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**THE RELATIONSHIP BETWEEN SMOKING AND PSYCHOLOGICAL  
DISTRESS AMONG THE WHITE APPALACHIAN POPULATION: USING  
THE 2007 HINTS SURVEY**

A Thesis in

Public Health Sciences

by

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## ABSTRACT

This study aims to examine the relationship between smoking behavior and serious psychological distress (SPD) in Appalachia, a region characterized as being “stressed” by the Appalachian Regional Commission, versus the rest of the U.S. outside of this region. A nationally representative, cross-sectional dataset from the 2007 Health Information National Trends Survey (HINTS) was used, which contained a newly created Appalachia variable. The sociodemographic factors (age, sex, income, and education), known smoking status (never smokers, former smokers, and current smokers) number of cigarettes smoked per day (CPD), smoking intensity (light, moderate, and heavy), and quit attempts among current smokers were all self-reported by the participants. SPD was used as the main outcome measure utilizing the clinically validated instrument, Kessler six-item Distress Scale (K6). Bivariate analyses and logistic regressions were used to examine associations between smoking behaviors in individuals with and without SPD. Interactions between the smoking variable of interest and Appalachia residence were used to detect if place of residence was a significant effect modifier in these associations. The results show that people who currently smoke were more likely to have SPD (POR: 1.9, 95% CI: 1.15-3.20) and smoke more cigarettes per day (POR: 1.02, 95% CI: 1.01-1.04), however place of residence was not a significant modifying factor for either ( $p=0.56$  and  $p=0.62$ , respectively). No significant associations were found with smoking intensity and quit attempt status. Although the findings here are analogous to the strong evidence between current smoking and CPD with SPD, they do not provide significant evidence to the association being modified by residing in the Appalachia region.

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## Chapter 1

### Introduction

The 2010 National Survey on Drug Use and Health in the U.S. reported that 58.3 million people, 23 % of the population, are current cigarette smokers (1). Despite a gradual, steady decline of smoking through 2002-2010, there are still high rates of cigarette use among certain subpopulations in the United States. Previous research has consistently shown that individuals with psychological distress are one of these subpopulations that continue to be a major consumer of tobacco (2-4). A recent study showed those with serious psychological distress (SPD) had higher rates of daily smoking (30.2% vs. 16.7%) compared to those without SPD and smoked a greater number of cigarettes as symptoms of distress increased (5). People who have SPD consume cigarettes at a level that is disproportionate to those who do not have these symptoms. An economic study in 2005 found that persons with nonsubstance-related mental illness in the past twelve months represented 24% of the population in the U.S., but had consumed 40% of all cigarettes smoked in the U.S (6). In addition to cross-sectional associations, prospective studies with longitudinal follow-up data have also been published. The prospective data shows that smoking pre-dates the onset of depression. A study of 1007 young adults followed for 5 years found a hazard ratio for progression to major depression associated with prior daily smoking was 1.96 (95% CI: 1.37-2.80) (7). Another study found an increased dose-response of risk in smokers compared to never smokers. Compared with never smoking, past quit ( $\leq 5$  years ago HR 1.46, 95% CI: 0.70-

3.03) and low current amounts of smoking ( $\leq 10$  cigarettes/day: HR 1.29, 95% CI: 0.74-2.25) were associated with a higher risk of depression, with even more substantial risk ratios for 11–20 cigarettes per day (HR 2.01, 95% CI: 1.17-3.43) and for more than 20 cigarettes per day (HR 4.34, 95% CI: 1.85-10.18) (8).

Disproportionate rates of illness have been well established in tobacco users with mental illness, accounting for 200,000 out of the 443,000 premature tobacco-related deaths in the United States (9). More specifically, these persons suffer from excessive rates of smoking-related cancers, cardiovascular, and respiratory diseases (10).

