Differences in Sun Protection Behaviors between Rural and Urban Communities in Texas

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Abstract

Purpose: The increasing incidence of skin cancer is a global health issue. In order to identify at-risk populations in Texas, we compared sun protection behaviors and sunburn history across rural and urban counties.

Methods: An online health screening survey collected data from a non-probability sample of Texas residents in 2018. Data were weighted by sex, age, race, and ethnicity. Multinomial multivariable logistic regression identified key factors associated with sun protection behaviors and sunscreen use. Weighted Pearson's χ test identified differences between urban and rural respondents in strength of sunscreen used and sunburn history.

Findings: Rural residents in Texas were less likely to seek shade (OR = 0.58; P = .004) and less likely to use sunscreen lotion (OR = 0.65; P = .013) compared to their urban counterparts. Sunscreen use was also lower among current versus never smokers (OR = 0.67; P = .034) but higher in those with personal versus no cancer history (OR = 2.14; P = .004). Although rural versus urban residents were more likely to use higher SPF sunscreen (P < .001), they had more sunburns in the past 12 months (P < .001). They also had more blistering sunburns over the course of their life (P < .001) and these injuries were more likely to occur at an earlier age, between 5–14 years old (P < .001).

Conclusions: Increased attention to sun protective behaviors among rural communities in Texas is vital to help reduce the high prevalence of sunburn injury and incidence of skin cancer.

Keywords

rural; skin cancer; sun protection; sunburn; sunscreen behaviors

Skin malignancies primarily comprise keratinocyte cancers and melanoma.[1] In the US, the incidence of keratinocyte cancers are estimated to be 5.4 million new cases per year.[2,3] Despite this high incidence, keratinocyte cancers have relatively low metastatic potential and

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low mortality.[1] Nonetheless, they are associated with substantial morbidity and high disease and economic burden. On the other hand, the incidence of cutaneous melanoma is estimated to be 91,270 new cases and currently ranks fifth highest amongst malignancies in men and sixth highest in women.[4,5] Moreover, cutaneous melanoma can be highly aggressive and early detection is paramount.[1] Therefore, it is alarming that the incidence of cutaneous melanoma and keratinocyte cancers have been rising over the decades, in both the US and on a global level, and this trend is predicted to continue.[1,5] In Texas, cutaneous melanoma incidence and mortality rates are lower compared to the US as a whole.[6] Yet, with the second-largest population, the state currently ranks fourth in estimated new cases of melanoma and third in estimated deaths.[6]

Texas comprises 254 counties, including 77 urban and 177 rural designations.[7] Across the state, melanoma incidence varies widely from 2.8 to 25.2 per 100,000 in urban and 8.4 to 26.7 per 100,000 in rural counties.[8] Risk for melanoma increases with age overall, and older males are at higher risk compared to older females.[1,9] However, melanoma is also the second most common malignancy among adolescents and young adults; in these populations, females are at increased risk.[10] Other than age and gender, another primary risk factor for skin cancer is race/ethnicity, with increased susceptibility observed amongst non-Hispanic whites (NHW).[1,9]

The principal causes of skin cancer include cumulative ultraviolet (UV) exposure and sunburn history.[11,12] Primary prevention strategies for skin cancer focus on reducing solar exposure by encouraging adequate protection through use of hats and protective clothing; use of sunscreen of at least SPF15; seeking shade; and minimizing sun exposure during peak hours.[13] Refrainment from indoor tanning is also a key prevention strategy.[9] Total body skin examination for early detection may be beneficial, at least for those at highest risk.[1]

Overall, there is a higher incidence of and mortality from cancer in rural compared to urban communities across the US, and this pattern also holds true for melanoma.[14] Contributing factors include a greater proportion of aging residents in rural areas; lower health literacy, educational attainment and socioeconomic status; and reduced access to health care.[14] In Texas, rural versus urban residents have lower income, higher rates of poverty and unemployment, and lower rates of high school graduation.[15] Moreover, Texas has one of the largest elderly populations in the US coupled with a dearth of primary care physicians; this particularly impacts the health of rural communities.[16,17]

We hypothesized that sun protection behaviors and sunburn prevalence would differ amongst Texas residents living in rural and urban communities. To test this hypothesis, we analyzed data from a 2018 statewide Texas health screening survey that included assessment of cancer prevention behaviors in a non-probability sample of the Texas population to reveal key differences in sunscreen use and sunburn history.[18] Our results should help target future intervention strategies for reduction of skin cancer prevalence across the state.

