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A pattern of health insurance policy among smokers in the United States

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A Pattern of health insurance among adult smokers in the United States

This study used the 2021 Behavioral Risk Factor Surveillance System (BRFSS) data to investigate how enrollment in healthcare insurance impact smoke cessation in the US. Bivariate and multivariable logistic regression were used to assess the association. The study found that health insurance to a strong predictor of smoke cessation among adult smokers in the US.

Health Services Research Methods

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BACKGROUND

Cigarette smoking remains a leading cause of death in the United States.[1] It is estimated that 11-30% and 7-23% of deaths among men and women are attributable to tobacco consumption respectively.[2] A study published in 2012 estimates that 60% of mortalities in southern states of the US are related to tobacco use.[2] There are cost implications to tobacco use in the United States. Center for Disease Control (CDC) estimates an approximately $185 billion loss to tobacco use in 2018.[3] These costs are predominantly from hours lost to non-productivity and treatment of people living with smoking-related medical conditions.[3] A study published in 2016 indicates that Heath insurance enrollment in the United States remains an essential component of state and federal public health initiatives for greater access to affordable healthcare. In 2021, more Americans were enrolled in health insurance compared to previous years. Meanwhile, the United States Census Bureau reports show that in 2021, private health insurance schemes continue to enroll more Americans than public health insurance policies at 66% and 35.7% respectively. A 2017 study notes the positive impact of Medicaid expansion on healthcare access and the quality of healthcare services among individuals with lower incomes.[4] There had been previous studies linking health insurance enrollment to smoking cessation attempts, However, only a few of these studies used nationally representative data for analyses. This study aims to examine the pattern of healthcare insurance among adult smokers and the nature of the relationship between having any form of health insurance coverage and smoke cessation among adult population of the US.

METHOD

DATA SOURCE

This study used a 2021 nationally representative Behavioral Risk Factor Surveillance System (BRFSS) dataset obtained from responders to interviews from all 50 States of the United States and the District of Columbia. The BRFSS is health-related survey data collected through phone interviews of adults between the ages of 18 and 64 years.[6] The BRFSS dataset has data regarding respondents' health-related risk behavior, chronic medical conditions, and utilization of preventive measures. The BRFSS used for this study has a total of 167, 079 respondents in various categories of smoking status. Giving the survey nature of the dataset, statistical techniques were used to account for proper weighing.

STUDY DESIGN

This is a cross-sectional study design on a weighted secondary survey dataset.

STUDY POPULATION

This study has adult respondents who are 18 years of age and above who reported "yes" for current smoking status or former smoking status who were included in our analyses. We excluded respondents who reported "never smoked" as their smoking status.

THEORETICAL FRAMEWORK/COVARIATES

We used the Andersen Expanded Behavioral Model of Health Services to develop the conceptual framework for this study. We categorized variables of interest into five5) broad categories namely; Environmental factors considered were the presence of Federal and State laws on Tobacco use and health insurance coverage), Predisposing factors included Age, Race/Ethnicity, Gender, presence or absence of Adverse Childhood Experiences (ACES), and Geographic location), Enabling factors included Household income, Employment status, Marital status, and Educational qualification, Personal need factors included Personality type, Peer pressure, and Reported physical and/or mental health diagnoses. Lastly, we considered health behavioral factors including the presence or absence of alcohol consumption, fruit & vegetable consumption, and daily exercise. Some of the covariates were not added to the model given the limitation of the available dataset. Figure 1 below shows a diagrammatic representation of the conceptual framework for this study using the Anderson model.