Previous research has produced multiple theories with conflicting evidence of the possible cause and effect relationships of smoking and depression. A number of epidemiological studies have shown an apparent comorbidity between smoking and depression caused by common underlying genetic and environmental factors (11, 12). Subsequent research has found that when controlling for these shared genetic and environmental influences there still lies a residual association between smoking and depression (7, 13). Another plausible explanation is that these two factors are related in a causal manner- smoking increases risk of mental illness or vice versa. A recent study aimed to examine the causal relationships between these two factors using fixed-effects regression to control for genetic and environmental confounders and structural equation modeling to find the best fitting model to assess causation with longitudinal data from a birth cohort (14). As with previous studies, they found a persistent significant association with daily cigarette smokers and depressive symptoms even after controlling for non-observed fixed and observed time-dynamic effects, such as common genes and environment. They concluded the best-fitting causal model to be the one that daily

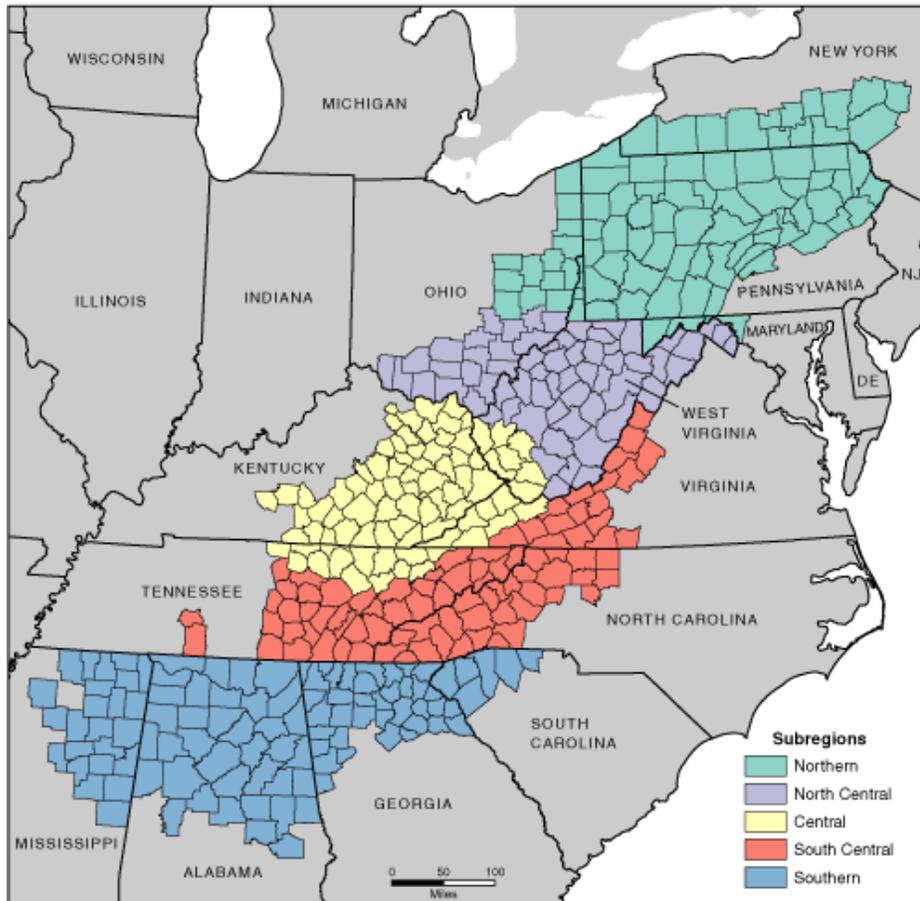
cigarette consumption led to an increased risk of depression. The biological mechanisms that cause this arise from nicotine's actions on neurotransmitter activity in the brain that leads to the increased risk of depression (15).

