

# Perceived Risk of Developing Certain Cancers in People Who Smoke Tobacco in Eastern Kentucky: An Opportunity for Patient Education

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**Abstract** The associations between tobacco and many cancers, including lung cancer, have been extensively studied and reported; however, rates of these cancers in Appalachia have remained largely unchanged for years. This discrepancy could be influenced by factors like healthcare access and health literacy, defined as the extent to which individuals can find and use information to make decisions about their health. This study quantifies perceptions of personal cancer risks from smoking cigarettes among people in Eastern Kentucky. By comparing these results to predicted risks, knowledge about smoking-related health hazards in this community is described, representing an important opportunity for patient education. Adult smokers at Highlands ARH Regional Medical Center in Prestonsburg, Kentucky were approached randomly and received a 16-item validated survey tool to rate the perceived risk of developing certain cancers due to smoking. There were 183 total participants. Respondents were first screened with a verbal script explaining the study and asking if they were current everyday smokers. Predicted risk values were developed using information reported by the American Cancer Society. Kruskal-Wallis and Mann-Whitney U tests were used to calculate statistical differences across demographic groups. The results showed that the average perceived risk of lung cancer was 3.73 and the estimated risk value was 5. The estimated risk of bladder cancer was 5, but the average perceived risk was 2.02. Gastric and pancreatic cancer

replicated this trend, each scoring a perceived risk of 2.31 when the estimated risks for both were 4. Women respondents rated brain cancer significantly higher than men did ( $p=.019$ ). There were no other significant differences in any demographic variables in all 12 cancers. The results of this study show that low health literacy may contribute to the disproportionately high cancer rates in Appalachia from preventable causes such as smoking. A brief educational intervention using visual tools to discuss personal risks of developing cancers from smoking may be an effective form of patient education in this population.

**Keywords** Cancer, Smoking, Appalachia, Health Beliefs, Perceived Risk

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## 1. Introduction

Cancer is the leading cause of death in the 54-county region of Appalachia, which can be linked to a range of barriers including socioeconomic, behavioral, and policy influences [1]. Prevalent cancers in this area include lung, colorectal, cervical, and head and neck cancers, all of which share smoking as a risk factor. The American Cancer Society (ACS) reports that 20% of all cancers are caused by smoking and 30% of all cancer-related deaths are attributable to smoking [2]. The ACS also states that 80%

of lung cancers are due to smoking and that smoking is a major risk factor for esophageal, bladder, stomach, pancreas, and colorectal cancers. Diseases associated with smoking account for over half of the difference in life expectancy in Appalachians compared to the rest of the United States (U.S.) [3] and rural Appalachian counties have poorer cancer outcomes than other U.S. counties [4]. Although the association between tobacco and cancer has been extensively studied and reported, cancer burdens in Appalachia have remained largely unchanged since the 1960s [5]. Citizens living in rural areas have been shown to have sparse educational resources and negative beliefs about healthcare, resulting in a low level of engagement in positive health behaviors, which is exacerbated by widely accepted cultural norms such as smoking acceptance and the idea that fate cannot be controlled [6]. Only 79% of residents in Appalachia have earned a high school diploma, compared to the national average of 88%, which contributes to low health and cancer literacy [7].

Low health literacy, combined with a shortage of healthcare professionals, is a major contributing factor to a person's medical decision-making capabilities. The limited amount of time providers often have with patients can perpetuate negative opinions regarding healthcare services. In one study, the authors reported that only 29% of survey participants living in Appalachian counties believed there were enough providers in their area, which differed significantly from the 57% reported in non-Appalachian counties [8]. The Appalachian respondents also reported less satisfaction with the quality, courtesy, and information received from their healthcare services, resulting in less than one-fourth of participants stating that they had ever sought preventative screenings for cancer. Geographic isolation and a fatalistic view of cancer have also been noted as cancer screening hurdles are unique to this location; in Kentucky alone, about 1.1 million people live in rural regions that are isolated within the Appalachian Mountains, making preventative healthcare difficult to accomplish [9].

