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A growing geographic disparity: Rural and urban cigarette smoking trends in the United States

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Abstract

Rural areas of the United States have a higher smoking prevalence than urban areas. However, no recent studies have rigorously examined potential changes in this disparity over time or whether the disparity can be explained by demographic or psychosocial characteristics associated with smoking. The present study used yearly cross sectional data from the National Survey on Drug Use and Health from 2007 through 2014 to examine cigarette smoking trends in rural versus urban areas of the United States. The analytic sample included 303,311 respondents. Two regression models were built to examine (a) unadjusted rural and urban trends in prevalence of current smoking and (b) whether differences remained after adjusting for demographic and psychosocial characteristics. Results of the unadjusted model showed disparate and diverging cigarette use

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Conflict of Interest

The authors declare there is no conflict of interest.

trends during the 8-year time period. The adjusted model also showed diverging trends, initially with no or small differences that became more pronounced across the 8-year period. We conclude that differences reported in earlier studies may be explained by differences in rural versus urban demographic and psychosocial risk factors, while more recent and growing disparities appear to be related to other factors. These emergent differences may be attributable to policy-level tobacco control and regulatory factors that disproportionately benefit urban areas such as enforcement of regulations around the sale and marketing of tobacco products and treatment availability. Strong federal policies and targeted or tailored interventions may be important to expanding tobacco control and regulatory benefits to vulnerable populations including rural Americans.

Keywords

Tobacco Products; Rural Health; Health Status Disparities

1 INTRODUCTION

Rural America is commonly characterized by high poverty rates, low education levels, and low access to health information and specialized health care relative to urban (i.e., non-rural) America (Hart et al., 2005; National Center for Health Statistics, 2012; Rural Health Reform Policy Research Center, 2014; Wagenfeld, 2003). It is therefore perhaps not too surprising that rural residents often exhibit higher prevalence of health-related risk behaviors, and higher mortality rates than their urban counterparts (Mansfield et al., 1999; National Center for Health Statistics, 2012; Pettit and Nienhaus, 2010; Rural Health Reform Policy Research Center, 2014). In particular, cigarette smoking prevalence is higher among rural versus urban residents (American Lung Association, 2012; Doescher et al., 2006; Roberts et al., 2016; Rural Health Reform Policy Research Center, 2014), a pattern that has been observed for at least the last two decades (Eberhardt et al., 2001), and warrants ongoing monitoring. The present study was conducted in response to a dearth in recent research monitoring and comparing time trends in cigarette smoking prevalence between urban and rural populations in the United States.

Volume 45 of the Public Health Services Monograph series (Haenszel et al., 1956) offers a historical comparison of rural versus urban tobacco use in the United States in the mid-1950s stratified by gender (because of the large gender differences in tobacco use at the time). The report indicates that cigarette smoking prevalence was very high among men (50%), and that rural farm male cigarette use (41%) was clearly lower than urban male use (52%). Overall female smoking prevalence was lower (24%) than male use, but the rural versus urban contrast was starker (rural farm: 10%; urban: 26%), again with urban use dominating. Since the first U.S. Surgeon General's report on the health consequences of smoking was published in 1964 linking smoking to serious health conditions, America has seen a large decline in smoking among the general population, much of which has been attributed to tobacco control efforts (Holford et al., 2014; U.S. Department of Health and Human Services, 2014; Warner et al., 2014). However, a closer look reveals that the many vulnerable populations—such as those of a lower socioeconomic status and those suffering from mental health conditions—have not experienced equitable declines in prevalence of

cigarette smoking (Cook B et al., 2014; Stanton et al., 2016). Rural populations may be among the populations being left behind, although typically they are not mentioned along with other groups.

To our knowledge, only one report, published a decade ago by Doescher and colleagues (2006), has investigated U.S. trends in rural versus urban tobacco use. Using data from the Behavior Risk Factor Surveillance System (BRFSS), their findings indicated that rural smoking prevalence was significantly higher than urban prevalence, even after controlling for age, sex, race, educational attainment, income, and employment status. Thus, it is not simply differences in the risk profile, with respect to the included covariates at least, that explain the disparity in tobacco use. They also found that rural areas showed either no decline or an increase in cigarette use between 1994 and 2001, while urban use had declined. These authors concluded with a call to monitor this disparity in cigarette use.