Methods

Participants

The overall study population included a non-probability sample of 2,050 Texas residents including 50% females, 36.5% NHW, 25% NHB, 33.5% Hispanics, and 5% Asians/other (compared to Texas demographics, US Census, V2017: 50.3% females, 42% NHW, 12.7% NHB, 39.4% Hispanics, and 5% Asians).[18] Oversampling of NHBs was conducted to ensure more accurate estimates for this minority group. Strata goals were also set for household income in Texas: 48% < $50,000; 30% $50,000–$100,000; 22% >$100,000.[19] The NHW category was defined as non-Hispanics selecting white as the sole race and the NHB category as non-Hispanics selecting black/African American, either alone or with any other race. The recruitment target included 60% urban and 40% rural residents. To determine urbanization status, we matched respondent ZIP Codes to county, and county to rural/urban designation as defined by the Texas Department of State Health Services.[20,21]

Survey Design and Implementation

The Texas health screening survey was composed of 153 measures with the majority of questions derived from the National Health Interview Survey (NHIS), Health Information National Trends Survey (HINTS), and Behavioral Risk Factor Surveillance System Questionnaire, as detailed elsewhere.[18] The instrument was prepared in both English and Mexican Spanish using the services of Masterword Services, Inc. (Houston, TX), and administered through the Qualtrics online survey platform (Qualtrics International Inc., Provo, UT and Seattle, WA). To identify any potential technical issues, the survey was piloted among 50 participants prior to full launch. Qualtrics managed survey implementation and compensation of opt-in panelists ($10 or its equivalent) between February 5 and March 5, 2018. Following collection of the first 1,600 complete responses, the sampling targets for Hispanics, lower income categories, and urban residents were primarily met. Subsequently, demographic strata were relaxed to meet the required sample size. The study protocol (PA16–0724) was approved by MD Anderson's Institutional Review Board.

Outcome Measures

The primary outcome measures for sun protective behaviors were derived from the NHIS 2015 instrument focused on cancer.[22] All respondents were presented with the stem question (ID NAF.020_00.000), "When you go outside on a warm sunny day for MORE than one hour, how often do you..," followed by 6 individual measures: 1) Stay in the shade? 2) Wear a baseball cap or sun visor? 3) Wear a hat that shades your face, ears and neck such as a hat with a wide brim all around? 4) Wear a long sleeved shirt? 5) Wear long pants or other clothing that reaches your ankles? 6) Use sunscreen? Respondents had the choice to answer on a 5-point Likert scale: always, most of the time, sometimes, rarely, and never. An additional option, "Don't go out in the sun" could also be selected. Several other sun-related exposures were assessed to determine level of SPF use and sunburn history. Two measures were derived from NHIS 2015: 1) What is the SPF number of the sunscreen you use MOST often? Response categories included, 1–14, 15–49, and 50 plus; and 2) During the past 12 months, how many times have you had a sunburn? This question was followed by a fill-in-the-blank response. Two additional measures were derived from the PhenX Toolkit (RTI

International, Research Triangle Park, NC) (question ID 061300): 1) About how many blistering sunburns have you gotten in your life? This question was followed by a fill-in-the-blank response; and, 2) How old were you the first time you got a blistering sunburn? Response categories included under 5 years old, 5–15 years old, 15–24 years old, 25–39 years old, 40–64 years old, and 65 years old or older.

Covariates

The explanatory variable selected for this analysis was rural versus urban locale, determined as detailed above. Other covariates were analyzed based on their theoretical significance with sun protection behaviors, including respondent's sex, age group, ethnicity and race, place of birth, educational attainment, marital status, occupation status, home ownership, and income range. Perception of financial stability was assessed using the question, "Which one of these comes closest to your own feelings about your household income these days?" Behaviors and health variables included smoking status, history and frequency of self-reported depression, diabetes, body mass index (BMI), and personal and family history of cancer.

Statistical Analysis

The analytical data set included 2,034 respondents.[18] In order to calibrate the study sample to the state's demographics, data were weighted by ICF International, Inc. (Fairfax, Virginia) using a 3-dimensional raking approach with iterative post-stratification based on: sex; 3-category age (18–44, 45–59, and 60 and over); and 4-category race/ethnicity (NHW, NHB, Hispanic, and other).[23] Population data from the 2015 5-year American Community Survey (US Census Bureau, Suitland, MD) were used to compute weights at base and post-stratification stages. The weighted percentage of ages in the 18–44, 45–59, and 60+ group, sex, race and ethnicity were within 95% confidence intervals of the American Community Survey data aggregated over the state of Texas (see Appendix Table 1, available online only). The R "survey" package (The R Foundation, Vienna, Austria) was used to calculate means, proportions, percentages, and standard deviations. For all questions associated with the stem "When you go outside on a warm sunny day for MORE than one hour, how often do you..," responses to outcome variables were collapsed into 3 levels: always/most of the time, sometimes, and rarely/never. The "Don't go out in the sun" response was not included in the regressions. The multilevel response variable was modelled using the multinomial survey logistic regression with survey weights and analyses performed using PROC SURVEYLOGISTIC (SAS for Windows, version 9.4, SAS Institute Inc., Cary, NC) and the generalized logit link function to evaluate the significance of covariates with each of the sun protection behaviors. The category "rarely/never" was used as the reference group. Wald-test-based P values are reported to assess significance of each category of a predictor while adjusting for the presence of other predictors in the model. In addition, we also report type 3 analysis-based P values to assess overall significance of a predictor. The weighted Pearson's χ^2 test was used to determine significance between weighted rural and urban data for measures related to use of sunscreen, SPF level, and sunburn history.