CONCEPTUAL FRAMEWORK/VARIABLES

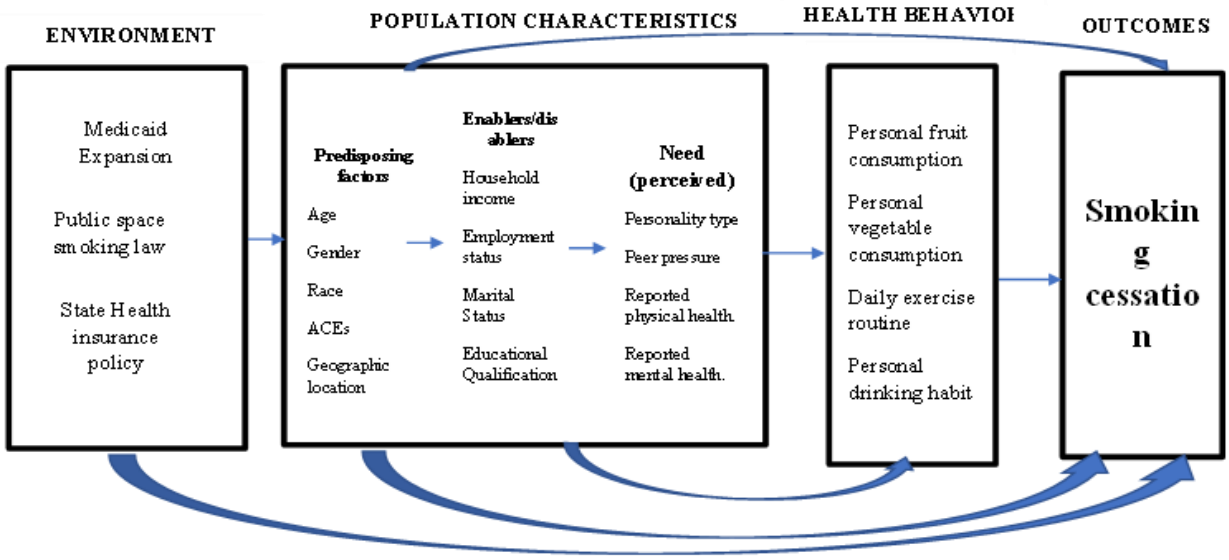


Fig. 1: Anderson's model of the theoretical framework

OUTCOME(S) OF INTEREST

We used the “four-level smoker status” as the main predictor variable. Respondents in smoker status levels “current smoker” and “former smoker” were included for this variable while those in smoker levels “never smoked” and “don’t know, refuse or missing” were excluded. The BRFSS survey asked for the current smoking status of respondents. Adults who reported “current smoking status every day” and current smoking status someday” were grouped into “current smoker” while those who reported “former smoker” were used as the control group.

EXPOSURE(S) OF INTEREST

The main exposure variable of interest used for this study was “Access to insurance” irrespective of the type of health insurance. The BRFSS survey question asked if respondents have some form of health insurance.

Adults who reported having any health insurance within the last year were considered as meeting up with inclusion criteria for the outcome variable while those who reported “No” were used as the controlled category for this variable. Respondents who refused to respond to this question or reported “don’t know” were excluded from these analyses. This study used “health insurance”, “healthcare plan” and “healthcare enrollment” interchangeably.

Other covariates (predictor variables) included were based on the Andersen Behavioral Model shown in Figure 1. These were age, gender, level of education, race/ethnicity, household income, and employment status.

ANALYSIS APPROACH/DATA ANALYSIS

A descriptive statistic was conducted with percentages and frequencies to describe the socio-demographic features of the study population. We used the Chi-square test, Cross-tabulation, and Unadjusted and Adjusted logistic regression to investigate the association between having any form of health insurance and current smoking status. We used unadjusted and adjusted odd ratios (OR) at a 95% Confidence Interval (CI) and a p-value of 0.05 to assess the statistical significance of the association.

We used IBM SPSS version 24 for the descriptive, bivariate analyses, multivariable logistic regression. Model fitness was checked using the Hosmer-Lemeshow test.

DEFINITION OF TERMS

Smoking involves drawing smoke from burning tobacco and/or its derivative products into the lungs through the mouth. Stopping smoking can be described as involving an intent to smoke no more cigarettes from a specific point in time (a ‘quit attempt’) followed by self-conscious resistance to smoke resulting in

a period of abstinence.[6] "Long-term abstinence" refers to abstinence for a minimum of 6 months but more often involves abstinence for at least 12 months.[7] The BRFSS data used for this analysis were collected at one-year intervals thereby making the use of the smoking status a valid assumption for smoke cessation or "stopping smoking". Health Insurance involves the signing of an agreement that requires a health insurer to pay some or all the healthcare costs in exchange for a premium from an enrollee.[8]

