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ORIGINAL PAPER

Comparison of Cancer Fatalism Among Rural Smokers and Nonsmokers

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Abstract
This study examined the relationship of cancer fatalism, using the Powe Fatalism Inventory (PFI), and smoking status (active smoker and nonsmoker) among rural adults. Utilizing a convenience sample, a cross-sectional study was performed. Inclusion criteria included being at least 18 years of age and a resident of one of the selected counties in the rural region. Analyses conducted were two-sample *t* tests, Fisher's exact tests, and logistic regression. Among 485 participants, the overall fatalism mean score and five PFI items had statistically significant outcomes. Using multiple significance tests, significance remained when adjusting for demographic variables for the individual PFI items. Analyses indicated that smokers possessed a heightened level of fatalistic views compared to nonsmokers. Future directions includes the creation of a community-informed, multi-level intervention to increase perceived susceptibility of smoking-related health risks and foster healthcare seeking behaviors. This approach has the potential to reduce rates of morbidity and mortality in rural, underserved communities.

Keywords Cancer prevention · Fatalism · Smoking · Rural

Introduction

Residents of rural communities, in comparison to urban settings, are noted as having lower educational levels, higher poverty rates, and decreased health services access [1, 2]. In addition, this population also participates in health-risk behaviors at an increased prevalence [1]. One such behavior is tobacco use, which has been identified as the most preventable cause of mortality [1, 3, 4]. Moreover, annually in the United States, nearly one in five deaths have been attributed to smoking [5]. Therefore, in an effort to lessen this outcome, it is imperative to assess a multitude of individual level attitudes and beliefs leading to engagement [6, 7].

A favored individualistic area of exploration among researchers is cancer fatalism. Cancer fatalism is defined as the belief that mortality is inevitable upon presence of cancer through external causes [8, 9]. Although the occurrence is not fully understood, the phenomenon has been documented as an action predictor for cancer screening, treatment, and survivorship [8, 9]. Additionally, on the cancer continuum, addressing fatalism has been noted as a focus for preventive educational intervention [9, 10].

Regarding fatalism and smoking status, smokers are more likely to have avoidant and pessimistic cancer beliefs compared to nonsmokers [9, 11, 12]. Unfortunately, this has been associated with lack of cancer screening recommendation adherence [12, 13]. Thus, an elevated risk of late-stage diagnosis occurs among smokers, minimizing their treatment options [12]. Research suggests that smokers may be unaware of their increased risk of cancer because of their cognitive-dissonance reducing beliefs [14, 15]. In turn, smokers use these beliefs to rationalize their cigarette usage and develop positive attitudes about engaging in the behavior [15]. Having the ability to assess these trends of fatalism is a crucial step in pinpointing effective strategies to improve their healthful behavior involvement, including screening adherence [11].

An assessment tool widely utilized by researchers to understand the role of fatalism is the Powe Fatalism Inventory (PFI). Initially, the PFI was developed to assess cancer fatalism among rural, medically underserved individuals [16]. The inventory consists of 15 "yes" or "no" items, with

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a range of scores from 0 to 15. One point is added for each "yes" selection, with higher scores indicating heightened levels of cancer fatalism [16]. The basis of the items is to adequately define attributes of fear, pessimism, inevitability of cancer mortality, as well as predetermination [17]. The measurement tool has been employed to understand mammography screening and breast cancer awareness among elderly women [18], as well as Mexican-American [19] and Turkish women [20, 21]; and prostate cancer screening among Caribbean-born men [22, 23]. Furthermore, PFI has also been used to determine the relationship of religiosity, spirituality and cancer fatalism beliefs [24, 25], and cancer information avoidance [26].

To the authors' knowledge, there is no study in the literature with the coupling of cigarette smoking behaviors and the PFI measure. Therefore, in an effort to further elucidate this relationship and build the existing literature regarding smoking and fatalism, the purpose of this study is to examine cancer fatalism among rural residents. The comparison of data, relative to participant smoking status, will identify any pertinent differences between the groups. Subsequently, information obtained will be used to inform future cancer prevention programs in the region.