Results

The overall study population included 1,219 respondents from urban and 815 from rural ZIP Codes with weighted mean (median) age of 41 (38) years and 48 (50) years, respectively. The baseline characteristics and weighted percentages for the rural and urban strata are shown in Table 1. Hispanics and NHBs were more prevalent in the urban group whereas NHWs were more prevalent in the rural group. Urban versus rural respondents were more likely to be born outside the US, be college graduates/postgraduates, employed, single/never married, and rent versus own their own home. On the other hand, rural respondents were more likely to be married and/or retired, be current or former smokers, and have class II or extreme obesity, although the incidence of diabetes was similar between groups. Household income distributions were largely comparable, and although the data suggested fewer rural residents reported financial difficulty, this was not significant. Of note, more rural versus urban respondents had a personal or family history of cancer.

Six measures were assessed to determine sun protection behaviors (Figure 1). Urban versus rural respondents were more likely to stay in the shade always/most of the time (50.0% versus 37.2%). However, the rural group was more likely to wear a cap or visor always/most of the time (38.9% versus 32.9%). The likelihood of wearing a wide-brimmed hat was low amongst both groups with about 55% rarely or never using this form of protection. Compared to their rural counterparts, urban respondents seemed a little more inclined to wear a long-sleeved shirt always/most of the time (19.3% versus 15.5%) and sometimes (27.1% versus 24.7%). However, the majority rarely/never used this type of clothing (51% urban, 57.6% rural). Use of long pants was largely similar between groups. With respect to sunscreen, consistent use seemed to be higher in the urban versus rural group (27.5% versus 24.2%). However, 46.2% of urban and 48.8% of rural respondents rarely or never used any sunscreen.

To determine if rurality was a significant factor for any of the sun protection behaviors, multinomial survey logistic regression analyses were performed across all outcomes that measured use of shade, sun protective clothing, and sunscreen. After adjusting for other possible relevant covariates, rurality was found to be a significant predictor for the 2 outcomes: when you go out on a warm sunny day for MORE than 1 hour, how often do you 1) stay in the shade, and 2) use sunscreen? (Table 2). Thus, rural compared to urban residents were less likely (always/most of the time versus rarely/never) to stay in the shade (OR = 0.58; P = .004, Type 3 P = .004) and use sunscreen (OR = 0.65; P = .013, Type 3 P = .044).

Other factors associated with "stay in the shade" included sex and income. For example, females compared to males were more likely (always/most of the time versus rarely/never) to stay in the shade (OR = 1.93; P < .001). Factors associated with "use sunscreen" included sex, age, race and ethnicity, marital status, employment status, income, home ownership, obesity, smoking, and cancer history. For example, significantly increased use of sunscreen (always/most of the time versus rarely/never) was apparent amongst 36- to 55-year-olds compared to 56- to 65-year-olds (OR = 1.70; P = .020) and those with versus without personal history of cancer (OR = 2.14; P = .004). Decreased use of sunscreen was associated

with being NHB versus NHW (OR = 0.29; *P* < .001), Hispanic versus NHW (OR = 0.66; *P* = .026), reporting $20,000 - $49,999 versus $50,000 - $74,999 household income (OR = 0.68; *P* = .043), and being current versus never smokers (OR = 0.67; *P* = .034). See Table 2 for full results.

The level of sunscreen protection used and sunburn history was also compared between rural and urban respondents (Table 3). A greater proportion of rural respondents used higher levels of SPF sunscreen (*P* < .001), although they tended to have more (4+) sunburns within the past 12 months (*P* < .001). Rural respondents also had significantly more lifetime blistering sunburns with 67% versus 45% reporting 3 or more such injuries (*P* < .001). These blistering sunburns were also more likely to occur at a younger age with 61.2% versus 43.2% reporting 5–14 years as the age of their first blistering sunburn (*P* < .001).

Discussion

This study compared current sun protection behaviors and prevalence of sunburn amongst rural and urban residents in Texas. After adjusting for a battery of covariates, our data show that rural residents in Texas were less likely to seek shade and less likely to apply sunscreen lotion compared to their urban counterparts. Interestingly, when sunscreen lotion was applied, rural versus urban residents were more likely to use a higher SPF. However, they reported more sunburns in the past 12 months and more blistering sunburns over the course of their life. Of particular importance, rural versus urban residents were more likely to have had blistering sunburns at an earlier age.

National estimates of sun protection behaviors have been summarized from NHIS 2015 data.[11] In comparing our results, we find that both urban and rural residents in Texas versus the US as a whole were more likely to always/most of the time wear long-sleeved shirts (19.3% and 15.5%, respectively, versus 12.8%), long-sleeved pants (38.8% and 40.8%, respectively, versus 29.6%) and wide brimmed hats (21.8% and 20.8%, respectively, versus 14.7%). Urban residents in Texas were also more likely to always/most of the time stay in the shade (50% versus 39%) compared to national estimates. In contrast, the frequency of sunscreen use in Texas was lower, particularly amongst rural residents (24.2% versus 34.8% for US). Overall, these data suggest that Texas residents preferentially use shade and protective clothing rather than sunscreen application. Nonetheless, with routine use of shade and protective clothing falling short for many Texans, it is particularly concerning that sunscreen is an underused preventive measure. Sunscreen is known to decrease not only sunburn but also keratinocyte cancers, new nevi in children, and melanoma.[24–26] Indeed, a recent large cohort study reported that using sunscreen SFP 15 or greater could reduce risk of melanoma by 18% in women age 40–75 years.[27]