While there is a lack of recent studies formally comparing rural versus urban trends in cigarette prevalence, the literature does offer some point estimates of prevalence in rural and urban populations during more recent years. For example, visual comparison of results presented in the 2001 Urban and Rural Health Chartbooks and its 2014 update (Figure 7 in the 2001 report and Figure 7(a) in the 2014 report) suggests that the trend observed by Droscher and colleagues (2006) continues (Eberhardt et al., 2001; Rural Health Reform Policy Research Center, 2014). However, comparison of the point estimates in the chartbooks does not give a clear picture of the trends across time, and does not evaluate the statistical significance of differences or control for sociodemographic characteristics that may explain the differences.

Given the limited set of covariates used by Droscher and colleagues (2006), and the lack of controls in a visual comparison of unadjusted (except for age) plots from the chartbooks, it remains unclear whether there is a unique contribution from rural residence on cigarette use after controlling for a comprehensive set of potentially confounding covariates including outdoor labor (Matz et al., 2015), marital status (Lindström, 2010), substance abuse and mental health variables (Substance Abuse and Mental Health Services Administration, 2013), health insurance (Centers for Disease Control and Prevention, 2015), and smokeless tobacco use (Roberts et al., 2016), all of which are related to tobacco use, could vary between urban and rural populations, and should be controlled in a comparative rural versus urban analysis in addition to variables included in similar previous work (Droscher, 2006).

The U.S. Center for Tobacco Products has identified geographically based vulnerability as a research priority (FDA Center for Tobacco Products, 2016), thus underscoring the importance of understanding how proposed regulations impact—or fail to impact—vulnerable populations such as those living in isolated rural areas. The purpose of our study was to update and expand the literature on rural tobacco use disparities by examining and modeling rural versus urban trends in current cigarette smoking using recent data. To do so, we first examined covariate-unadjusted prevalence trends for current smoking among rural compared with urban adults. We then used a multivariable approach to model current smoking trends controlling for numerous confounding factors to determine the extent to

which a difference in smoking prevalence or trends could be uniquely attributed to rural residence in the observed time period.

2 METHODS

2.1 Data Source

Data were obtained from the public use data files of the Nations Survey of Drug Use and Health (NSDUH)—a nationally representative cross-sectional survey of the civilian, non-institutionalized U.S. population aged 12 years and older. The survey has been conducted intermittently since 1971 and has been conducted annually since 1990. To keep current, measures in the NSDUH occasionally change. To ensure consistency of measures across time and with recent work examining trends of tobacco use in vulnerable populations (Stanton et al., 2016), we limited our analysis to adults (≥ 18 years) who responded during the years 2007 through 2014. We used the provided participant weights in all analyses, unless stated otherwise, to ensure that the results were representative of the U.S. population by correcting for selection probabilities, non-response bias, and post-stratification (Center for Behavioral Health Statistics and Quality, 2015). References to “adjusted” or “unadjusted” models refer to covariate adjustment.

2.2 Measures

The dependent variable was *current smoking* defined as reported consumption of at least one cigarette in the past 30-days *and* at least 100 cigarettes smoked lifetime. The key independent variables were *rural residence* and *time* (i.e., survey year). *Rural residence* was determined using Rural/Urban Continuum Codes based on the 2000 Census data and 2013 statistical area classifications provided by the Office of Management and Budget (OMB); classifications were at the county level. Respondents were classified as rural if they did not reside in a metropolitan or micropolitan area. A metropolitan area is defined as core counties that are part of an urbanized area with a population size of 50,000 or more, or an outlying county with 25% or more of its labor force tied to a core counties by commuting flows. A micropolitan area is similarly defined as core counties that are part of urban clusters with a population size of 10,000 to 49,999 or an outlying county with 25% or more of its labor force tied to the core counties by commuting flows (Cromartie and Parker, 2016). *Time* was coded as an integer valued variable that ranged from zero (year 2007) to seven (year 2014), which supported interpretability by allowing the intercept from our statistical model to represent smoking odds in the year 2007, and the *rural residence* effect to represent the odds adjustment for rural populations in 2007.

