
Compliance with other recommended screening	0.5343	0.0410	0.0002
Yes	2.07 (0.06)	1.94 (0.05)	3.05 (0.06)
No	2.11 (0.06)	2.04 (0.05)	2.82 (0.06)
Are you currently smoking	< 0.0001	0.0665	0.8420
Yes	2.33 (0.06)	2.03 (0.05)	2.94 (0.06)
No (Former Smoker)	1.84 (0.06)	1.95 (0.05)	2.93 (0.06)
In the past 12 months used internet to look for health info for self	0.0118	0.6558	0.0491
Yes	2.16 (0.06)	2.00 (0.05)	2.99 (0.06)
No	2.02 (0.06)	1.98 (0.05)	2.88 (0.06)
How long has it been since you last visited a doctor for a routine checkup	0.3528	0.1164	< 0.0001
< 1 year	2.15 (0.05)	1.91 (0.05)	3.13 (0.05)
1–5 years	2.09 (0.08)	1.99 (0.07)	2.98 (0.08)
5+ years, never, DK	2.02 (0.09)	2.06 (0.07)	2.69 (0.09)

Multivariable model includes gender, education, income, and variables in the table. Presented in the table are the type 3 p-values from the multivariable model as well as the model adjusted means and standard errors

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Compliance with Ethical Standards

Conflict of interest All authors report no conflicts of interest.

Ethical Approval IRB Approval: IRB00033429

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