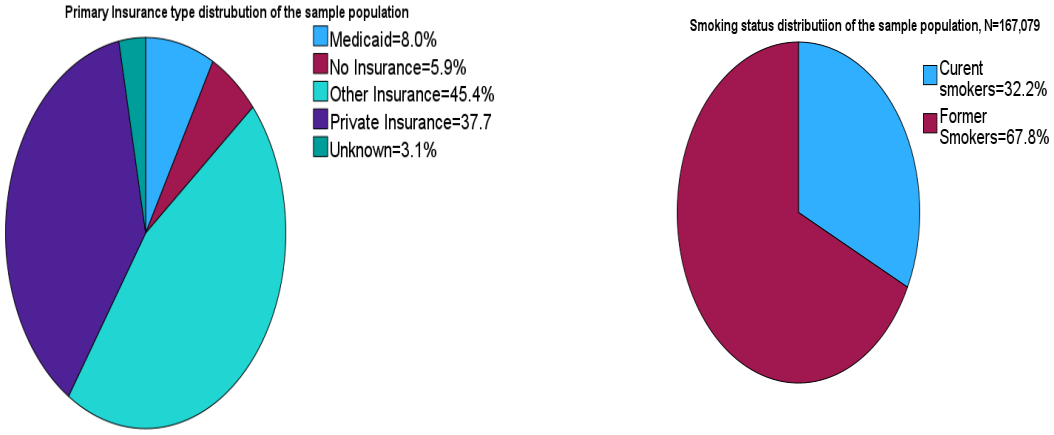
ETHICAL CONSIDERATIONS

The BRFSS 2021 used for this study is a publicly available dataset with no individual identifiers of the participants. This dataset does not require ethical clearance to access and use for research studies. The Institutional Review Board (IRB) of East Tennessee State University will be consulted for approval if the publication of this work is considered in the nearest future.

RESULTS

SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE SAMPLE POPULATION

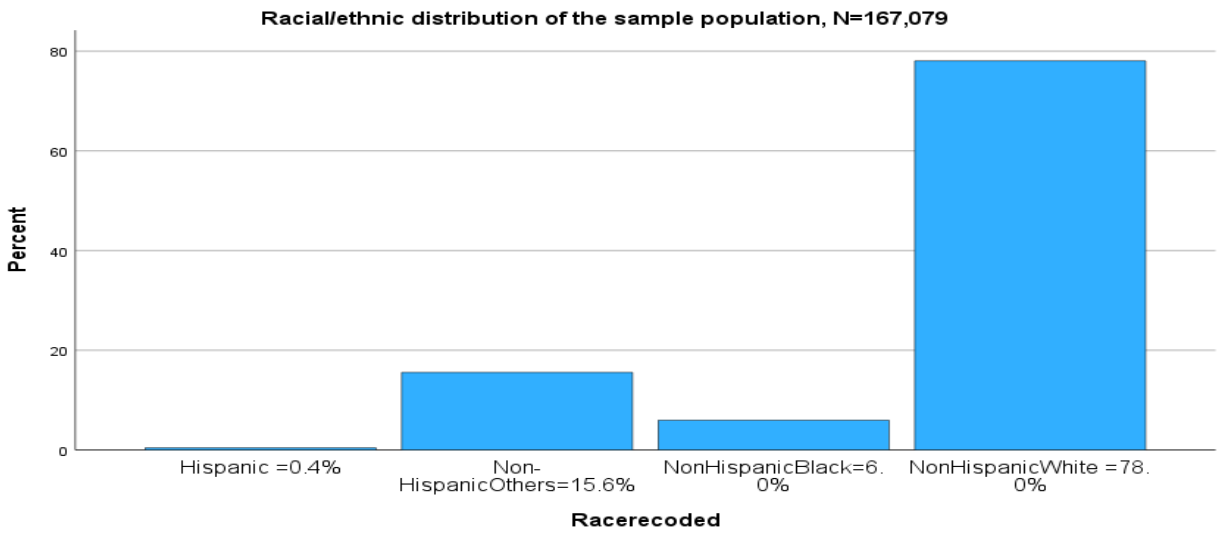
The BRFSS national survey data had a total of 167,079 current or former adult smoking population in 2021. Of this number, 53,832 (32.2%) respondents were "current smokers" while 113,247 (67.8%) respondents were "former smokers". Figure 2 shows the smoking and health insurance status distribution of the sample population.