Methods

Participants and Recruitment

The study was approved by East Carolina University Institutional Review Board (project identification number: UMCIRB 14-001282). Upon receiving approval, staff were trained in the data collection protocol. The protocol included interviewers wearing a photo-ID badge that identified them as project staff and soliciting participation from people in community venues (i.e., strip malls, department stores, local health events) in Pitt and surrounding tier-one counties of eastern North Carolina. Tier-one counties are those that are identified as the most distressed in the state, based on average unemployment rate, median household income, percentage growth in population, and adjusted property tax base per capita.

Within these locations, participants were approached and presented with a consent letter, which was read aloud by staff. The interviewer then asked the potential participant if she met the inclusion criteria and would like to complete the questionnaire. Individuals who agreed to participate (through informed consent) were handed the survey, asked to complete the document alone (on-site), and instructed to submit the assessment to project staff. Participants were given a $30 gift card upon completion of the survey. The amount of compensation was determined through assessment of incentives used in previous studies conducted by the research team and time allotment needed for completion. The inclusion criteria for participation in the study included: (a) being at least 18 years of age and (b) currently residing in Pitt, Halifax, or Edgecombe counties in eastern North Carolina. Data were collected during the months of November and December 2016, with data entry, two-person coding audit, and analyses occurring thereafter.

Questionnaire Guide

The questionnaire consisted of 61 items regarding cancer fatalism, medical mistrust, chronic disease diagnoses, health behaviors, and demographic characteristics. The 15-item PFI was used to assess fatalism and the medical mistrust component included the 12-item Group Based Medical Mistrust Scale. The chronic disease and health behaviors section comprised 27-items related to (a) physical activity, dietary, and risk behaviors; (b) health care access and utilization; (c) health screening adherence; (d) health status; and (e) chronic conditions. The remaining demographic component (seven items) of the assessment included self-identified race/ethnicity, age, gender, educational attainment, marital and employment statuses, and household income. The average time of completion was 20 min. The components identified in this specific analysis are limited to the PFI and demographic items.

Statistical Analyses

The two groups were compared on age and other numeric variables using side-by-side boxplots, and when appropriate, p-values were obtained from the two-sample *t* test (without assuming equal variances). Additionally, categorical variables were visualized using segmented bar plots. The number of missing values was small for variables other than county of residence. Fisher's exact test was used to obtain p-values. The significance level is taken to be .05; no adjustments were made for multiple comparisons.

Furthermore, odds ratios were assessed for individual items of the cancer fatalism measure. For questions in which smoking was statistically significant, logistic regression was used to investigate how the estimated odds ratios changed after adjusting for other covariates. The covariates considered were health insurance coverage, age, sex, education (at most Associates/Bachelors), income (less/greater than or equal to $50,000), and race. The bestglm package (version 0.33) in R (version 3.4.2) [27] was used to search for the best subset of regressors from these covariates and the variable smoking. The default information criteria (BIC) was used for defining what was meant by "best" model.

Results

Respondent Characteristics

Table 1 compares the two smoking status groups on demographic and other variables. A total of 371 nonsmokers completed the survey and 114 smokers. The approximate mean age of nonsmokers was 46 years (range 19–87 years) and 41 years (range 20–82 years) for smokers, a difference that was statistically significant. Regarding gender, 73.3% (n = 272) of nonsmokers were female, compared to 61.4% (n = 70) of smokers, also statistically significant. Among nonsmokers, 52.3% (n = 194) self-identified as White, which was similar to smokers at 50.9% (n = 58). Regarding marital status of nonsmoking participants, 30.7% (n = 113) were single, and 50.5% (n = 186) married. Among smokers, 48.6% (n = 54) classified themselves as single and 36.0% (n = 40) as married.