Our findings on reduced sunscreen use and limited seeking of shade in rural compared to urban residents are in keeping with prior observations.[28–30] Although one such study has largely attributed such variances to confounders, including demographic, regional, and behavioral differences in rural versus urban populations, our findings remained significant even after adjustment for these confounders and covariates.[28] In agreement with national

data and other studies, sunscreen use amongst our population positively correlated with being female, NHW and middle aged.[9]

It was encouraging to find more compliance with sunscreen use amongst those with a personal history of cancer compared to those with no cancer diagnosis. Indeed, increased sunscreen use has previously been reported amongst both rural and urban skin cancer survivors.[28] However, other evidence across studies shows that 7%–38% of melanoma survivors never apply sunscreen.[31] It was disappointing that there was only a marginal increase in sunscreen use amongst those with a family history of any cancer. That rural versus urban individuals may be less likely to modulate their behavior after a family diagnosis of skin cancer has been previously reported.[28] Thus, despite increased awareness, other barriers are preventing personal uptake of preventative behavior change. Barriers to inconsistent sunscreen use are multifactorial and include anticipation of shade cover, perceptions of short periods of sun exposure, lack of time, and discomfort during intensive physical activity, amongst others.[32] Intervention strategies to enhance risk reduction practices have had varying success.[33–35]

In our study, current versus never smokers were less likely to use sunscreen and this correlates with other reports describing decreased skin cancer protection amongst those engaged in risky health behaviors.[36] Biased risk perceptions may help explain these observations. However, this is particularly concerning since smoking itself is a risk factor for squamous cell carcinoma.[11,37] There was also some evidence suggesting a trend towards lower sunscreen use amongst those with lower income. Although underlying factors can be complex, this may be explained in part by lack of financial resources to routinely purchase sunscreen.

Particularly concerning was the much higher likelihood of rural versus urban residents to have experienced blistering sunburns, and most importantly between the early ages of 5–14 years. These types of injuries during childhood are associated with a greater risk of skin cancer compared to such injuries in older adults.[38] The increased prevalence of blistering sunburns in rural respondents correlated with their lower use of sunscreen, even though they tended to use higher SPF compared to their urban counterparts. Paradoxically, use of sunscreen has been linked to increased prevalence of sunburn.[27] For rural residents using sunscreen, it is possible that untimely reapplication as well as misjudgment of sunscreen effectiveness resulting in longer solar exposure times contributed to our findings. It is also feasible that increased likelihood of experiencing blistering sunburn amongst our rural compared to urban respondents is due to occupational hazards rather than intentions to tan, and increased outdoor leisure time activities.

Conclusions

Overall, our data highlight a distinct need for increased cancer prevention and control activities on sun protective behaviors across Texas, particularly for rural communities. Of importance, promotion of such behaviors is currently part of the Texas Cancer Plan.[39] Targeting schools to better educate students, parents, teachers, and staff on the harms of sunburn and the benefits of sun protection behaviors is one such approach and national

guidelines have been developed.[40] Notably, Texas passed a state law in 2015 allowing students to carry and apply sunscreen at school.[41] However, it is unclear how many parents are fully aware of this opportunity and how many urban and rural Texas schools are proactively encouraging such behavior. To enhance sun protection behaviors among children, sun safety programs have been developed for elementary grades, such as "Ray and the Sunbeatables," with current dissemination across 44 states.[42] Among national initiatives, municipality shade policies and improved availability of sunscreen at parks, recreation centers, sporting venues, and beaches are intended to promote stronger adherence to sun protection behaviors.[9] Clearly, increased physician counseling, targeting those at high risk and with a history of blistering sunburn, would be expected to yield benefit. In Texas, policy makers have been educated on the harms of indoor tanning and this has led to new legislation banning minors from using public tanning bed facilities in Texas.[43] Although it is clear that much more work needs to be done, our current findings should further help guide cancer prevention and control activities across the state, particularly in the rural areas.

Strengths and Limitations

The strengths and limitations of the overall survey have been discussed previously.[18] Relevant to the current study, non-probability sampling may have enriched for respondents with a particular interest in cancer prevention and thus behaviors may not reflect the general Texas population. However, survey data were weighted to be representative of the state population and the weighted percentages of income, homeownership, and several other core measures matched well with the national Health Information National Trends Survey (HINTS) and Texas state Behavioral Risk Factors Surveillance System (BRFSS). Self-reporting of data may also be impacted by social desirability bias. The electronic mode of our survey primarily reached NHWs in the rural areas, although this may not reflect a major drawback in this particular analysis since NHWs are more at risk for skin cancer than NHBs and Hispanics. Our data were not adjusted for confounding variables such as occupational and recreational sun exposure, and therefore these factors cannot be accounted for. Finally, we did not apply adjustments for multiple comparisons, as for descriptive and exploratory studies such an adjustment is not considered necessary.[44]