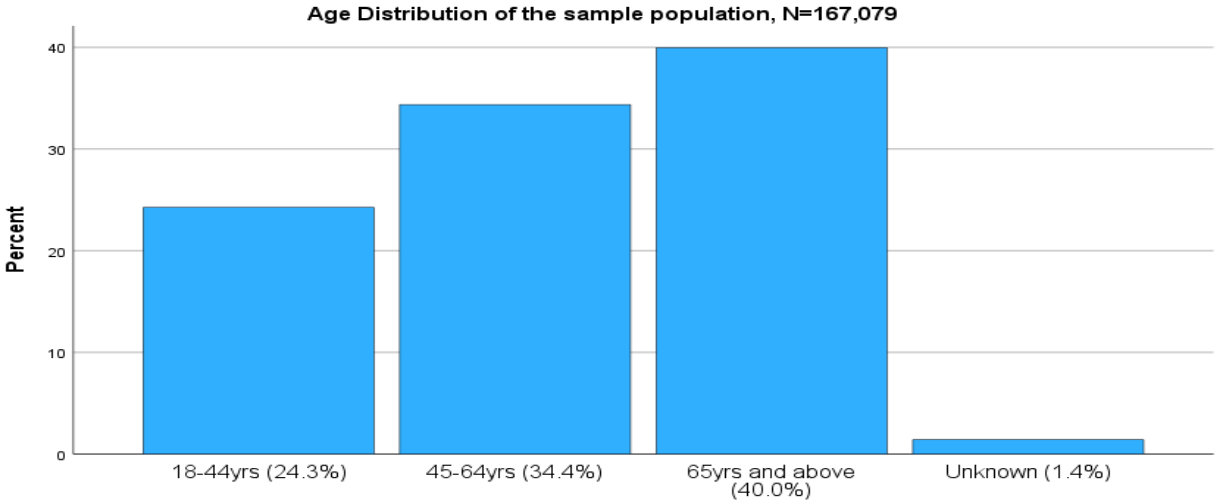
As shown in Figure 2 above. Among those included in the sample population studies, 152, 088 respondents had some form of health insurance. Respondents were enrolled predominantly in

Private and Other types of health insurance. The sample population shows that 62,915 (37.7%) respondents were enrolled in private insurance, 75, 866 (45.5 %) respondents were enrolled in other forms of insurance coverage, 133,007 (8%) respondents were covered under the expanded Medicaid insurance while 9,865 (5.9%) respondents had no form of insurance.The racial/ethnic distribution of the sampled data shows that 130,397 (78.0%) of respondents are non-Hispanic Whites, 9,963 (6.0%) are non-Hispanic Black, 26,002 (15.6%) are non-Hispanic others and 717 (0.4%) are of Hispanic racial/ethnic origin. This is shown in Figure 3 below.

Figure 3: shows the racial/ethnic distribution of the sample population.

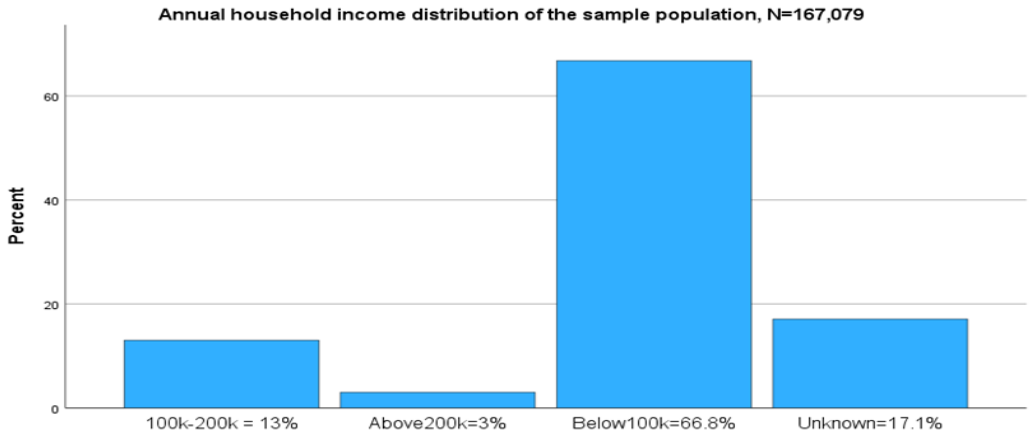


In terms of age distribution, 40524 (24.3%) respondents were between the age of 18 and 44 years, 57426 (34.4%) respondents were aged between 45 and 64 years and 6672 (40.0%)



respondents were 65 years and above. The sample population has 48.7% male respondent and51.3% female respondents. Marital status distribution is 48.4% married and 51.6% unmarried. Figure 4 shows the age distribution of the sample population.