The covariate-adjusted model additionally included covariates that are known risk factors for smoking. Similar to previous work on tobacco use trends among vulnerable populations (Stanton et al., 2016), covariates included the polytomous categorical variables *age*, *race*, *education*, and *income*, a dichotomous *gender* variable (*male*=1, *female*=0), and eight additional dichotomous conditions, *unemployed*, *outdoor occupation*, *married*, *anxiety*, *depression*, *health insurance* (any type), *smokeless tobacco use*, and *substance abuse* (all coded 1 = ‘yes’ and 0 = ‘no’). All covariate measures except *outdoor occupation* and *health insurance* were operationalized identically to those described in the recent work of Stanton

and colleagues (2016). *Outdoor occupation* was coded as a one if the participant reported working in farming, fishing, mining, construction, or extraction, and coded zero otherwise. *Health insurance* was coded as a one if the participant reported any health insurance coverage including private, Medicare, Medicaid/CHIPCOV, Champus, ChampVA, VA, Military, or other health insurance, and zero otherwise. The levels of polytomous covariates and descriptive statistics of all covariates are provided in Table 1.

2.3 Statistical Analyses

Analyses consisted of calculating and plotting unadjusted (covariate unadjusted) current cigarette smoking prevalence estimates by rural status and survey year, and using logistic regression to model current smoking at the individual level with and without controls for confounding factors. The key independent variables were rural status, survey year, and the rural-by-year interaction, the latter of which allowed the trends to vary depending on rurality. A covariate-unadjusted model included only the key independent variables (including the interaction), and a covariate-adjusted model additionally included all control covariates. We plotted covariate-unadjusted prevalence estimates for all years and superimposed prediction lines and 95% confidence bands from the covariate-unadjusted model to support visualization of the prevalence trends. We also plotted predictions and confidence bands from the covariate-adjusted model in a separate adjusted prevalence plot to clarify the unique contribution to prevalence and prevalence trends from rural status. We specified predictions for the adjusted prevalence plot such that urban and rural trend predictions were made assuming equivalent population characteristics with respect to included control covariates. Specifically, we used the weight-adjusted mode (see the “Adjusted %” column of the overall population in Table 1) of categorical variables as observed in the full sample except for gender, for which we assumed equal proportions of males and females. Thus, with respect to our model and the covariates included in it, the only difference between the two lines in the adjusted prevalence plot was rural residence status. We used the package “survey” (Lumley, 2004) within the R statistical computing environment (R Core Team, 2015) in order to incorporate observation weights into the statistical analyses and to generate predictions and confidence intervals from the model.

3 RESULTS

3.1 Descriptive Results

The analytic sample included 303,311 respondents who provided responses for all necessary survey items. Of the total sample, 238,858 (78.8% of the sample) respondents represented the urban population and 64,453 (21.2%) represented the rural population. Among the overall sample, 79,974 (26.4%) were classified as current cigarette smokers. Of these, 20,297 (25.4% of all smokers in the sample) resided in rural areas and the remaining 59,677 (74.6% of all smokers) lived in urban areas. Table 1 shows a characteristic profile of the overall sample as well as urban and rural subsets of the sample. It includes percentages adjusted to reflect national characteristic distributions (unlike the percentages in the parenthetical text above that describe the sample only). Comparisons of the weighted descriptive results show that overall in the years 2007-2014, rural adults had lower levels of education, lower incomes, less racial diversity, were older, were more likely to have outdoor

occupations, and were more likely to smoke cigarettes and use smokeless tobacco than urban adults. Differences in the distribution of these categorical variables were tested individually using a chi-square test for a difference between urban and rural populations, and each was statistically significant (all p s<0.001).