Beyond this area's limited access, beliefs about cancer itself may influence the decision to opt out of routine screening procedures. In one study, three National Cancer Institute cancer centers within Appalachian areas of Kentucky, Ohio, and Pennsylvania surveyed the community about cancer-related beliefs and found that less education, living in Kentucky, and a lack of financial security were all associated with more negative beliefs toward cancer [10]. Cancer beliefs are important to measure because they can provide valuable insight into a person's motivations for quitting harmful behaviors like smoking. Using the health belief model, a widely accepted tool that has been used for many diseases, it has been shown that if a person believes they are susceptible to conditions that have life-altering effects, they are more likely to change their behavior to avoid negative consequences [9]. According to national surveys, 69% of U.S. smokers were interested in quitting but only 42%

attempted cessation [3]. Of these attempts, only 55% were successful. In Appalachia, barriers like geographic access and dissatisfaction with healthcare may create an even harder path to sustained smoking abstinence. The social determinants of health must be taken into great consideration in these areas because their populations face many health inequities. The more impoverished and rural an area is, the more likely its citizens will have less knowledge about preventative medicine and little to no prior cancer screening experience [5], which is the mainstay of secondary cancer prevention.

The objective of this study is to assess the perceived risk vs. estimated risk of developing certain types of cancer in people who smoke cigarettes in an Eastern Kentucky Appalachian town. Cancers that have a known association with tobacco smoking were selected for this study, as well as some cancers that did not have a known association with smoking. Cancers that have not been previously linked to smoking were included to better assess the participants' knowledge of cancer risks. The perceived risks of some cancers like bladder and colorectal were hypothesized to be lower than those of better-known associations like lung cancer. Assessing a population's perceived risk of disease is important for healthcare providers to implement the most effective patient education practices and for patients to make more informed decisions about their health. Health literacy is especially important in Appalachian communities where many social, physical, and educational barriers can impede a patient's understanding of cancer beliefs and health behaviors.

## 2. Methodology

### 2.1. Procedures

A 16-item intercept survey was distributed at Highlands Appalachian Regional Healthcare (ARH) Regional Medical Center in Prestonsburg, Kentucky for a total of seven days during two different weeks in October and November 2023. Prestonsburg is a small Eastern Kentucky town located in the Appalachian Mountains with a population of 4,099 people [11]. The survey was administered to adults who were receiving inpatient care, outpatient care, or visiting family members. Participants must have been over 18 years old, of any gender and ethnicity, and currently smoked any number of cigarettes daily. Exclusion criteria included individuals under 18 years old, patients in the Critical Care Unit, prisoners, and people who did not smoke every day. The decision was made to exclude patients who were critically ill to decrease the cognitive bias of participants who were already in a detrimental state of health.

As an intercept survey, individuals were directly approached, and verbal consent was obtained before administering the questionnaire. No incentives were offered to decrease any perceived coercion by participants.

A total of 186 respondents completed the questionnaire, which met the minimum sample size needed to complete data analysis, as calculated by G\*Power version 3.1.9.6 [12]. A total of 184 participants, or 92 per group, were needed to assess differences across genders using a Mann-Whitney U test with a medium effect size of  $d=0.05$ ,  $\alpha$  level of 0.05, and power of 0.95. However, male and female respondents were not equally distributed and three of the surveys were not included in the analysis due to inconsistencies in responses (rating the wrong gender-specific cancers for their reported gender) so the group sizes varied slightly from the goal size, with 82 male and 101 female respondents.

## 2.2. Data Collection Instrument

The questionnaire was a modified version of the Perceived Risk Instrument (PRI), a validated survey tool for quantifying personal health risk perception of disease from tobacco and tobacco-related substances in adults of all genders, ages, ethnicities, and smoking statuses [13]. The modified version did not contain the questions assessing general health risks that were used in the original PRI and instead only measured personal health risks. The original PRI was administered as a web-based survey. The authors predicted that the validity would remain high if administered through a pencil-and-paper method due to the stability of the instrument in diverse populations, products, and behaviors.