Another problem that smokers with mental illness face is successful attempts at smoking cessation. A recent paper published found that people with high levels of psychological distress were more likely than people with low levels to want to quit smoking, to try to quit smoking, and to use smoking cessation aids; however, they were less likely to successfully quit for 6 months or more (16). Concluding that moderate to high levels of psychological distress is a significant inhibitor of smoking cessation and may require targeted strategies to support cessation efforts. Interestingly, smokers who had attempted in the past to quit and failed and that smoked to feel relaxed or deal with stress were more likely to report psychological distress (4). Many studies show that psychological distress is a strong positive or negative predictor of smoking cessation. Smokers report that relapse occurs when they are experiencing high levels of distress (17) or in situations that involve negative moods such as anxiety, anger, and depression (18-20)

The tobacco industry has been shown in recent decades to have used the vulnerability of those with mental illness or distress to harden their market. Marketing research done by the tobacco industry found that smokers use cigarettes to enhance their mood and for positive stimulation. Their research further discovered that smokers used tobacco to relieve themselves from depressive symptoms and anxiety relief, specifically stating that tobacco "helps perk you up" and aids in the ability to "cope with stress" (21). More than 5,000,000 documents from tobacco industry became available in 1998 because

of the Master Settlement Agreement between the U.S. government and the cigarette companies. A study conducted in 2003 searched through an archive of these documents and confirmed that the tobacco industry identified psychological or behavioral needs of consumers and targeted consumer groups based on the needs-assessment. The tobacco industry was successfully able to segment smokers into their needs or wants of cigarettes and use current brands and new products to gratify the psychological needs of the smoker. This in turn helped them to increase the initiation of new smokers and maintain addiction (22).

The Appalachia population is another subpopulation that merits special attention. This area of the country includes 420 counties that cover all of West Virginia, and parts of New York, Pennsylvania, Ohio, Kentucky, Virginia, Tennessee, North Carolina, South Carolina, Georgia, Alabama, and Mississippi (Figure 1-1). Forty-two percent of the area is rural compared with only 20% in the rest of the country (23). The Appalachian region has a higher prevalence of cigarette use than the national average (24). In Ohio Appalachian counties, the percent of current smokers was 31.5% compared to 26.1% in non-Appalachian Ohio counties between the years of 1999 and 2003 (25). One study that set out to find why rural respondents have a greater risk of smoking compared to urban respondents concluded that the higher smoking prevalence was explained by lower levels of income and education and by the greater likelihood that rural residents were White (26). The rural area of Appalachia is also characterized by low levels of income, employment, and education, high poverty rates, and a large White population (27, 28). The White Appalachian population provides an excellent opportunity to test if the association of smoking and SPD is compounded by living in this region.



Map by: Appalachian Regional Commission, November 2009.

Figure 1-1: Map of contiguous Appalachian region (420 counties) used in this analysis.

Furthermore, Kiviniemi et al. (2011) assessed the link between psychological distress and smoking by a participant's race. They found that higher levels of psychological distress were associated with a greater likelihood of current smoking and with a greater number of cigarettes consumed per day among White individuals (OR= 1.66, 95% CI 1.41-1.94), but showed no significant association among either Black

(OR=1.02, 95% CI 0.72-1.46) or Hispanic (OR=1.27, 95% CI 0.92-1.76) populations (29).

The Appalachian community makes an ideal population to study the dynamic factors contributing to the prevalence of tobacco use within individuals suffering from SPD. This study will provide additional information on current claims that smokers in low socioeconomic subgroups have an increased odds of having SPD (3), particularly in a unique contiguous and isolated geographic area. This is the first known study which aims to test the well-established association between smoking and SPD and whether any association in Appalachia differs to that observed for the rest of the U.S. in a nationally representative survey. It is hypothesized that people who are current smokers, smoke more cigarettes per day, and have lower quit rates will have a higher likelihood of having SPD. It is also hypothesized that the magnitude of these relationships will be greater for those residing in the Appalachia, which is a rural region with predominately White residents and has characteristics of being a distressed population. With the slight decline of smoking rates and continued efforts to further the decline, new studies need to be conducted to reanalyze smoking rates within subpopulations in the U.S to guide the efforts to reach and assist these populations.