A total number of 111,615 (66.8%) of respondents earn below $100k per year, 21,794 (13.0%) earn between $100k-$200k per year, 21, 794 (3.0%) Earn $200k and above while 28.601 (17.1%) respondents are in the Unknown income category. This is shown in Figure 5 below.



The educational qualification of respondents varied from "No Diploma" to "Graduated College/Technical School". Figure 6 below shows the educational level distribution of adult smokers in the US in 2021.

Figure 6 shows the educational level distribution of the sample population.

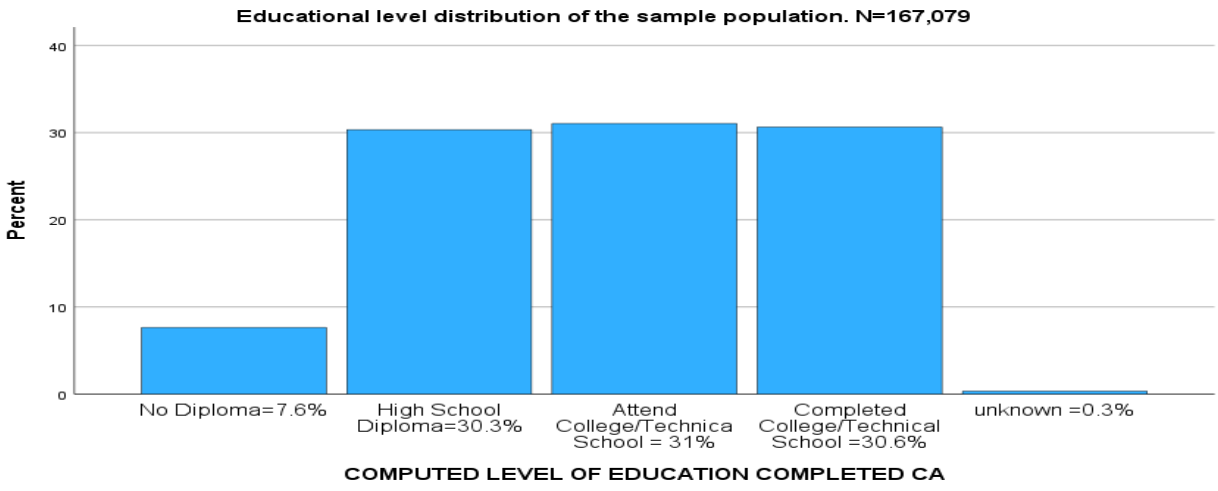
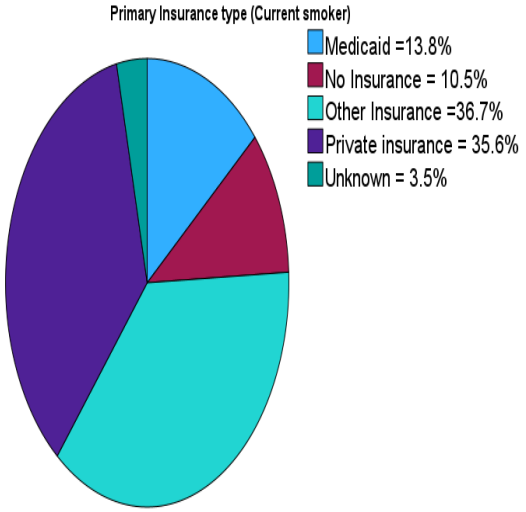
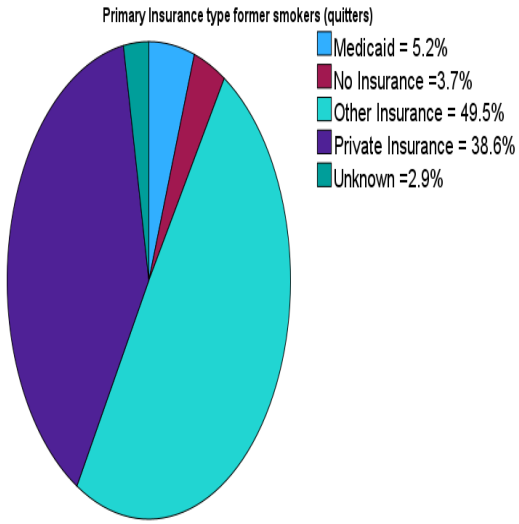