The survey administered in the current study contained 4 demographic questions followed by a question stem with 12 items assessing the perceived risk to the participant of developing certain types of cancers because they smoke cigarettes. The demographic items included age, gender, number of smoking years, and number of packs smoked per day. The question stem used for assessing the perceived risk of cancers was written as “What do you think is the risk, if any, to you personally of getting the following (sometime during your lifetime) because you smoke cigarettes?” followed by 12 different types of cancer. These items were rated on a scale of 1 through 5, where 1 represented “No Risk” and 5 represented “Very High Risk”. A “Not Applicable” option was available for cancers that were gender-specific and did not apply to the participant’s reported gender, and for cancers that the participant had ever been diagnosed with. The 12 cancers included bladder, brain, cervical, colorectal, gastric, esophageal, lung, melanoma, ovarian, pancreatic, prostate, and testicular. Some cancers were simplified for easier comprehension, which were written as “colon”, “stomach”, and “esophagus” cancer. For gender-specific cancers, a statement was added that said either “(female-only cancer)” or “(male-only cancer)”, and melanoma was specified as “(a type of skin cancer)”.

## 2.3. Estimated Risk Assessment

An estimated risk value was assigned to each cancer to

represent the predicted risk of developing that cancer in people who smoke. The same Likert scale used for the questionnaire was used to assign estimated risks. Information from the ACS was used to determine these numbers, as well as supplemental data from the Centers for Disease Control and Prevention (CDC). Since the Likert scale reports ordinal values, several cancers were able to be categorized into the same group if they had similar likelihoods relative to people who don’t smoke. For instance, lung cancer and bladder cancer have different risks attributable to smoking, but both have a much higher likelihood in people who smoke compared to those who do not, so they were both categorized as “Very High Risk”.

Cancers that were designated as “No Risk” were given a 1. These included brain cancer, melanoma, prostate cancer, and testicular cancer, none of which are listed on the CDC’s list of smoking-associated cancers [14]. Only one cancer was assigned a 2 for “Low Risk”, which was ovarian cancer. The ACS reports that there is not an increased risk of ovarian cancer overall in people who smoke, but there is a slightly increased risk of developing the mucinous subtype, a rare malignant tumor of the ovary [2]. A meta-analysis was consulted to further explore this association. The authors determined that the relative risk of developing ovarian cancer overall was 1.05 (95% CI 0.95-1.16) and the relative risk of developing mucinous ovarian cancer was 1.78 (95% CI 1.52-2.07), concluding that there was a significant dose-risk relationship between smoking and mucinous ovarian cancer [15].

The development of colorectal cancer is described by the ACS as being “more likely” in people who smoke than in those who don’t. A meta-analysis was also consulted for the risk assessment of this cancer, which reported that the relative risk of developing colorectal cancer in people who smoke was 1.14 (95% CI 1.10-1.14) and a linear association was shown with increasing pack-years [15]. Due to this association, we assigned colon cancer a 3, or “Moderate Risk”. The cancers that were reported by the ACS as a 2x increased risk in people who smoke were designated as “High Risk” and assigned a 4. These included cervical, esophageal, gastric, and pancreatic cancers. Finally, the ACS reports that people who smoke are “at least 3x more likely” to develop bladder cancer than non-smokers and that the risk of lung cancer is “many times more likely”. The CDC reports a more precise estimate of lung cancer risk in this population, at a 15-30x increased likelihood [14]. Due to this information, both bladder and lung cancers were assigned a 5, or “Very High Risk”.

## 2.4. Data Analysis

The perceived risk of each cancer was averaged for all participants and the means were compared to the estimated risk values. Since the perceived risk means were not being compared to other means but rather a singular assigned number, the most meaningful comparison was to qualitatively describe the discrepancies between these

values. The means for males and females were also calculated for this purpose. To assess for differences between demographic variables, non-parametric statistical tests were performed. This type of analysis was chosen because the data are ordinal and there is no measure of central tendency. Differences across demographic variables were analyzed using SPSS version 29.0.2.0. Ratings for each cancer across age groups, years smoked, and packs smoked per day were analyzed using the Kruskal-Wallis test with 95% confidence. Of the gender options, which included “Male”, “Female”, “Other”, and “Prefer not to say”, the only reported categories were male and female. To assess for significant differences in ratings across these variables, the Mann-Whitney-U test was performed. Missing data were removed from the analyses. Three surveys were invalidated due to rating the wrong gender-specific cancers for the participant’s reported gender and none of their responses were included in any analyses.