## **Chapter 2**

### **Methods**

#### **Data Source**

Data for this analysis are from the most recently available 2007 National Cancer Institute's Health Information National Trends Survey (HINTS). HINTS is a biennial cross-sectional survey designed to give nationally representative data on American public need for, access to, and use of cancer information. This dataset also incorporated a newly created dichotomous Appalachia variable. The survey used a mixed mode, dual-frame sampling design with a total of 7,674 respondents. One frame used a random digit dialing (RDD) telephone survey with a computer assisted telephone interview (CATI) system. The second frame used a national listing of addresses available from the United States Postal Service (USPS) and were administered a mail survey. The advantage to this allows the sample to reach not only landline telephone users, but also reach people without telephones or mobile-only telephone users. The response rate for the RDD survey (n=4,092) was 24.2%. The response rate for the mail survey (n=3,582) was 30.1%. The full report of the methodology and procedures for the 2007 HINTS can be found in Cantor et al., 2009 (30). This analysis included only the non-Hispanic White proportion of both sample modes with a final sample size of 4,527 respondents.

#### **Measurement of SPD**

The presence of SPD was determined by using the Kessler- 6 scale (K6) developed by Kessler and his colleagues to assess the prevalence rates of nonspecific psychological distress at the population level (31). The K6 was designed specifically for the core of the redesigned U.S. National Health Interview Survey (NHIS) in 1997 as an easy tool to collect mental health information in large, nationally representative population surveys. The NHIS was following a movement in research to measure mental health based on severity of psychological distress rather than just disorder specific diagnostic measures in order to identify people with a high probability of having a diagnosable mental illness that is severe enough to cause impairment in daily living activities or require treatment (32).

The K6 uses the item response theory methodology which selects questions with optimal sensitivity in the 90-99<sup>th</sup>- percentile range of the general population distribution of psychological distress along with high sensitivities across different sociodemographic subsamples. Not surprisingly the K6 has strong psychometric properties with a sensitivity of 0.36 (SE, standard error =0.08), specificity of 0.96 (SE=0.02), and a good internal consistency reliability of  $\alpha = .89$  (33).

The K6 asks about the frequency of each of six symptoms of mental illness or nonspecific psychological distress:

During the PAST 30 DAYS, how often did you feel...

1. So sad that nothing could cheer you up;
2. Nervous;
3. Restless or fidgety;
4. Hopeless;
5. That everything was an effort; and
6. Worthless.

The following options are given for describing frequency:

1. NONE of the time;
2. A LITTLE of the time;
3. SOME of the time;
4. MOST of the time; and
5. ALL of the time.

“None of the time” is given a score of 0, “all of the time” a score of 4 and the total possible score ranges from 0 to 24. “Don’t know” and “refused” were coded as missing and excluded from the analysis. As suggested by Kessler and colleagues (33), a score of 13 or greater was used to define SPD.

A study evaluated the K6 as a useful screener for predicting 1-month depression, producing areas under the curve (AUC) of 0.926 (95% CI: 0.905-0.947) meaning the scale was able to accurately distinguish a randomly chosen case from a non-case based on their score from the scale (34). Another study found that the K6 actually outperformed the General Health Questionnaire (GHQ-12), which is the worldwide standard screener for mental health, in detecting DSM-IV mood and anxiety disorder cases and non-cases (K6 AUC: 0.89, 95% CI: 0.88-0.90 versus GHQ-12 AUC 0.80, 95% CI: 0.78-0.82), even though the GHQ-12 contains twice as many questions (35). A strong correlation between K6 and a current CIDI (Composite International Diagnostic Interview) diagnosis of anxiety and affective disorders has been found (36). These results show that short, well-constructed scales like the K6 have the ability to reproduce classifications based from much more extensive clinical interviews.

The accuracy, brevity, and ability to detect cases from non-cases makes the K6 scale an attractive tool for population-based health surveys. Since its debut, the scale has been adopted in a number of countries including the U.S., Australia, and Canada for use

in their ongoing state and national government health surveys. The K6 has been included specifically in the U.S. National Health Interview Survey since 1997 and the U.S. Behavioral Risk Factor Surveillance System, as well as internationally in the WHO World Mental Health Survey.