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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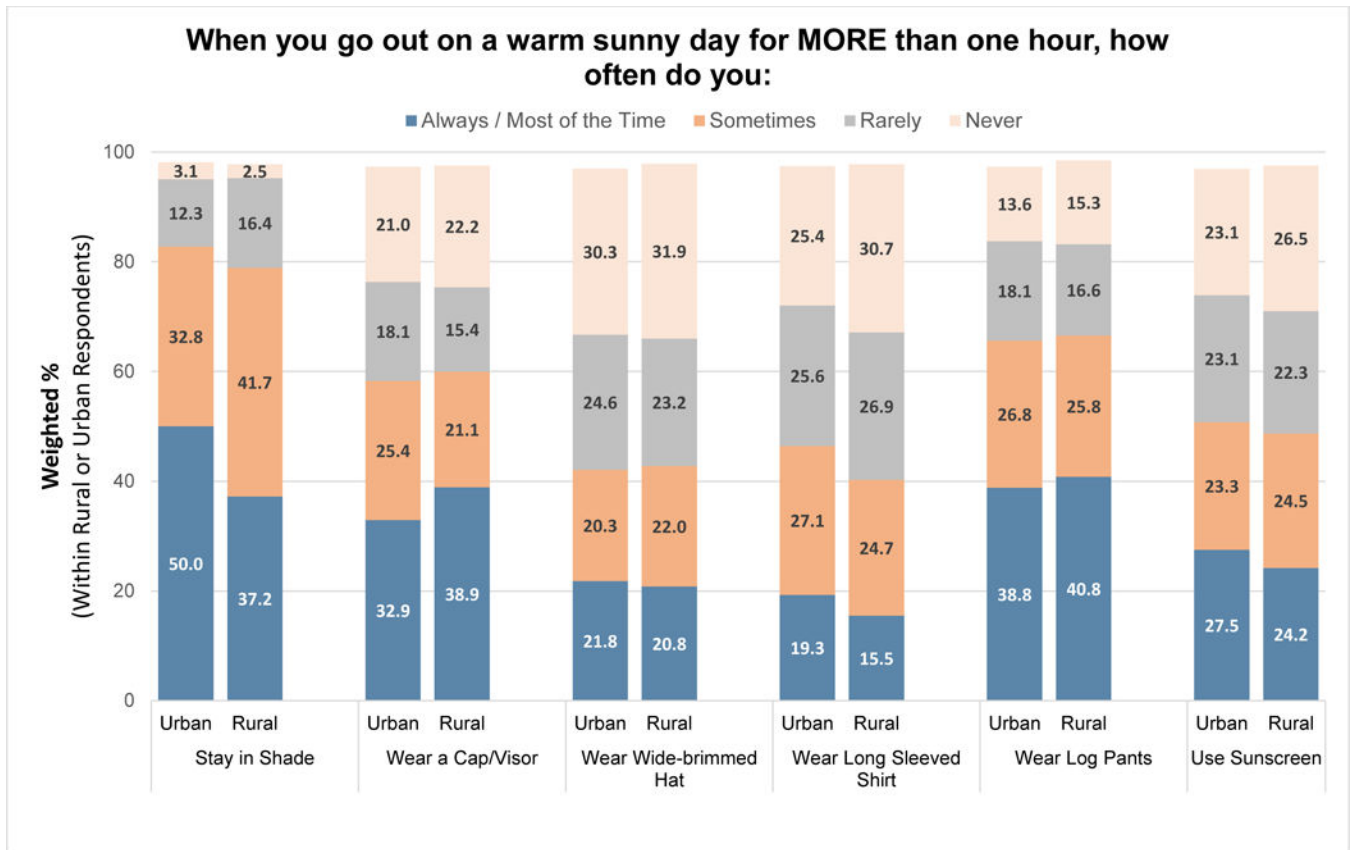
Figure 1.
Sun Protection Behaviors

Table 1.

Demographics and Health Characteristics of Rural and Urban Respondents

VARIABLE	OVERALL		URBAN		RURAL		*P* Value
	N	% Weighted	N	% Weighted	N	% Weighted	Rural vs Urban
Respondents	2034	100	1219	51.3	815	48.7	
Gender (N= 2034)							.0016
Female	1348	50.8	803	26.0	545	24.8	
Male	686	49.2	416	25.3	270	24.0	
Ethnicity / Race (N= 2034)							< .0001
Hispanic	764	35.7	558	26.2	206	9.5	
White, non-Hispanic	639	45.5	135	9.1	504	36.3	
Black, non-Hispanic	468	10.6	390	9.0	78	1.6	
Others	163	8.2	136	6.9	27	1.3	
Born In USA (N= 2034)							< .0001
No	178	8.2	158	7.1	20	1.1	
Yes	1856	91.8	1061	44.1	795	47.6	
Education (N= 2033)							.0077
Less than 8 years	21	0.8	14	0.5	7	0.3	
8 through 11 years	93	4.2	44	1.8	49	2.5	
12 years or completed high school	471	22.6	247	10.5	224	12.1	
Post high school training other than college (vocational or technical)	134	6.5	81	3.1	53	3.5	
Some college	610	29.9	358	14.7	252	15.2	
College graduate	508	25.5	339	14.7	169	10.8	
Postgraduate	196	10.4	135	6.0	61	4.4	
Marital Status (N= 2033)							< .0001
Divorced	222	11.8	124	5.2	98	6.6	
Living as married	158	6.9	99	3.8	59	3.1	
Married	834	45.4	443	20.5	391	24.9	
Separated	52	2.4	27	1.0	25	1.4	