Among nonsmokers, 5.9% (n = 22) reported they had less than a high school education, 22.6% (n = 84) stated they had completed high school, 28.8% (n = 107) selected the some college or technical school category as their highest level of education, 14.3% (n = 53) received an Associate's degree, 20.2% (n = 75) completed a Bachelor's degree, and the remaining 8.1% (n = 30) earned a

Table 1 Respondent demographics and cancer fatalism score by smoking status

Item	Nonsmokers n = 371	Smokers n = 114	*p*-value
Age, mean (SD)	46.1 (15)	40.8 (13)	0.000*
Gender			
Female	73.3% (272)	61.4% (70)	0.019**
Male	26.7% (99)	38.6% (44)	
Race/ethnicity			
Black/African American	47.7% (177)	49.1% (56)	0.831
White	52.3% (194)	50.9% (58)	
Marital status			
Single	30.7% (113)	48.6% (54)	0.010*
Married	50.5% (186)	36.0% (40)	
Widow	4.3% (16)	1.8% (2)	
Divorced	9.0% (33)	7.2% (8)	
Living with partner but not married	5.4% (20)	6.3% (7)	
Highest level of education			
Less than high school	5.9% (22)	14.0% (16)	0.000*
Completed high school	22.6% (84)	34.2% (39)	
Some college or technical school	28.8% (107)	32.5% (37)	
Associates degree	14.3% (53)	10.5% (12)	
Bachelors degree	20.2% (75)	7.0% (8)	
Post baccalaureate degree	8.1% (30)	1.8% (2)	
Employment status			
Unemployed	38.6% (137)	41.2% (47)	0.861
Full-time employed	39.4% (140)	36.8% (42)	
Part-time employed	22.0% (78)	21.9% (25)	
Household income (annual)			
< $25,000	41.3% (151)	68.4% (78)	0.000*
$25,000–$49,999	31.1% (114)	25.4% (29)	
$50,000–$74,999	16.4% (60)	5.3% (6)	
Equal to or more than $75,000	11.2% (41)	1.0% (1)	
Health insurance coverage	82.8% (304)	57.9% (66)	0.000*
Cancer Fatalism Mean Score	4.158	5.638	0.000*

Values are % (n) unless stated otherwise. P-values for categorical variables obtained using Fisher's exact test. For 'Highest level of education' the p-value was obtained using simulation with 2000 replicates

*Statistically significant at the 0.01 level

**Statistically significant at the 0.05 level

post baccalaureate degree. Smokers accounted for their highest level of education as: 14.0% (n = 16) had less than a high school education, 34.2% (n = 39) completed high school, 32.5% (n = 37) received some college or technical school training, 10.5% (n = 12) earned an Associate's degree, 7.0% (n = 8) were awarded a Bachelor's degree, and 1.8% (n = 2) received a post baccalaureate degree. The 2 by 6 table obtained by comparing smoking status and education was statistically significant (see Table 1).

Mutually, 39.4% (n = 140) of nonsmokers were employed full-time compared to 36.8% (n = 42) of smokers. Household income was also assessed, with 41.3% (n = 151) of nonsmokers having received less than $25,000 annually and 31.1% (n = 114) noted $25,000–$49,999. In addition, 68.4% (n = 78) of smoking respondents had an annual household income < $25,000 and 25.4% (n = 29) were in the $25,000–$49,999 range. Health insurance coverage was also evaluated, with 82.8% (n = 304) of nonsmokers and 57.9% (n = 66) of smokers stating they were insured. For both household income and health insurance coverage categories, the difference between smokers and nonsmokers was statistically significant. Additionally, for PFI scores, nonsmokers had a mean of 4.158 in comparison to 5.638 for smokers; this difference was statistically significant as well (see Table 1).

Powe Fatalism Inventory

Table 2 presents odds ratios (OR) for each PFI item. The odds are for negative responses (strongly disagree or disagree) to positive responses (strongly agree or agree), with neutral responses removed. The ratio is for smokers compared to nonsmokers. Responses to eight questions were found to be statistically significant (p-values 0.033 or less). As well as being statistically significant, these questions show a significant effect with odds ratio for each ranging from 1.63 to 3.09. This indicates that the odds of smokers responding negatively is nearly twice to three times that for nonsmokers.