### **Measure of Smoking Behavior**

The smoking characteristics that were examined included smoking status, CPD, smoking intensity, and quit attempts. Smoking status was derived from two questions on the survey. All respondents were first asked, “Have you smoked at least 100 cigarettes in your entire life?” When a respondent answered ‘yes’ to the previous question they were then asked, “Do you now smoke cigarettes every day, some days, or not at all?” From the first two questions, respondents were placed into one of three groups- current, former, or never-smokers. Current smokers were categorized by responding ‘yes’ to smoking 100 cigarettes and ‘yes’ to either smoking some days or every day. Former-smokers were categorized by responding ‘yes’ to having smoked at least 100 cigarettes in their lifetime, but currently do not smoke at all. Never-smokers included persons who have never smoked at least 100 cigarettes in their lifetime.

Current smokers were asked, on average, how many cigarettes per day they smoked. Smoking intensity for current smokers was assessed ordinally by categorizing their CPD into 3 categories: “light”, “moderate”, and “heavy”. Light smokers were those who smoked less than 14 cigarettes per day, moderate smokers smoked 15-24 cigarettes per day, and heavy smokers smoked more than 25 cigarettes in a day. Current smokers

were finally asked, “During the past 12 months, have you tried to quit smoking completely?” A quit attempt was defined if they answered ‘yes’ to this question.

### **Data Analysis**

Descriptive statistics were calculated for all variables. A separate bivariate analysis was conducted comparing the association between each variable and SPD. Weighted means and standard errors for continuous variables and unweighted frequencies and weighted percentages for categorical variables were reported. Odds ratios and 95% confidence intervals from logistic regression models were used to assess the relationship between smoking status, cigarettes per day, and quit attempts and SPD. In order to test how these relationships varied by Appalachia residence an interaction term was created between Appalachian residence and the independent variable of interest. All models were adjusted with age, sex, education, and survey mode. All statistical analyses were performed using Statistical Analysis Software (SAS) version 9.3 (SAS Institute, Cary, NC). The jackknife method was used for the standard error estimations. All statistical tests were two-sided and used a significance level of  $p < .05$ . All point estimates included the estimation of 95% confidence intervals (CIs).

## Chapter 3

### Results

Among the 2007 HINTS dataset, 4,527 reported being White non-Hispanic. The mean age of this group was 46.9 (SEM, standard error of mean = 0.22) years, with a range of 18-97 years of age. Gender was evenly represented (males 49.6% and females 50.4%). About 36% of the sample had an annual household income of more than \$75,000 and 46.7% had some college or more. Almost half (48.9%) of the overall sample were never smokers and 22% reported current cigarette use. The majority of the sample were moderate smokers (44%) with a mean of 17.7 (SEM=0.6) cigarettes per day. Nearly 11% were categorized as living in an Appalachian region.

### Demographics by SPD

Overall, of the total non-Hispanic White sample, approximately 5% (n= 228) experienced SPD in the past month scoring a 13 or higher on the K6 scale. There were some noteworthy differences between the respondents with and without SPD. Participants with SPD differed most notably by income ( $p < .0001$ ) and education ( $p = 0.0002$ ). Nearly 34% of persons with SPD had a family income of less than \$20,000 per year, while only 13% of persons without SPD had this level of income. Participants with SPD showed significantly lower levels of education with 22.6% reporting less than a high school diploma compared to 7% in those without SPD. Similarly, respondents with SPD were much less likely to have received a college degree (10.4%) than adults without SPD (30.8%). In addition, adults who reported SPD were more likely to be at a younger

age ( $p=0.02$ ). No differences were seen in the two groups by gender ( $p=0.07$ ). Residing in Appalachia showed no statistically significant difference in SPD ( $p=0.66$ ). There was a significant difference in survey mode ( $p<.0001$ ); therefore, it was included as a covariate in all multivariate regression models.