### 3. Results

The total number of participants used in the analysis was 183. Only 4 approached individuals who met the criteria for the questionnaire declined to complete it. One of these individuals was called into an appointment early and the other 3 cited lack of interest as the reason for declining. Of all age groups, people who were 40-65 years old made up the largest proportion at 50.3% (n=92). There were 103 female respondents and 80 male respondents. The largest proportion of years smoked was the 11-30 years group with 94 participants, and the most common number of packs smoked per day was 1 pack (n=69). A summary of these characteristics can be found in Table 1. It was hypothesized that participants would be familiar with the association between smoking and lung cancer and rate it higher than other cancers, which was observed. Although the estimated risk of lung cancer was a 5, or “Very High Risk”, the average perceived risk among participants was 3.73 which is between “Moderate Risk” and “High Risk”. The largest discrepancy observed was for bladder cancer. The average perceived risk for bladder cancer was 2.02 or “Low Risk”, but the estimated risk was 5.

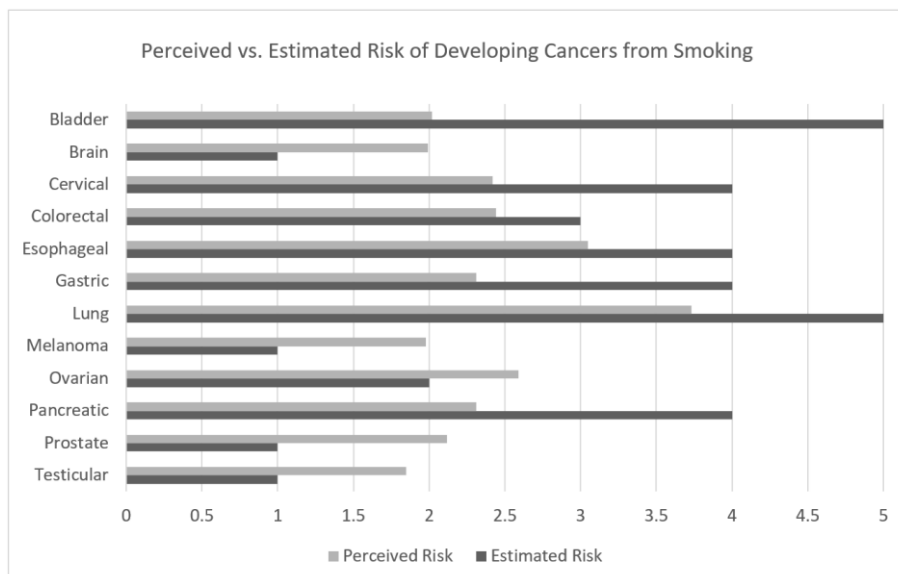
This trend was replicated for gastric and pancreatic cancers, both of which had a perceived risk average of 2.31 and an estimated risk of 4. Colon cancer showed the closest perceived and estimated risk values with a perceived average of 2.44 and an estimated value of 3. Cervical cancer had a perceived risk of 2.42 and an estimated risk of 4. Esophageal cancer was also underrated with a perceived risk of 3.05 and an estimated risk of 4. Although ovarian

cancer had an estimated risk of 2 or “Low Risk”, its perceived risk was slightly higher at 2.59.

Interestingly, the cancers that generally are not associated with smoking as a risk factor were all overrated. These include brain, melanoma, prostate, and testicular cancers. Brain cancer scored an average perceived risk of 1.99, melanoma scored 1.98, prostate scored 2.12, and testicular scored 1.85. Perceived vs. estimated risks for all respondents are depicted in Figure 1. The average perceived risks for males and females compared to estimated risks are described in Table 2. Women participants rated brain cancer significantly higher than men did (p=.019) but no other significant differences were observed across demographic variables including age, number of years smoked, and number of packs smoked per day. The Mann-Whitney-U analysis describing the statistical differences in cancer ratings across genders can be found in Table 3.