VARIABLE	OVERALL		URBAN		RURAL		P Value
	N	% Weighted	N	% Weighted	N	% Weighted	Rural vs Urban
Single, never been married	696	29.2	489	19.0	207	10.2	
Widowed	71	4.4	36	1.9	35	2.5	
Occupation Status (N= 2032)							<.0001
Disabled	122	6.7	46	2.0	76	4.7	
Homemaker	214	8.8	108	3.9	106	4.9	
Retired	237	16.0	115	5.8	122	10.2	
Student	136	5.2	100	3.4	36	1.8	
Employed	1050	50.6	688	29.2	362	21.4	
Unemployed	228	10.6	135	5.9	93	4.7	
Other	45	2.2	26	1.1	19	1.1	
Rent Or Own (N= 2031)							<.0001
Occupied without paying monetary rent	199	9.0	115	4.4	84	4.7	
Own	1002	56.7	519	24.6	483	32.1	
Rent	830	34.3	583	22.3	247	12.0	
Income Ranges (N= 2034)							.2492
$0 to $9,999	212	8.7	122	4.5	90	4.2	
$10,000 to $14,999	140	6.4	69	2.9	71	3.5	
$15,000 to $19,999	138	6.4	89	3.5	49	3.0	
$20,000 to $34,999	335	15.8	208	8.9	127	7.0	
$35,000 to $49,999	351	17.6	222	9.4	129	8.1	
$50,000 to $74,999	404	20.9	224	9.4	180	11.5	
$75,000 to $99,999	215	11.0	131	5.8	84	5.2	
$100,000 to $199,999	203	11.3	130	5.9	73	5.3	
$200,000 or more	36	1.9	24	1.0	12	0.9	
Which one of these comes closest to your own feelings about your household's income these days? (N= 2031)							.1471
Finding it very difficult on present income	190	8.7	110	4.4	80	4.3	
Finding it difficult on present income	416	19.8	243	19.8	173	9.7	
Getting by on present income	831	42.2	481	20.7	350	21.5	

VARIABLE	OVERALL		URBAN		RURAL		P Value
	N	% Weighted	N	% Weighted	N	% Weighted	Rural vs Urban
Living comfortably on present income	594	29.4	383	16.1	211	12.2	
Smoking (N= 2032)							< .0001
Never smokers	1286	58.9	845	34.7	441	24.2	
Former smokers	315	19.2	145	6.5	170	12.7	
Current smokers	431	21.9	228	10.1	203	11.8	
Depression (N= 2032)							.1349
Daily	305	14.8	153	6.5	152	8.2	
Weekly	301	13.9	174	7.1	127	6.8	
Monthly	217	10.3	134	5.8	83	4.5	
A few times a year	615	30.4	385	16.1	230	14.3	
Never	594	30.7	371	15.7	223	14.9	
Diabetes (N=2032)							.6516
Borderline	150	7.3	91	3.9	59	3.4	
No	1646	79.6	995	41.0	651	38.5	
Yes	236	13.2	132	6.4	104	6.8	
BMI (N=2002)							.0047
Underweight (<18.5)	63	3.0	39	1.7	24	1.3	
Normal (18.5 to <25)	568	27.2	368	14.9	200	12.2	
Overweight (25 to <30)	575	30.7	360	16.4	215	14.3	
Obesity, Class I (30 to <35)	387	19.3	228	9.8	159	9.5	
Obesity, Class II (35 to <40)	196	9.8	101	4.2	95	5.6	
Extreme Obesity (40 or above)	213	10.1	100	4.0	113	6.1	
Personal history (N=2031)							.0243
No	1895	(91.9)	1151	47.9	744	44.0	
Yes	136	(8.1)	66	3.3	70	4.8	
Family History (N=2031)							< .0001
No	579	(26.5)	420	17.3	159	9.2	

VARIABLE	OVERALL		URBAN		RURAL		P Value
	N	% Weighted	N	% Weighted	N	% Weighted	Rural vs Urban
Not sure	217	(11.0)	120	5.2	97	5.8	
Yes	1235	(62.6)	677	28.8	558	33.8	

Table 2.

