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Season of Interview and Self-Report of Summer Sun Protection Behaviors

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Abstract

Self-report of past behavior may be affected by recall biases that result in over- or under-reporting. This study explored whether the season an interview was conducted affected individuals' self-reported frequency of past summer sun protection behaviors, including use of sunscreen, hats, long sleeves, and shade. We examined two existing data sets—National Health Interview Survey (NHIS) and the Behavioral Risk Factor Surveillance System (BRFSS) with sample sizes of 31,428 and 21,122, respectively. Weighted logistic regression models adjusting for survey design estimated the influence of interview season on the odds of consistent summer sun protection behaviors, while controlling for age, sex, sun sensitivity, and geographic region. For NHIS, significant seasonal differences were found for all protection behaviors that were measured. For the BRFSS items, significant seasonal differences were found only for staying in the shade. Based on these findings, when interviewing adults about summer sun safety behavior, we recommend conducting the interviews during the summer season or shortly thereafter to reduce potential recall biases.

Keywords

skin cancer; bias; measurement

Introduction

Skin cancer is one of the most prevalent cancers, representing nearly half of all cancers in the U.S. In 2007, over 62,480 incident cases of melanoma were reported in the U.S., and over one million adults developed nonmelanoma skin cancer (NMSC) (1). While NMSC generally occurs in people older than 50 years, the incidence of NMSC may be increasing for people of all ages. A recent study found that between 1976 and 2003 the incidence of basal cell carcinoma for all age groups under 40 years old increased among the Caucasian population, especially for women (2). A similar trend was found for squamous cell carcinomas for both men and women. Among other factors, the increasing incidence of nonmelanoma cancer may be due to ultraviolet radiation (UVR) exposure from the sun and/or indoor tanning lamps (2). Solar UVR exposure has been linked definitively with all types

of skin cancers (1). Skin cancer prevention is an important public health goal, which is possible through protective behaviors such as sun avoidance or increased use of protective clothing and sunscreen (3).

A recent review on measuring UVR exposure and protection pointed out that verbal reports of sun protection behaviors were the most common method of assessment, and questions about habitual or typical behaviors were the most common type of question asked. The authors warned that self-reports of sun protection may include inaccuracies from social demand bias, poor recall, or difficulty estimating routine behaviors (4).

To our knowledge, no studies have validated the distal self-report of sun safety behaviors in which reports are occurring at least one season removed from when the behavior was performed. And more specifically, there has been no research to date on the effect of season of interview on reporting *past* sun protection, such as the last summer. With this type of data, at least two types of recall bias may occur. First, forgetting may result in under-reporting of behaviors, which is more likely to occur as the duration increases between the events of interest and the interview. Second, telescoping, or the tendency of survey respondents to include events from outside of the time period being asked about, may result in over-reporting (5, 6).

The purpose of this study was to determine whether season of the interview affects individuals' self-reported summer sun protection behaviors; two data sets using overlapping, albeit somewhat different sun protection items, were examined. We predicted that self-reports of summer sun protection behaviors would be similar across interviews administered in all four seasons. Since either or both recall biases could be occurring, the current analyses focus on the existence of *any* differences between summer versus non-summer seasons of the interview, and not on the direction of the differences.

Methods

Samples

For the current study, we drew upon two existing data sets. These data sets were selected because each study included questions about participants' summer (or "warm sunny day") sun protection behaviors, interviews were conducted during all four seasons, and participants were located throughout the U.S.

National Health Interview Survey—The 2005 National Health Interview Survey (NHIS) is an in-person household interview that collected data on a broad range of health topics from the general U.S. population (7). The NHIS followed a multi-stage area probability sampling approach that allowed for representative sampling of households. Patients of long-term care facilities, individuals on active duty with the military, and U.S. nationals living in foreign countries were excluded. In the 2005 survey, both Black and Hispanic populations were oversampled. For each selected family, one child and one adult (over 18 years of age or older) was randomly sampled and an in-person interview conducted. Sun protection data only for the adults (N=31,428) were available and examined. The total household response rate was 86.5% (7). The conditional response rate for the Sample Adult component was 80.1%. The final response rate for the Adult Sample Person component was approximately 69.0% calculated as the overall family response rate multiplied by the sample adult response rate.