Specifically, the OR for "I believe if someone has cancer, it is already too late to do anything about it" is 3.09 with a 95% confidence interval (CI) of [1.46, 6.54]. "I believe someone can smoke all their life, and if they are not meant to get cancer, they won't get it" was determined to have an OR of 2.23 (95% CI 1.46–3.42). Additionally, "I believe if someone is meant to get cancer, they will get it no matter what they do" is 1.89 with a 95% CI of [1.24, 2.90]. Also, the OR for "I believe if someone gets cancer, their time to die is near" is 3.01 with a 95% CI of [1.49, 6.07]. "I believe if someone gets cancer, that's the way they were meant to die" was determined to have an OR of 2.15 (95% CI 1.21–3.82). Furthermore, "I believe getting checked for cancer makes people think about dying" is 1.63 with a 95% CI of [1.06, 2.51]. "I believe if someone is meant to have cancer, they

Table 2 PFI negative responses odds ratio results (smokers and nonsmokers)

	Est. OR	95% CI	*p*-value
1. I believe if someone is meant to have cancer, it doesn't matter what they eat, they will get cancer anyway	1.39	0.91–2.12	0.134
2. I believe if someone has cancer, it is already too late to do anything about it	3.09	1.46–6.54	0.006*
3. I believe someone can smoke all their life, and if they are not meant to get cancer, they won't get it	2.23	1.46–3.42	0.000*+
4. I believe if someone is meant to get cancer, they will get it no matter what they do	1.89	1.24–2.90	0.003*+
5. I believe if someone gets cancer, it was meant to be	1.47	0.95–2.25	0.094
6. I believe if someone gets cancer, their time to die is near	3.01	1.49–6.07	0.003*+
7. I believe if someone gets cancer, that's the way they were meant to die	2.15	1.21–3.82	0.013**
8. I believe getting checked for cancer makes people think about dying	1.63	1.06–2.51	0.033**
9. I believe if someone is meant to have cancer, they will have cancer	2.96	1.92–4.56	0.000*+
10. I believe some people don't want to know if they have cancer because they don't want to know they may be dying from it	1.40	0.88–2.20	0.176
11. I believe if someone gets cancer, it doesn't matter when they find out about it, they will still die from it	1.64	0.88–3.05	0.123
12. I believe if someone gets cancer, a lot of different treatments won't make any difference	1.67	0.97–2.90	0.071
13. I believe if someone was meant to have cancer, it doesn't matter what the doctor tells them to do, they will get cancer anyway	1.34	0.82–2.19	0.243
14. I believe if someone is meant to have cancer, it doesn't matter if they eat healthy foods, they will still get cancer	1.88	1.22–2.89	0.005*+
15. I believe cancer will kill most people who get it	1.17	0.74–1.86	0.551

*Statistically significant at the 0.01 level

**Statistically significant at the 0.05 level

+Significance remained at the 0.05 level after logistic regression

will have cancer" was also determined to be statistically significant with an OR of 2.96 (95% CI 1.92–4.56). Lastly, "I believe if someone is meant to have cancer, it doesn't matter if they eat healthy foods, they will still get cancer" was assessed at an OR of 1.88 (95% CI 1.22–2.89) (see Table 2).

Logistic regression was used to investigate how the estimated odds ratios changed after adjusting for additional covariates, with five of the eight questions maintaining statistical significance (0.05 level). The variables considered were health insurance coverage, sex, age, education (Associates/Bachelors degree as the reference group), income (≥ $50,000 as the reference group), and race. For q4, q6, and q14, smoking was not included in the best model, but was significant when added to the model. For q3, smoking was one of two covariates in the best model. For q9, the best model consisted of only the smoking variable. Notably, for q2, q7, and q8, the best model did not include smoking and when added to the model, smoking was not significant.

Discussion

Results of this study yield various demographic implications regarding cancer fatalism and smoking behaviors among rural adults in eastern North Carolina. In comparison to nonsmokers, smokers had lower levels of college degree attainment and annual household income. Both of these characteristics are associated with rurality and reduced health literacy [1, 2]. Moreover, reduced health literacy is prevalent in rural communities, and heightens an individual's likelihood of possessing fatalistic views [28]. Specifically, this demographic is more likely to have personally observed experiences with poor cancer outcomes in their social environment [28]. The same pessimistic effect has been noted for groups of low socioeconomic status and educational level [29, 30]. In addition, minimal health literacy is correlated with having reduced levels of knowledge concerning preventative behaviors and health services [31]. Therefore, researchers must explore innovative and population-specific strategies to increase health awareness and comprehension for those belonging to these vulnerable demographic categories [30, 31].