Factors Associated with Sun Protection Behaviors

| | When you go out on a warm sunny day for MORE than one hour, how often do you STAY IN THE SHADE? | | | | | | | When you go out on a warm sunny day for MORE than one hour, how often do you USE SUNSCREEN? | | | | | | |
| | Sometimes vs rarely/never | | | Always/most of the time vs rarely/never | | | Type 3 P Value | Sometimes vs rarely/never | | | Always/most of the time vs rarely/never | | | Type 3 P Value |
COVARIATES	OR	95% CI	P Value	OR	95% CI	P Value		OR	95% CI	P Value	OR	95% CI	P Value	
Locale							.004							.044
Rural vs Urban	0.86	0.59–1.25	.434	0.58	0.40–0.84	**.004**		0.90	0.65–1.24	.516	0.65	0.46–0.91	**.013**	
SEX							<.001							<.001
Female vs Male	1.24	0.90–1.72	.193	1.93	1.40–2.66	**<.001**		1.41	1.06–1.88	**.020**	2.58	1.92–3.47	**<.001**	
AGE							.552							.292
22 years vs 56–65 years	0.89	0.41–1.93	.770	0.63	0.29–1.36	.236		0.86	0.42–1.74	.666	1.31	0.69–2.49	.410	
23–35 years vs 56–65 years	0.87	0.48–1.59	.648	0.87	0.47–1.60	.643		1.20	0.70–2.06	.499	1.38	0.84–2.29	.205	
36–55 years vs 56–65 years	0.82	0.48–1.42	.484	0.81	0.48–1.39	.453		1.24	0.76–2.01	.394	1.70	1.09–2.65	**.020**	
66 years vs 56–65 years	0.72	0.35–1.48	.375	1.22	0.57–2.58	.610		0.73	0.38–1.42	.352	1.14	0.63–2.10	.662	
Race and Ethnicity							.136							<.001
NHB vs NHW	0.86	0.53–1.41	.552	1.47	0.91–2.35	.115		0.32	0.21–0.49	**<.001**	0.29	0.18–0.45	**<.001**	
Hispanic vs NHW	0.91	0.60–1.39	.661	1.18	0.78–1.77	.437		0.70	0.48–1.01	.056	0.66	0.45–0.95	**.026**	
Other race vs NHW	0.70	0.37–1.31	.264	0.88	0.48–1.59	.666		0.89	0.52–1.53	.671	0.84	0.49–1.45	.540	
Born in US							.461							.175
No vs Yes	0.91	0.50–1.68	.768	1.20	0.68–2.12	.531		0.63	0.39–1.03	.064	0.79	0.50–1.25	.308	
Education (vs 12 years/completed high school)							.518							.453
Less than high school	1.14	0.54–2.40	.733	0.98	0.48–2.00	.965		0.87	0.46–1.67	.683	1.15	0.61–2.16	.672	
Post High School/some college	1.02	0.66–1.56	.933	0.82	0.54–1.25	.363		0.88	0.61–1.26	.473	1.08	0.75–1.57	.672	
College graduate/postgraduate	1.31	0.82–2.09	.252	0.90	0.57–1.42	.647		1.13	0.77–1.67	.526	1.47	0.98–2.18	.060	

	When you go out on a warm sunny day for MORE than one hour, how often do you STAY IN THE SHADE?							When you go out on a warm sunny day for MORE than one hour, how often do you USE SUNSCREEN?						
	Sometimes vs rarely/never			Always/most of the time vs rarely/never			Type 3 P Value	Sometimes vs rarely/never			Always/most of the time vs rarely/never			Type 3 P Value
COVARIATES	OR	95% CI	P Value	OR	95% CI	P Value		OR	95% CI	P Value	OR	95% CI	P Value	
Marital Status							.449							.144
Divorced/separated vs married/living as married	0.98	0.57–1.66	.928	1.19	0.71–1.97	.509		0.92	0.58–1.48	.743	1.77	1.15–2.73	**.010**	
Single/never been married vs married/living as married	1.41	0.95–2.09	.092	1.41	0.95–2.09	.085		1.02	0.71–1.46	.929	1.25	0.87–1.80	.225	
Widowed vs married/living as married	1.82	0.64–5.23	.264	1.69	0.58–4.94	.341		0.71	0.34–1.47	.355	0.94	0.43–2.05	.881	
Total Household	1.00	0.91–1.09	.909	1.01	0.92–1.09	.912	.963	0.98	0.90–1.06	.551	1.00	0.92–1.08	.940	.828
Employment Status							.075							.520
Disabled vs Employed	1.93	0.85–4.40	.118	1.84	0.86–3.94	.117		0.67	0.34–1.32	.250	0.51	0.26–0.99	**.046**	
Homemaker vs Employed	1.34	0.77–2.33	.301	1.05	0.62–1.78	.865		1.02	0.65–1.60	.920	0.89	0.58–1.37	.585	
Retired vs Employed	0.69	0.27–1.74	.429	0.73	0.30–1.76	.482		1.35	0.60–3.04	.466	0.85	0.34–2.16	.735	
Student vs Employed	1.59	0.80–3.15	.183	0.95	0.47–1.94	.896		0.98	0.52–1.85	.954	0.93	0.53–1.61	.781	
Unemployed vs Employed	1.59	0.78–3.26	.203	0.76	0.38–1.52	.435		1.28	0.69–2.37	.434	1.19	0.63–2.27	.590	
Other vs Employed	1.30	0.75–2.28	.353	0.76	0.44–1.31	.315		0.59	0.36–0.97	**.037**	0.76	0.46–1.26	.286	
Income							.237							.239
<$20,000 vs $50,000 - $74,999	0.56	0.33–0.97	**.037**	0.69	0.41–1.16	.162		0.77	0.49–1.21	.257	0.66	0.42–1.05	.079	
$20,000 - $49,999 vs $50,000 - $74,999	0.83	0.53–1.33	.441	0.75	0.48–1.17	.209		0.87	0.60–1.27	.465	0.68	0.47–0.99	**.043**	
$75,000 - $99,999 vs $50,000 - $74,999	0.56	0.31–1.00	.050	0.59	0.34–1.03	.064		1.21	0.74–1.98	.441	1.19	0.75–1.90	.464	
$100,000 - $50,000 - $74,999	0.88	0.49–1.60	.672	0.70	0.39–1.23	.212		0.78	0.47–1.31	.348	0.93	0.59–1.47	.765	
Home Ownership							.705							.262
Occupied vs Own	0.67	0.37–1.19	.168	0.74	0.42–1.33	.315		0.76	0.45–1.28	.302	0.64	0.37–1.10	.106	
Rent vs Own	0.85	0.58–1.24	.387	0.93	0.65–1.32	.671		0.86	0.62–1.19	.361	0.74	0.54–1.00	**.048**	
BMI							.238							.215