3.2 Multivariable Analysis Results

Table 2 contains the coefficients estimated for the covariate-unadjusted and covariate-adjusted multivariable logistic regression time trend models. The unadjusted model showed a 30% increased odds of current smoking for rural residents (OR=1.295, 95% CI (1.218, 1.378), p <0.001) at time zero (year 2007) compared with urban residents (the referent category). The *Rural X Time* interaction was statistically significant (OR=1.021, (1.007, 1.036), p =0.005), and indicated that the time slope for rural residents differed from that of their urban counterparts. The time coefficient suggested a 3% decrease in odds of smoking for each year following 2007 (OR=0.970, (0.963, 0.977), p <0.001) among the urban residents (the reference category in these analyses), while the positive parameter estimate for the interaction suggested a less negative time slope for smoking among rural residents. We used a post-hoc interaction probe (Holmbeck, 2002) and found that the rural trend was not statistically significant (OR=0.991, (0.979, 1.002), p =.119).

The covariate-unadjusted model results are visualized in Figure 1 as best fit lines drawn from the model with 95% confidence interval bands. Covariate-unadjusted yearly prevalence estimates are also plotted as points. The plot illustrates the difference between the urban and rural trend lines: a clear and substantial decline in prevalence of current smoking among urban populations, a slower (and not statistically significant) decline for rural populations, and a substantial gap between the lines with rural use always highest.

The results of the covariate-adjusted model that included all covariates were interpreted similarly, but with the important difference that they were adjusted for characteristic differences between urban and rural respondents that might explain the differences in prevalence and trends observed in the covariate-unadjusted model. Indeed, the simple effect of *rural residence* in the adjusted model was no longer statistically significant once we adjusted for covariates (OR=1.022, (0.963, 1.085), p =0.480), indicating that in 2007 rural residence did not appear to uniquely contribute to the difference in smoking prevalence between urban and rural populations. However, the *Rural X Time* interaction remained *positive* and significant (OR=1.023, (1.008, 1.038), p =0.004). The simple effect of *time* remained significant indicating a reduced odds of smoking each year among urban residents by a little over 2% (OR=0.977, (0.969, 0.985), p <0.001) after 2007. These results show that the difference in *trends* between rural and urban areas remained after controlling for all of the covariates in our model, and unlike the decreasing urban slope, the rural slope—again determined using a post-hoc interaction probe (Holmbeck, 2002)—was approximately zero (OR=1.000, (0.988, 1.013), p =.985).

Figure 2 shows an adjusted prevalence plot visualizing the rural versus urban trends after adjusting them to represent otherwise equivalent populations with respect to all covariates included in the model. The two trend lines began at nearly the same location on the y-axis, which is consistent with the non-significance of the *rural residence* simple effect in 2007 in

the covariate-adjusted model (i.e., the effect of *rural residence* when *time* and all other covariates equal zero). The trends then diverged as *time* progressed with urban prevalence declining and rural prevalence remaining constant. To verify that urban and rural prevalence was indeed statistically different in 2014, we used a post-hoc interaction probe to compare urban and rural prevalence in 2014 (Holmbeck, 2002). The 2014 covariate-adjusted odds of smoking in rural areas was higher than that in urban areas, and the difference was statistically significant (OR=1.189, (1.112, 1.272), $p<0.001$). Given the controls included in the model, this suggests that rural residence, as defined in our model, contributed uniquely to smoking prevalence differences in 2014, which was an increase from no unique contribution in 2007.

4 DISCUSSION

The overarching aim of the present study was to update the literature characterizing the U.S. rural versus urban cigarette prevalences and trends using recent (2007—2014). The results indicate that the trend in cigarette use is declining more quickly among urban populations than rural populations, even after controlling for numerous risk factors for smoking (e.g., psychosocial and demographic characteristics).

This study is consistent with at least two decades of previous work demonstrating that rural populations have higher rates of cigarette use than urban populations in the U.S. (Doescher et al., 2006; Eberhardt et al., 2001). However, the results of our covariate-adjusted model suggest that as recently as 2007 the difference between rural and urban smoking prevalence was entirely explained by differences in demographic and psychosocial risk factors. By 2014, however, a clear and unexplained difference had emerged.