**Table 1-1:** Sociodemographic characteristics of the White non-Hispanic sample by psychological distress status

	Total (n=4527)	Yes (SPD score $\geq$ 13) (n=228)	No (SPD score < 13) (n=4299)	p-value <sup>1</sup>
Sex, n (%) <sup>2</sup>				0.07
Male	1853 (49.6)	70 (41.3)	1783 (50.3)	
Female	2674 (50.4)	158 (58.7)	2516 (49.7)	
Age, n (%)				0.02
18-34	599 (28.2)	41 (35.2)	558 (27.6)	
35-49	1081 (29.4)	68 (32.4)	1013 (29.2)	
50-64	1558 (26.3)	82 (25.2)	1476 (26.3)	
65-74	703 (8.3)	19 (2.6)	684 (8.8)	
75+	586 (7.8)	18 (4.6)	568 (8.0)	
Income, n (%)				<.0001
Less than \$20,000	593 (14.5)	75 (33.5)	518 (13.0)	
\$20,000 to <\$35,000	712 (14.9)	51 (27.2)	661 (13.9)	
\$35,000 to <\$50,000	638 (14.2)	25 (9.2)	613 (14.6)	
\$50,000 to <\$75,000	918 (20.7)	29 (8.9)	889 (21.7)	
\$75,000 to <\$100,000	609 (13.8)	26 (12.8)	583 (13.9)	
More than \$100,000	1057 (21.9)	22 (8.4)	1035 (23.1)	
Education, n (%)				0.0002
Less than high school	253 (8.1)	40 (22.6)	213 (6.9)	
High school graduate	1058 (25.3)	66 (30.7)	992 (24.8)	
Some college	1362 (37.4)	78 (36.3)	1284 (37.5)	

College graduate	1854 (29.2)	44 (10.4)	1810 (30.8)	
Smoking Status, n (%)				<.0001
Never Smoker	2222 (48.9)	89 (38.8)	2133 (49.7)	
Former Smoker	1525 (29.1)	41 (15.7)	1484 (30.3)	
Current Smoker	780 (22.0)	98 (45.5)	682 (20.0)	
Smoking Intensity, n (%)				0.69
Light (0-14)	231 (38.5)	29 (39.6)	202 (38.3)	
Moderate (15-24)	265 (44.1)	30 (39.5)	235 (44.9)	
Heavy (>25)	112 (17.4)	21 (20.9)	91 (16.8)	
Cigarettes/day, mean (SEM) <sup>4</sup>	17.7 (0.6)	19.0 (1.4)	17.4 (0.6)	
Quit Attempt, n (%) <sup>3</sup>				0.98
Yes	362 (47.6)	48 (47.5)	49 (52.5)	
No	415 (52.4)	314 (47.7)	366 (52.3)	
Appalachia, n (%)				0.66
Yes	428 (10.9)	29 (8.7)	399 (91.3)	
No	4099 (89.1)	199 (7.6)	3900 (92.4)	
Sample Mode, n (%)				<.0001
Address	2128 (58.4)	133 (8.9)	1995 (91.1)	
RDD	2399 (41.6)	95 (5.1)	2304 (94.9)	

*Abbreviations:* SEM, standard error of mean; SPD, serious psychological distress; RDD, random digit dialing

<sup>1</sup>Rao-Scott (Second-Order) Chi-Square Test

<sup>2</sup>N was unweighted, percentage was weighted

<sup>3</sup>Among current smokers

<sup>4</sup>Mean and SE were weighted

### Smoking Behaviors by SPD

There was a significant difference in smoking status between adults with and without SPD ( $p < .0001$ ). Of those adults with SPD, 45.5% were current smokers which more than double the 20% smoking prevalence among respondents with no SPD. There was not a significant difference in smoking intensity, but individuals with SPD did have a

higher CPD average (19.0, SEM=1.4) than those without SPD (17.4, SEM=0.6) (Table 1).