**Table 1.** Demographic Characteristics of Respondents

	<b>Number of Responses (N)</b>	<b>Percent of Total Responses (%)</b>
<b><u>Gender</u></b>		
Male	82	44.8%
Female	101	55.2%
<b><u>Age</u></b>		
18 to 24	17	9.3%
25 to 39	50	27.3%
40 to 65	92	50.3%
>66	24	13.1%
<b><u>Packs Per Day</u></b>		
<½ pack	18	9.8%
½ pack	30	16.4%
1 pack	69	37.7%
1½ packs	32	17.5%
2 packs	27	14.8%
>2 packs	7	3.8%
<b><u>Years Smoked</u></b>		
0-10	56	30.6%
11-30	68	37.2%
31-50	42	23.0%
>50	17	9.3%



**Figure 1.** Perceived risks of developing each type of cancer from smoking in all survey respondents compared to estimated risks. The perceived risks were rated on a Likert scale of 1-5 where 1 was “No Risk” and 5 was “Very High Risk”. The estimated risks were developed to reflect the American Cancer Society’s reported risks for each cancer

**Table 2.** Average Perceived Risk of Cancers for Males and Females Compared to Estimated Risk

Cancer Type	Average Female Perceived Risk	Average Male Perceived Risk	Combined Perceived Risk	Estimated Risk
Bladder	2.10	1.93	2.02	5
Brain	2.14	1.80	1.99	1
Cervical	2.42	-	-	4
Colorectal	2.56	2.27	2.44	3
Gastric	2.43	2.17	2.31	4
Esophageal	3.19	2.89	3.05	4
Lung	3.85	3.59	3.73	5
Melanoma	2.14	1.49	1.98	1
Ovarian	2.59	-	-	2
Pancreatic	2.48	2.10	2.31	4
Prostate	-	2.12	-	1
Testicular	-	1.85	-	1

**Table 3.** Mann-Whitney U Analysis of Cancer Rating Differences Across Gender

Cancer Type	N	U value	P value	Standard Error
Bladder	183	3707.5	0.193	333.31
Brain	183	3355.5	0.019*	335.39
Colon	183	3595.5	0.115	345.76
Esophageal	180	3572.0	0.206	338.74
Gastric	183	3742.0	0.246	344.15
Lung	181	3696.0	0.302	333.40
Melanoma	180	3498.0	0.109	318.77
Pancreatic	183	3482.0	0.055	343.54

## 4. Discussion

The perceived risks of most cancers were inconsistent with the assigned predicted risks. Although only one association was statistically significant, women rated all 12 cancers higher than men did. Most cancers were rated between low and moderate risk, regardless of their actual association with smoking. This resulted in smoking-associated cancers being rated lower than their predicted risk and cancers that are not associated with smoking being rated higher than their predicted risk. Further, similar ratings were recorded between participants of all demographic variables, strengthening the argument that a ubiquitous influence in this region may be accountable for this discrepancy. From these findings, it should be emphasized that improving patient education and health literacy in Appalachia is particularly important due to the high smoking rates and low cessation rates observed in this community.

Appalachian communities have a disproportionately high rate of cancer mortality compared to urban settings [16] and even with smoking interventions increasing the probability of cessation in Appalachian smokers by 2.33 times [3], participation remains an issue. For this reason, many smoking cessation techniques have not been proven to be as productive in this population as they are in other areas of the U.S. Although smoking quit-lines are an evidence-based resource that is available in all 50 states, there is a lack of sufficient evidence to prove that people living in rural areas utilize these lines enough to make a reasonable impact [17]. Disbelief about effectiveness and lack of awareness have been cited as possible reasons for the underutilization of such resources [17]. Interventions that only include social media campaigns were also shown

to not be effective in Appalachian areas, possibly due to access issues with technology and internet that result in roughly half the population not having data use available on their cell phones [5]. Given the unreliable nature of smoking cessation techniques in Appalachia, understanding why cessation is important could be a valuable tool for people in this area. Likewise, understanding why a population engages in health behaviors to begin with is essential to describe the utilization of this study's findings. Many reasons have been suggested to explain the smoking and cancer trends in Appalachia, many of which are enabled by low health literacy and strengthen the association suggested in this study.