| COVARIATES | When you go out on a warm sunny day for MORE than one hour, how often do you STAY IN THE SHADE? | | | | | | | When you go out on a warm sunny day for MORE than one hour, how often do you USE SUNSCREEN? | | | | | | |
| | Sometimes vs rarely/never | | | Always/most of the time vs rarely/never | | | | Sometimes vs rarely/never | | | Always/most of the time vs rarely/never | | | |
	OR	95% CI	P Value	OR	95% CI	P Value	Type 3 P Value	OR	95% CI	P Value	OR	95% CI	P Value	Type 3 P Value
Underweight vs normal	0.61	0.25–1.53	.294	1.14	0.46–2.79	.780		1.21	0.54–2.70	.641	1.43	0.68–3.01	.346	
Overweight vs normal	1.11	0.74–1.67	.609	1.04	0.70–1.56	.838		0.82	0.57–1.17	.268	1.13	0.80–1.59	.487	
Obesity Class I vs normal	0.91	0.58–1.45	.700	1.11	0.71–1.72	.652		0.73	0.49–1.08	.117	0.78	0.53–1.16	.218	
Obesity Class II vs normal	1.38	0.73–2.57	.320	1.76	0.95–3.24	.072		0.71	0.43–1.18	.185	0.58	0.34–0.99	**.046**	
Obesity Class III vs normal	1.21	0.64–2.28	.566	1.80	1.00–3.24	.051		0.62	0.37–1.04	.070	0.81	0.50–1.31	.393	
Smoking Status							.375							.018
Current vs Never	1.25	0.83–1.88	.285	0.93	0.63–1.39	.730		0.61	0.43–0.88	**.008**	0.67	0.46–0.97	**.034**	
Former vs Never	1.33	0.83–2.13	.232	1.14	0.72–1.79	.584		0.72	0.48–1.10	.125	1.09	0.75–1.60	.642	
Diabetes							.232							.174
Borderline vs No	0.82	0.45–1.48	.501	0.69	0.39–1.22	.196		0.92	0.56–1.52	.743	0.68	0.39–1.19	.175	
Yes vs No	0.81	0.47–1.41	.460	1.17	0.71–1.94	.537		0.74	0.46–1.20	.226	1.25	0.83–1.89	.291	
Depression							.204							.074
Few times per year vs Never	1.34	0.90–2.01	.153	1.14	0.77–1.69	.519		1.31	0.92–1.85	.133	0.94	0.67–1.32	.722	
Daily/monthly/weekly vs Never	0.99	0.67–1.47	.965	1.16	0.80–1.70	.438		0.90	0.63–1.29	.572	0.72	0.51–1.01	.054	
Cancer History, Personal							.242							.015
Yes vs No	0.70	0.37–1.32	.272	1.07	0.59–1.95	.819		1.36	0.78–2.38	.284	2.14	1.27–3.61	**.004**	
Cancer History, Family							.393							.124
Not sure vs No	1.23	0.69–2.20	.485	0.91	0.52–1.59	.727		0.75	0.46–1.22	.249	0.78	0.47–1.29	.329	
Yes vs No	0.98	0.67–1.43	.906	0.78	0.54–1.11	.168		0.65	0.47–0.90	**.008**	0.79	0.57–1.09	.145	

P values < .05 are bolded

Table 3.

Sunscreen Use and Sunburn History

Question		Overall N	Rural N	Rural % weighted	Urban N	Urban % weighted	P Value[a]
What is the SPF number of the sunscreen you use MOST often?							
SPF 1–14		220	61	10.4	159	17.2	< .001
SPF 15–49		708	283	52.2	425	50.0	
SPF 50+		509	222	37.4	287	32.8	
	sum	*1437*	*566*	*100*	*871*	*100*	
During the past 12 months, how many times have you had a sunburn?							
Burns, 0		27	9	3.8	18	6.6	< .001
Burns, 1		158	71	37.8	87	37.2	
Burns, 2		117	59	27.4	58	26.0	
Burns, 3		59	25	10.9	34	16.1	
Burns, 4+		67	39	20.0	28	14.1	
	sum	*428*	*203*	*100*	*225*	*100*	
About how many blistering sunburns have you gotten in your life?							
Blistering burns, 0		76	23	3.3	53	9.9	< .001
Blistering burns, 1		165	55	10.6	110	23.7	
Blistering burns, 2		183	95	19.1	88	21.4	
Blistering burns, 3+		468	299	67	169	45	
	sum	*892*	*472*	*100*	*420*	*100*	
How old were you the first time you got a blistering sunburn?							
<5 years old		59	30	5.7	29	6.6	< .001
5–15 years old,		454	284	61.2	170	43.2	
15–24 years old,		286	130	27.4	156	37.1	
25 years old		85	25	5.7	60	13.1	
	sum	*884*	*469*	*100*	*415*	*100*	

[a] Weighted Pearson's χ^2 test-based P value