Also, in analyses of demographic characteristics, smokers were considerably younger in comparison to nonsmokers. This aligns with national data, which indicates that cigarette smoking is higher for persons aged 18–24 years, 25–44 years, and 45–64 years when compared to individuals 65 years of age and older [32]. Additionally, smokers within the study were more likely to be uninsured in comparison to their counterparts. This too reflects national data which states that smokers are nearly 2.5 times more likely to be uninsured or Medicaid recipients than nonsmokers [33]. These findings indicate that targeting those at-risk populations for smoking cessation and cancer prevention endeavors, will be an advantageous approach to improve their health outcomes and subsequent quality of life [33, 34].

Regarding the PFI, the total mean scores and five individual tool items were identified as having statistically significant differences between smokers and nonsmokers. This significance for the separate inventory items remained when adjusting for demographic variables. Each item indicated that smokers had a higher level of cancer fatalistic views than nonsmokers. Specifically, smokers believed that a person could smoke their entire life, and if they were not meant to get cancer, they would not have the disease. Likewise, smokers believed that a person would get cancer if it was meant to be, regardless of various preventative behaviors they may incorporate in their daily practices. With these views, smokers placed their fatalistic beliefs in an external context, out of one's personal control [8, 9]. Moreover, smokers possess an optimistic bias related to cancer risk in comparison to nonsmokers [35, 36]. This is in direct correlation with their lack of commitment to adhere to smoking cessation recommendations [36]. Therefore, it is imperative that community and clinical-based programs continue to focus efforts on heightening perceived susceptibility of smoking related health risks through multilevel theory-driven techniques [37–39].

Lastly, smokers expressed that if someone gets cancer, they would die in the near future. This perception of the disease may lead to screening and physician avoidance due to an attitude of hopelessness [22]. As a result, individuals are deterred from secondary prevention engagement to reduce the impact of disease, if found in early stages [11, 40]. Moreover, additional studies have found that cancer-related avoidance is further exacerbated by demographic characteristics, such as low educational attainment [41]. To increase survivorship among these high-risk populations (i.e., smokers and low level of education), eliminating this impactful determinant of healthcare-seeking behavior must be addressed through targeted intervention [40, 41].

There are notable strengths of this study. Firstly, the employment of the PFI tool in its entirety to assess cancer fatalism among smokers. Likewise, the inclusion of nonsmokers for comparison in the exploration added to the limited literature. In addition, the study population consisted solely of rural and largely low-income individuals, which builds on the importance of this research. However, although a source of rich and much needed data was provided by this study, there are limitations. Due to the utilization of a convenience sample, generalizability for the entire state and region cannot occur. Lastly, the high unemployment and low household income rates may have shifted the outcomes to show an elevated level of fatalism.

There is limited research in the literature outlining the influence of smoking status on cancer fatalism among rural

populations. However, data obtained through the present study has contributed to the knowledge base for understanding perceptions for this vulnerable group. Future research will seek to gain insights on the underlying cause of these findings (e.g., socioeconomic status and level of health literacy). In addition, heightened consideration will be placed on including participants of higher socioeconomic status to determine if there is a significant difference of fatalism for each income classification.

Conclusion

Among smokers, in comparison to their counterparts, statistically significant differences were found for multiple fatalistic beliefs. Namely, smokers believed cancer was a disease an individual will have in their lifetime if they were meant to have it, regardless of whether or not they engaged in preventive behaviors. In addition, smokers were more inclined to agree that cancer would result in a rapid and inevitable death, which is a barrier to screening adherence. The findings will be used to create a community-informed, multilevel intervention to increase perceived susceptibility of smoking-related health risks and to foster healthcare seeking behaviors. This approach has the potential to reduce rates of morbidity and mortality in rural, underserved communities.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

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