A possible explanation for the emerging difference detected by our study is that tobacco control and regulatory efforts may not be reaching isolated rural populations with the same scope or intensity as that experienced by urban populations. Indeed, York and colleagues demonstrated a positive relationship between county population density—a foundation of some rural classification schemes—and strength of tobacco control (York et al., 2010), a measure that included tobacco control resources, the infrastructure for tobacco control implementation, and media and policy advocacy (National Cancer Institute, 2006; Stillman et al., 2003). Supporting this view, Wewers and colleagues (Wewers et al., 2003) found that rural residents are less prepared to make a quit attempt than their urban counterparts, a pattern consistent with weaker tobacco control and higher prevalence in rural areas. Notably, our study finds that a detectable difference between rural and urban smoking trends—unaccounted for by common demographics and psychosocial factors—began to emerge within the 2007 to 2014 time period, the beginning of which marked the time point when clean indoor air policies were becoming prominent in the United States. This is further suggestive of the importance of policy for explaining rural disparities in tobacco use; uniform federal policies may be important to expanding effective tobacco control and regulatory efforts into areas that lack the resources or political will to implement and enforce local policies that decrease initiation and increase cessation.

Aside from tobacco control and regulatory policy, there are other important factors to consider. A diminished tobacco control impact in rural areas could also be a function of poor health communication (Balamurugan et al., 2007; Kefalides, 1999), low access to health care (Rural Health Reform Policy Research Center, 2014), and a low quality of health care (Agency for Healthcare Research and Quality, 2014). Our model controls for health insurance coverage of respondents, but this accounts for only one aspect of the rural disparity in health care. Moreover, some rural areas of the country have historically depended on the economic benefits of the tobacco crop, and may remain positive in their view of tobacco (Meyer et al., 2008). Due to geographic isolation, basic needs such as high quality and healthy foods can also be more difficult to obtain. Rural areas can therefore have a depriving characteristic (Marmot and Wilkinson, 2005), which may lead inhabitants to seek or remain addicted to alternative sources of reward or reward enhancement such as nicotine delivery devices like cigarettes (Leventhal, 2016).

The results of this study also suggest the importance of viewing and treating rural residents as a vulnerable population deserving of special attention when considering effective and equitable tobacco control, regulation, and other health related policy. As smoking behavior declines in the U.S., it is becoming a decreasingly accepted activity. This raises serious concern over stigmatization of groups that are not decreasing their cigarette use as quickly, such as low-socioeconomic status groups (Hiscock et al., 2012), and as the current study points out, those living in rural areas of the country. Stigmatization leads to myriad secondary deficits that act to exacerbate health and social disparities (Bell et al., 2010), and can further reduce the likelihood of quitting and fail to inhibit initiation, thus feeding back into the original problem. Tobacco control and regulatory policy must account for these unintended consequences or we may simply be trading a reduction in average tobacco use for additional future causes of population health disparities (Hatzenbuehler et al., 2013) and the costs associated with them (LaVeist et al., 2011).

Some important limitations of this study are worth discussion. The public use NSDUH data files do not include region, division, state, or substate geographic identifiers, which precluded the inclusion of state or local policy controls in our model. Clean indoor air, excise taxes, and tobacco control funding are examples that could bear directly on cigarette use or indirectly through normative or health risk beliefs about cigarette use. Our study cannot delineate the extent to which policy drives our findings versus some other unmeasured factors. However, given the fairly exhaustive inclusion of covariates in our adjusted model, historical, cultural, and policy-related explanations seem likely.

Another limitation is that the NSDUH public use files only have one useful measure for rural classification of geographic areas. Numerous measures exist, each uses a different set of criteria, and some offer finer gradations for defining areas by their rurality or urbanicity. Variations in the measures can lead to variation in results and implications for intervening policies (Hart et al., 2005). It is therefore important to carefully consider which measure is used, and for large survey designers to offer several options to researchers interested in rural and urban disparities.