Figure 7 below compares the primary insurance type of current smokers and former smokers (quitters). A higher proportion of respondents who are current smokers (13.8%) depend on Medicaid insurance for coverage while only 5.2% of former smokers (quitters) are enrolled in Medicaid insurance. Private insurance is the highest coverage of all respondents irrespective of their smoking status.





BIVARIATE ANALYSIS OF SMOKING STATUS BY HEALTH INSURANCE

A higher proportion of adults who had health insurance reported a former smoking status compared to those with no health insurance (69.5% vs. 42.8%; p=0.001). A higher proportion of respondents with married marital status reported former smoking status compared to respondents with unmarried marital status (76.0% vs 60.1%, p=0.001).

Other variables with a statistically significant relationship with former smoking status are Age group, Gender, Household income, educational level completed, and marital status. The result of the bivariate analysis is shown in Table 1 below.

Table 1 shows the bivariate analysis of the smoking status by health insurance and other variables.

	Former smoker		Unadjusted OR	**P-value**
	No	**Yes**		
A. Predisposing Factors				
Health Insurance				
No health insurance	7,514 (50.1%)	46,318 (30.5%)	Reference	
Have health insurance	7,477 (49.9%)	105,770 (69.5%)	2.30 (2.22-2.40)	0.001
Age (in years)				
18-44	18,409 (45.4%)	221,115 (54.6%)	0.44 (0.40-0.48)	0.001
45-64	22,622 (39.4%)	34,804 (60.6%)	0.56 (0.51-0.62)	0.001
65 and above	12,170 (18.2%)	54.602 (81.8%)	2.28 (2.07-2.50)	0.001
Gender				
Male	26,541(31.0%)	59,129 (69.0%)	1.12 (1.10-1.14)	0.001
Female	27,291(33.5%)	54,118 (66.5%)	Reference	
Race/Ethnicity				
Non-Hispanic White	38,913 (28.8%)	91,484 (70.2%)	2.00 (1.73-2.32)	0.001
Non-Hispanic Black	4.459 (44.8%)	5,504 (55.2%)	1.05 (0.90-1.23)	0.509
Non-Hispanic Others	10,130 (39.0%)	15,872 (61.0%)	1.34 (1.15-1.55)	0.001
Hispanic	330 (46.0%)	387 (54.0%)	Reference	
Education				
No Diploma	6,319 (49.5%)	6,454 (50.5%)	0.49 (0.41-0.59)	0.001
High School Diploma	20,059 (39.6%)	30,631(60.4%)	0.74 (0.62-0.88)	0.001
Attended College/Tech School	17,231 (33.2%)	34,633(66.8%)	0.97 (0.81-1.16)	0.717
Graduated from College/Technical School	10,042 (19.6%)	41,153 (80.4)	1.97 (1.67-2.35)	0.001
B. Enabling Factors				
Income ($)				
100k-200k	4,525 (20.8%)	17,269 (79.2%)	1.61 (1.55-1.68)	
Above 200k	771 (15.2%)	4,298 (84.8%)	2.36 (2.18-2.56)	0.001
Below 100k	40,034(35.9%)	71,581(64.1%)	0.76(0.74-0.78)	0.001
Unknown	8,502(29.7%)	20,099 (70.3%)	Reference	
Marital status				
Married	19,443(24.0%)	61427 (76.0%)	2.10 (2.05-2.14)	
Unmarried	34,389(39.9%)	51,820 (60.1%)	Reference	0.001

MULTIVARIATE ANALYSIS

We conducted an adjusted multivariable logistic regression with “smoking status” as the outcome variable and “have any form of health insurance” as the main predictor variable. We controlled other covariates including age, gender, household income, level of education completed, and marital status. The result of our analysis shows that adult Americans with some form of health insurance have 1.4x odds of smoking cessation compared to their counterparts without any form of health insurance (aOR 1.42, 95% CI=1.37-1.47). This contrasts with the unadjusted logistic regression which found that the odds of smoke cessation

were 2x likely for adult smokers with some form of health insurance compared to those without any form of health insurance (OR 2.3, 95% CI=2.22-2.40).