Table 2-1: Association between smoking status and risk of psychological distress

	Beta Estimate	Prevalence Odds Ratio (POR) <sup>1</sup>	95% CI	p-value
Smoking Status				
Never		1.0 (referent)		
Former	-0.5443	0.58	0.31-1.08	0.09
Current	0.7732	1.91	1.15-3.20	0.01
Appalachia				
No		1.0 (referent)		
Yes	0.2504	1.30	0.65-2.6	0.47

<sup>1</sup>POR adjusted for sex, age, education, sample mode.

Table 2 shows the adjusted PORs from a logistic regression including smoking status and Appalachian residence while controlling for respondents sex, age, education, and sample mode. Participants who smoked showed a 90% higher odds of reporting SPD compared to those who did not smoke (POR: 1.9, 95% CI: 1.15-3.20, p= 0.01). Former smokers did not show an increased odds in having SPD when compared to never smokers (POR: 0.58, 95% CI: 0.31-1.08, p= 0.09). The interaction between Appalachian residence and being a current smoker was also tested in this model and found not to be significant (p= 0.62). Similarly, the interaction between residence and former smokers was also not significant (p=0.30).

**Table 3-1:** Association between quit attempt status in current smokers and risk of psychological distress

	Beta Estimate	Prevalence Odds Ratio (POR) <sup>1</sup>	95% CI	p-value
Quit Attempt Status				
No		1.0 (referent)		
Yes	-0.0901	0.91	0.49-1.70	0.78
Appalachia				
No		1.0 (referent)		
Yes	0.2362	1.27	0.46-3.51	0.65

<sup>1</sup>POR adjusted for sex, age, education, sample mode

Table 3 shows the adjusted POR’s for the relationship between quit attempt status among current smokers and SPD. Compared to those who did not make an attempt at quitting, the odds of having SPD was no greater than those who did try to quit smoking in the past year (POR: 0.91, 95% CI: 0.49-1.70, p=0.78). The interaction term of quit attempt status and Appalachia residence on SPD was not found to be significant (p=0.42).

**Table 4-1:** Association between cigarettes smoked per day and smoking intensity and risk of psychological distress

	Beta Estimate	Prevalence Odds Ratio (POR) <sup>1</sup>	95% CI	p-value
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Cigarettes per day, mean	0.0239	1.02	1.01-1.04	0.002
Appalachia				
No		1.0 (referent)		
Yes	0.2072	1.23	0.61-2.49	0.56
Smoking intensity				
Light (0-14)		1.0 (referent)		
Moderate (15-24)	-0.2969	0.74	0.33-1.65	0.47
Heavy (>25)	0.2285	1.26	0.50-3.16	0.63
Appalachia				
No		1.0 (referent)		
Yes	0.3559	1.43	0.43-4.69	0.56

<sup>1</sup>POR adjusted for sex, age, education, sample mode

Table 4 shows the adjusted POR's for the relationships between CPD and smoking intensity between those with and without SPD. The first logistic regression with a continuous variable for CPD showed a significant association with SPD (POR: 1.02, 95% CI: 1.01-1.04, p=0.002). A separate logistic regression assessing smoking intensity and SPD found no significant associations. All interactions between smoking behavior and Appalachian residence were not significant.

## **Chapter 4**

### **Discussion**

The overall tobacco use estimate for this study was 22% which is similar to the national average from other studies (23%). For White non-Hispanic respondents, the results of the relationships between cigarette use and SPD suggest that those with psychological distress were associated with both current smoking status and with a higher number of cigarettes per day. These study findings are consistent with an abundance of previous research reliably showing a high prevalence and rate of smoking among adults with mental illness. The unique aspect of the present study was the examination of the relationship between cigarette use and SPD modified by place of residence. The persistent high rate of smoking within individuals who have psychological distress was hypothesized to be compounded by their rural residence. Contrary to what was hypothesized, the interaction did not hold true in this study population.