5. CONCLUSION

Rural living appears to be an important risk factor for cigarette smoking that is not accounted for by common demographic and psychosocial characteristics associated with cigarette smoking status. Future work needs to determine whether the unique contribution of rural residence to prevalence trends that we have identified can be explained by policy factors such as the strength of tobacco control (York et al., 2010). Such a result would further evidence that rural populations constitute a vulnerable group that has been left out of the benefits produced by the current policy landscape. The present results emphasize the importance of strong, uniform, and consistently enforced tobacco control and regulatory policy. In conjunction with strong regulation, appropriate support services to help tobacco users quit will also be crucial to expanding smoking declines into vulnerable groups, and these approaches must be tailored to address unique barriers characteristic of vulnerable populations (e.g., see Wewers et al., 2016). Beyond cigarettes, it is also important to consider prevalence trends of *other* types of tobacco and nicotine delivery products and tobacco related variables such as risk beliefs and tobacco control implementation and advocacy work. Advancements in these areas as well as in appropriate definitions of rurality will help draw a clearer picture of the conditions leading to and maintaining disparities in health generally, and tobacco use in particular across the continuum of rurality in America.

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Highlights

- A comparison of cigarette use trends in US rural versus urban residents (2007-2014)
- A robust set of covariates does not fully explain higher rural use
- Declines in adjusted urban prevalence are not observed among rural populations
- Policy and policy enforcement differences are one likely remaining explanation

Figure 1.

Rural versus urban current cigarette smoking prevalence by year with best-fit trendlines (not covariate-adjusted) and 95% confidence bands. Estimates are weight-adjusted to reflect the U.S. population during the years 2007-2014.

Figure 2.

Rural versus urban cigarette smoking prevalence trends and 95% confidence bands adjusted to a common characteristic profile, visualizing the unique contribution of rural residence across time given our adjusted model. Estimates are also weight-adjusted to reflect the U.S. population across the 2007–2014 period.

Table 1

Descriptive statistics of the combined 2007–2014 sample, including percentages weighted to reflect the U.S. population.

Characteristic	Urban		Rural		Overall	
	Sample N	Adjusted %	Sample N	Adjusted %	Sample N	Adjusted %
Age						
65+	14,065	16.8%	4,984	20.7%	19,049	17.4%
50–64	23,269	24.7%	7,395	27.6%	30,664	25.2%
35–49	51,364	27.4%	13,686	25.2%	65,050	27.0%
30–34	19,899	8.7%	4,882	7.3%	24,781	8.5%
26–29	18,003	7.6%	4,291	5.9%	22,294	7.3%
18–25	112,258	14.9%	29,215	13.3%	141,473	14.6%
Race						
White	142,310	64.6%	50,097	83.0%	192,407	67.6%
African American	33,079	12.3%	4,141	7.4%	37,220	11.5%
Native American	2,124	0.3%	2,351	1.4%	4,475	0.5%
Native Hawaiian / Pacific Islander	1,102	0.3%	309	0.2%	1,411	0.3%
Asian	10,925	5.4%	934	0.9%	11,859	4.7%
Hispanic	42,636	15.8%	4,706	5.7%	47,342	14.2%
Other	6,682	1.3%	1,915	1.3%	8,597	1.3%
Education						
Less than high school	36,314	13.7%	11,752	18.2%	48,066	14.5%
High school graduate	73,208	28.6%	24,221	38.0%	97,429	30.1%
Some college	70,873	26.3%	18,347	25.9%	89,220	26.2%
College graduate	58,463	31.4%	10,133	18.0%	68,596	29.2%
Income						
Less than \$20,000	57,615	17.2%	18,187	23.2%	75,802	18.2%
\$20,000 to \$49,999	79,186	31.3%	23,995	38.3%	103,181	32.4%
\$50,000 to \$74,999	38,345	17.3%	10,385	17.7%	48,730	17.3%
\$75,000	63,712	34.3%	11,886	20.8%	75,598	32.1%
Male	110,734	48.1%	30,016	48.0%	140,750	48.1%
Unemployed	17,216	4.5%	4,237	4.1%	21,453	4.4%