The result of the adjusted logistic analysis found that adult smokers with married marital status were found to have 1.8x higher odds of smoke cessation compared to their unmarried counterparts (aOR 1.75, 95% CI = 1.71-1.79). Adult smokers 65 years and above have higher odds of smoke cessation compared to those below age 65 years (aOR 1.61, 95% CI=1.46-1.77). There were 1.8x likely odds of smoke cessation among adult respondents who earn $200k and above compared to those who earn below $100k (aOR 1.79, 95% CI = 1.64-1.96). There are other predictive variables with statistically significant associations with smoke cessation in the adjusted logistic analysis. These include gender, racial/ethnic group and completed level of education. The adjusted logistic regression results are shown in Table 2 below.

Table 2 shows the results of adjusted logistic regression.

	Former smoker		Adjusted OR	**P-value**
	No	**Yes**		
1. Predisposing Factors				
Health Insurance				
No health insurance	7,514 (50.1%)	46,318 (30.5%)	Reference	
Have health insurance	7,477 (49.9%)	105,770 (69.5%)	1.42 (1.37-1.47)	0.001
Age (in years)				
18-44	18,409 (45.4%)	221,115 (54.6%)	0.46 (0.42-0.51)	0.001
45-64	22,622 (39.4%)	34,804 (60.6%)	0.55 (0.50-0.60)	0.001
65 and above	12,170 (18.2%)	54.602 (81.8%)	1.61 (1.46-1.77)	0.001
Gender				
Male	26,541(31.0%)	59,129 (69.0%)	1.14 (1.11-1.16)	0.001
Female	27,291(33.5%)	54,118 (66.5%)	Reference	
Race/Ethnicity				
Non-Hispanic White	38,913 (28.8%)	91,484 (70.2%)	1.37(1.17-1.60)	0.001
Non-Hispanic Black	4.459 (44.8%)	5,504 (55.2%)	0.90 (0.76-1.05)	0.187
Non-Hispanic Others	10,130 (39.0%)	15,872 (61.0%)	1.25 (1.07-1.47)	0.050
Hispanic	330 (46.0%)	387 (54.0%)	Reference	
Education				
No Diploma	6,319 (49.5%)	6,454 (50.5%)	0.48 (0.39-0.58)	0.001
High School Diploma	20,059 (39.6%)	30,631(60.4%)	0.65 (0.54-0.78)	0.001
Attended College/Tech School	17,231 (33.2%)	34,633(66.8%)	0.84 (0.69-1.01)	0.062
Graduated College/Technical School	10,042 (19.6%)	41,153 (80.4)	1.56 (1.30-1.89)	0.001
2. Enabling Factors				
Income ($)				
100k-200k	4,525 (20.8%)	17,269 (79.2%)	1.37 (1.31-1.44)	
Above 200k	771 (15.2%)	4,298 (84.8%)	1.79 (1.64-1.96)	0.001
Below 100k	40,034(35.9%)	71,581(64.1%)	0.84 (0.81-0.86)	0.001
Unknown	8,502(29.7%)	20,099 (70.3%)	Reference	
Marital status				
Married	19,443(24.0%)	61427 (76.0%)	1.75 (1.71-1.79)	
Unmarried	34,389(39.9%)	51,820 (60.1%)	Reference	0.001

DISCUSSION AND CONCLUSION

The findings from this research work demonstrates the association between having any form of health insurance and smoke cessation among adults Americans. There are other important variables that have significant impact on smoke cessation as demonstrated by the analyses. These are age, gender, household income and marital status and educational levels. These findings from this study consolidate previous findings associating Medicaid expansion programs with increased smoking cessation attempts in the United States. The Medicaid Expansion program is a critical component of larger efforts to reduce adult smoking rates and their associated complications.[9] Government efforts at reducing the prevalence of tobacco use through expanded Medicaid insurance must be complemented by collaborative strides target at other enabling factors. Americans must be encouraged to remain in loving marital unions and pursue higher educational learnings and opportunities. Community partnership and collaboration must involve local, state, and federal government. Private sector involvement through health insurance coverage for employees must be encouraged and intensified.

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