Socioeconomic factors strongly influence smoking rates in rural areas. People who live in rural areas of the U.S. are more likely to smoke in general, as well as smoking more cigarettes per day than people in urban areas [18]. The prevalence of smoking in adults in rural communities is more than double the national prevalence, and 42% of Appalachia is classified as rural. Prestonsburg, Kentucky in particular is classified as a non-metropolitan area with a small urban population in the category of 5,000 to 20,000 people and not adjacent to a metropolitan area [19].

Income, education, and disability have all been suggested as determinants of smoking as well. In a study by the Appalachian Regional Commission (ARC) in 2017, the median household income for this region was 19% less than the national median [20]. In Central Appalachia, where Prestonsburg, Kentucky is located, 46.7% of the population had received some level of post-secondary education, with the national average being 63.3%. The average percentage of people receiving disability benefits was 5.1% nationally and 13.9% in Central Appalachia. Interestingly, the entire region of Appalachia had 33% more social programs per 10,000 people than the national average (9.4) but Central Appalachia had less than the national average, at 8.8 per 10,000 people. The Mountain Air Study, conducted in two Appalachian Kentucky counties, outlined the association between these socioeconomic variables and smoking. Participants with a high school diploma or less education showed a significant association with smoking (PR 1.49, 95% CI 1.23–1.81) as did participants who felt they did not have enough income for basic needs (PR 3.15, 95% CI 2.99–4.96) [18]. Roughly 20% of all participants reported a disability.

The high smoking rates in Appalachia may also be influenced by widespread cultural beliefs like tobacco acceptance, medical mistrust, and fatalistic views of cancer. These ideas may be unchallenged if health literacy rates are low. People living in the Central Appalachian region may embrace the use of tobacco products more than the rest of the U.S. due to the rich history of tobacco farming in Kentucky. Although smoking rates have declined nationally, Kentucky was still the second-largest tobacco producer in the nation in 2021 and produced nearly 97 million pounds [21]. A report published by the ARC

suggests that the hesitance of Appalachian citizens to avoid smoking may be rooted in fear of harming the economic stability of their community's tobacco industry [22]. Consequently, the social acceptance of tobacco use in large tobacco-producing states remains an obstacle for policy-makers. The largest producing states have fewer anti-smoking laws and less tobacco sales tax, demonstrating a more lenient policy on smoking than in other states [23]. The Kentucky tobacco tax is \$1.10 per pack of 20 cigarettes [24], 71 cents less than the national average [25]. Further, the Kentucky Farm Bureau advocated against a state-wide clean indoor air policy in 2014 [23], perpetuating the idea that smoking remains a cultural norm in Kentucky. Health behaviors like smoking tend to be passed down through generations and replicated among close relationships [26], creating a cyclical pattern that emphasizes the need to address the socioeconomic and cultural influences discussed in this study to create healthy communities.

Cultural beliefs such as fatalism and medical mistrust, which have been commonly reported in Eastern Kentucky [27–29], may create a barrier to seeking healthcare, resulting in lower health literacy among citizens. The idea of medical fatalism has been proposed as a defense mechanism used to accept that one is not in control of their fate and that seeking medical care would be futile. This idea is commonly seen in Appalachian areas where religion is prevalent and may be exacerbated by this region's high morbidity and mortality rates [27]. Negative health outcomes may create stigma and fear that strengthen fatalistic thinking in patients. It has been reported that fatalism results in lower cancer screening rates and that providers may not offer screening tests at all if they believe fatalistic views will prevent a patient from agreeing to the screening [29]. However, low screening rates in specific populations may be influenced more strongly by other factors. In a survey assessing Appalachian women's views on cervical cancer screening, reasons for not getting a pap smear included privacy and healthcare quality concerns, lack of time and resources, and feeling that the test was unnecessary [29].