Characteristic	Urban		Rural		Overall	
	Sample N	Adjusted %	Sample N	Adjusted %	Sample N	Adjusted %
Outdoor Occupation	9,776	3.9%	4,211	5.7%	13,987	4.2%
Married	85,057	52.8%	26,119	56.8%	111,176	53.5%
Anxiety	14,869	5.6%	4,366	6.2%	19,235	5.7%
Depression	17,957	7.3%	5,604	8.6%	23,561	7.5%
Health Insurance (any type)	191,710	84.9%	51,223	83.6%	242,933	84.7%
Smokeless Tobacco Use	9,094	2.9%	5,479	6.8%	14,573	3.5%
Substance Abuse	32,432	9.0%	8,343	7.6%	40,775	8.8%
Current Cigarette Use	59,677	21.3%	20,297	27.3%	79,974	22.3%

The denominators for adjusted percents in the urban, rural, and overall columns are 191,492,914; 36,933,627; and 228,426,541, respectively.

Unadjusted and fully adjusted multivariable logistic regression coefficients for a model of current smoking in the U.S between the years 2007 and 2014.

Table 2

	Unadjusted Model			Fully Adjusted Model		
	OR	95% CI	p	OR	95% CI	p
Intercept	0.302	(0.292, 0.313)	<.001	0.348	(0.317, 0.383)	<.001
Rural residence						
No (ref)	–			–		
Yes	1.295	(1.218, 1.378)	<.001	1.013	(0.954, 1.076)	0.678
Time	0.970	(0.963, 0.977)	<.001	0.977	(0.969, 0.986)	<.001
Rural X Time	1.021	(1.007, 1.036)	0.005	1.023	(1.008, 1.039)	0.004
Age						
65+ (ref)	–			–		
50 – 64	–			3.101	(2.864, 3.358)	<.001
35 – 49	–			3.951	(3.679, 4.243)	<.001
30 – 34	–			4.721	(4.340, 5.135)	<.001
26 – 29	–			4.403	(4.026, 4.815)	<.001
18 – 25	–			2.217	(2.050, 2.397)	<.001
Race						
White (ref)	–			–		
African American	–			0.591	(0.562, 0.623)	<.001
Native American	–			0.967	(0.828, 1.129)	0.669
Native Hawaiian / Pacific Islander	–			0.638	(0.496, 0.820)	<.001
Asian	–			0.434	(0.395, 0.477)	<.001
Hispanic	–			0.342	(0.321, 0.363)	<.001
Other	–			1.121	(1.015, 1.237)	0.026
Education						
Less than high school (ref)	–			–		
High school graduate	–			0.774	(0.742, 0.806)	<.001
Some college	–			0.600	(0.573, 0.628)	<.001
College graduate	–			0.281	(0.267, 0.295)	<.001
Income						

	Unadjusted Model			Fully Adjusted Model		
	OR	95% CI	p	OR	95% CI	p
Less than \$20,000 (ref)	–			–		
\$20,000 to \$49,999	–			0.916	(0.885, 0.948)	< .001
\$50,000 to \$74,999	–			0.749	(0.715, 0.785)	< .001
\$75,000	–			0.612	(0.588, 0.636)	< .001
Gender						
Female (ref)	–			–		
Male	–			1.275	(1.240, 1.310)	< .001
Unemployed						
No (ref)	–			–		
Yes	–			1.328	(1.260, 1.400)	< .001
Outdoor Occupation						
No (ref)	–			–		
Yes	–			1.164	(1.095, 1.238)	< .001
Married						
No (ref)	–			–		
Yes	–			0.594	(0.576, 0.612)	< .001
Anxiety						
No (ref)	–			–		
Yes	–			1.524	(1.434, 1.619)	< .001
Depression						
No (ref)	–			–		
Yes	–			1.225	(1.152, 1.302)	< .001
Health Insurance (any type)						
No (ref)	–			–		
Yes	–			0.707	(0.680, 0.734)	< .001
Smokeless Tobacco Use						
No (ref)	–			–		
Yes	–			1.051	(0.985, 1.120)	0.135
Substance Abuse						
No (ref)	–			–		

	Fully Adjusted Model			Unadjusted Model		
	OR	95% CI	p	OR	95% CI	p
Yes	2.774	(2.666, 2.886)	< .001	–		

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