There were two interesting findings in this study. First, there was no difference found in the prevalence of SPD between the Appalachian and non-Appalachia respondents ( $p=0.6648$ ). The Appalachians in this sample and in previous research have been consistently shown to be at a social disadvantage (37). Similarly, persons with SPD are also more likely to be poor and less likely to have a high school diploma (32). So, this was an interesting finding that no association was detected in the results, perhaps because these groups were less likely to respond to the survey. Second, there was no significant difference found in smoking status for people living within Appalachia versus

outside of Appalachia ( $p=0.2812$ ). This is surprising considering the high prevalence of cigarette smokers in the Appalachia region. Kentucky, Ohio, and West Virginia are ranked among the top in the U.S. for high prevalence of adult smoking, possibly due to the fact that state-level tobacco control efforts and mass media messages are limited in rural areas. Rural areas possess unique environmental and cultural factors that influence health behaviors. Specifically, in the rural Appalachia regions residents have strong cultural ties with tobacco or carry the sentiment of “fatalism” that affects their outlooks of choosing a smoke-free, healthier lifestyle.

A limitation of using the K6 in this study is that its assessment focuses on the overall severity of psychological distress and does not provide insight into specific types or number of psychiatric illnesses a respondent may have. Although, the K6 is a clinically validated scale and has been shown to be reliable in discriminating between those with and without mental health disorders it is not perfect and may not be collecting the full spectrum of mental illnesses. In addition, the overall number of adults with mental illness may be underrepresented in this study because those with the most severe symptoms may either be homeless or institutionalized and would not be included in a household survey. Another limitation pertaining to symptom measures is that anyone who is successfully being treated for poor mental health will not be captured by the K6. Because of the cross-sectional nature of the 2007 HINTS survey, this study does not strive to describe causal or temporal relationships between smoking and psychological distress.

The Appalachian Regional Commission often categorizes the Appalachia region into sub-regions due to its diversities in populations, economics, cultures, and geography.

The data from the HINTS 2007 Appalachian variable only provided a robust sample size for the entire region. Future modifications to the survey would allow for over-sampling of the various sub-regions and allow for a sub-regional analysis to take into account these diversities. Another concern with the Appalachia variable is that not all of the areas are completely rural. Some areas in the Appalachian region contain urban areas where populations exceed 100,000 such as Pittsburg, Pa, Knoxville, Tennessee, and Chattanooga, Tennessee. In 1997, 2,145,813 people, or 39% of all Appalachians, resided within a metropolitan statistical area boundary. To address this issue, the relationship between smoking and psychological distress was also analyzed using the Rural-Urban Continuum Code (RUCC). The RUCC was collapsed into three categories: metropolitan, urban/suburban, and rural. The results for the smoking variables and SPD did not differ in significance.

The importance of the psychological well-being of our society is being increasingly recognized. This analysis contributes to the need for added focus on efforts of tobacco cessation within those with symptoms of poor mental health. Combining an approach to dealing with stressors along with proven cessation strategies could aid this population. This initiative targeted at individuals with the highest risk of tobacco use could help progress the gradual rate of decline in smoking that we have been seeing in the last 10 years. The goal of the *Healthy People 2020* is to reach a prevalence of  $\leq 12\%$  of the population consuming cigarettes (38). At the rate we are going now, the adult smoking rate in the United States will only reach approximately 17% by the year 2020. With a more targeted approach this goal could be more attainable. To assess if targeted approaches are reaching this population it is necessary to follow the smoking rates of

individuals with SPD at the population-level across a period of time. Interventions that promote permanent smoking cessation also have the power to reduce preventable diseases resulting from smoking such as cancer, heart disease, lung disease, and stroke.

## **Chapter 5**

### **Conclusion**

This study confirmed previous studies that current smoking is associated with increased SPD. We found this relationship not to be significant in the contiguous area of Appalachia, which is a rural region with lower socioeconomic characteristics. Furthermore, the relationships of smoking intensity and quit attempts were not found to be associated with SPD, nor were they modified by living within Appalachia. Although a significant association was not seen in this study sample does not mean that this relationship does not exist. Finally, the outcomes in this analysis should not undermine tobacco use as a major public health concern with tobacco prevention and cessation efforts as an essential factor in community health settings.

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