In Eastern Kentucky high school students, lack of healthcare access and medical mistrust, specifically in non-Appalachian providers, were also mentioned as reasons that may lead to higher cancer rates in the community [28]. Additionally, tobacco culture and lack of preventative education were listed. Many people in the Appalachian community have reported that a negative experience with cancer screenings was the reason for their low trust in healthcare providers [27]. Some of these experiences included humiliation from undressing, lack of professionalism from providers, uncomfortable procedure preparation, or a family member who was dissatisfied with a prior screening experience. Due to this mistrust, this population engages with healthcare professionals less frequently than other groups. Insufficient information on cancer prevention and screening is then magnified and underscores the idea that low health literacy in this area

contributes to the high cancer rates from preventable causes.

#### 4.1. Future Directions

Previous studies have shown that brief educational interventions on cancer significantly increased the participants' cancer literacy and could have the potential to aid in future health behaviors [30]. It has also been suggested that improving the perception of cancer in Appalachian communities, including the fear and stigma surrounding it, may be accomplished by utilizing low-literate tools with the addition of visual and audio-based learning to educate patients about statistics and survival rates of cancer [10]. Further, creating a positive image of healthcare by implementing religious and community-based initiatives may also be an effective method in Appalachian communities.

Based on the results of the present study, future research would benefit from a randomized controlled trial of Appalachian citizens with the control group receiving the standard level of cessation advice and the treatment group receiving a handout with visuals depicting the risk of developing high-risk cancers. A 2022 study from the CDC reports that in participants who smoked and saw a healthcare provider within the last year, 44% did not receive any advice on smoking cessation [14]. It was also observed that brief advice lasting under 3 minutes was beneficial in aiding smoking cessation. A similar brief advice session could be used as a standard level of care for future studies and compared to brief advice with a visual aid explicitly outlining predicted cancer risks from smoking and the effectiveness of screening. Due to the complex influences of Appalachian beliefs, culture, and socioeconomic disparities, this type of intervention may be an effective way to increase knowledge of smoking and cancer risks in this community.

#### 4.2. Limitations

This study has several limitations. Although the population was sampled from both outpatient and hospitalized patients, as well as family members, the sample was limited to people seeking medical services or accompanying others who were seeking medical services. The gender-specific cancers were only able to be analyzed for their associated genders so the sample size was drastically reduced when assessing the differences in those cancer ratings across genders. To keep the survey short and increase response rates, some demographics were not collected like education level, household income, and marital status, which are variables that could have affected the survey responses and given more insight into the participants' health literacy.

## 5. Conclusions

The current study showed a discrepancy between the perceived and predicted risks of cancer in people who smoke in Appalachia, suggesting that low health literacy may play an important role in understanding personal health risks from preventable causes. For most cancers associated with smoking as a risk factor, participants rated the perceived risk lower than the estimated risk. In contrast, the perceived risk of every cancer that did not have smoking as a risk factor was rated higher than its estimated risk. Smoking-related cancers are seen at a disproportionately high rate in the Appalachian population [17], emphasizing a need for primary and secondary disease prevention. However, smoking cessation strategies have not been proven to be consistently effective in these areas [3,5,17], suggesting that unique social determinants of health may contribute to the high rates of smoking observed here. Health literacy, poverty, and the tobacco farming history in Appalachia may influence the widely accepted smoking culture in this region and should be taken into consideration in future studies. It has been demonstrated that people who perceive detrimental personal risks from a behavior are more likely to discontinue that behavior [9]. Appalachian residents have listed a lack of education and awareness as reasons for not seeking preventative cancer screenings [28,29]. This study showed that participants were not aware of their predicted risk of developing certain types of cancer because they smoke, suggesting that low health literacy in this area may be a contributing factor to its smoking and cancer rates. Understanding one's perception of health risks from personal behavior is the first step in personalizing patient education in areas with unique cultural backgrounds. Based on previous studies regarding smoking cessation and cancer literacy [14,30], a brief educational intervention using visual aids to discuss the risks of cancer from smoking may be a useful strategy in helping Appalachian residents make informed decisions about their health.

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