Behavior Risk Factor Surveillance System—The Center for Disease Control and Prevention's Behavior Risk Factor Surveillance System (BRFSS) is the largest cross-sectional telephone surveillance survey tracking multiple health conditions and risk

behaviors in the U.S. Most states use a stratified sampling method by phone density, and randomly select one eligible adult (over 18 years) for every household called. The BRFSS survey includes a core set of questions administered in all 50 states, and optional modules that states can choose to administer based on their health concerns. The *summer* sun protection questions were part of an optional module made available in 2000 (8). Six states administered this module: Washington (N=3,584), South Dakota (N=4,999), Utah (N=2,891), Colorado (N=3,058), Maryland (N=4,594), and Virginia (N=1,996). Therefore, for this analysis the BRFSS sample was restricted to those states and included a total of 21,122 participants. These states' telephone coverage ranged between 95.4% to 96.24%. Cooperation rates, defined as the number of completed interviews divided by the number of eligible respondents capable of completing the survey, were 48.9% in Washington, 63.2% in South Dakota, 71.8% in Utah, 60.8% in Colorado, 40.9% in Maryland, and 55.9% in Virginia (9).

Measures

Sun Protection Behaviors—In the 2005 NHIS, participants reported use of six sun protection behaviors (7). Each item was prefaced with, “When you go outside on a warm sunny day for more than one hour, how often do you...”. Participants were asked whether they: 1) “use sunscreen,” 2) “stay in the shade,” 3) “wear a baseball cap or sun visor,” 4) “wear a hat that shades your face, ears and neck such as a hat with a wide brim all around,” 5) “wear a long sleeved shirt,” and 6) “wear long pants or other clothing that reaches your ankles.” Participants rated each question on a five-point Likert-type scale ranging from “never” to “always.”

The BRFSS measured sun protection behaviors using four items (11). Each item was prefaced with, “Summer means June, July and August. Sunny is what respondents consider sunny.” Each item started with, “When you go outside on a sunny *summer* day for more than one hour...” Participants were asked: 1) “How often do you use sunscreen or block?”, 2) “How often do you stay in the shade?”, 3) “How often do you wear a wide-brimmed hat or any other hat that shades your face, ears, and neck from the sun?”, and 4) “How often do you wear long-sleeved shirts?” Participants rated each question on a five-point Likert type scale ranging from “never” to “always.”

Demographics—In both studies, data for sex (male/female) and age (continuous) were obtained from the respondent.

Season of the Interview—The four seasons were coded based on the initial interview date. Our literature search found that over time and across countries the definition of seasons has varied substantially. As a result, we operationalized each of the four seasons based on the combined information from: current dictionary definitions of season, the preface of the BRFSS, and past UVR exposure prevention literature (10, 11, 12). Thus, the four seasons were defined as: spring (March through May), summer (June through August), fall (September through November), and winter (December through February). An alternative coding of seasons using the solstices and equinoxes was considered, but after review of the literature, it was determined that the alternative coding, while more astronomically precise, was less culturally and socially accurate for defining seasonal behaviors related to sun protection.

Sun Sensitivity—The two studies used slightly different items to assess participants' sun sensitivity (i.e. propensity of unprotected skin to burn and tan) (13). The NHIS 2005 survey asked “After several months of not being in the sun very much, if you went out in the sun for an hour without sunscreen, a hat, or protective clothing, which one of these best

describes what would happen to your skin?” Participants rated their sensitivity on a four-item scale that included: “nothing would happen,” “turn darker without sunburn,” “burn mildly with some or no darkening/tanning,” “have a moderate sunburn with peeling,” or “get a severe sunburn with blisters.” The BRFSS asked participants: “Suppose that after several months of not being out in the sun, you then went out in the sun without a hat, sunscreen, or protective clothing for an hour. Would you?” Participants selected one of the following four-item responses: “not have anything happen,” “darken without sunburn,” or “sunburn.” Although the sun sensitivity items varied across surveys, they all assessed skin reaction after 1 hour of sun exposure.

Geographic Region—Participants who live in different geographic areas may have different levels of UVR exposure and protection behaviors. Therefore, we coded and subsequently adjusted for geographic region based on the four U.S. Census regions: South, West, Midwest, and Northeast.

Statistical Analyses—Initially, descriptive statistics were generated for each variable. For the NHIS and BRFSS, we considered creating a sun protection behavior composite scale for each data set assessing sun protection using multiple items. The combined scale resulted in a low Cronbach’s alpha for both the BRFSS ($\alpha=.41$), and for the NHIS ($\alpha=.61$), with very low inter-item correlations. Therefore, we retained all individual items for analysis. For all sun protection items within the two data sets, we combined the two highest frequency categories (i.e., “always” and “most of the time” for the NHIS, “always” and “nearly always” for the BRFSS) and the three lowest frequency categories, resulting in a new dichotomous variable. The two new levels were called “consistent protection” versus “inconsistent protection.” This recoding was done to make the analyses more comparable across the two samples. Chi square tests examined whether the unweighted demographic and sun protection variables differed across seasons. Initially, unweighted logistic regression models uncontrolled for survey design examined the influence of season of the interview on the odds of consistent sun protection behaviors, concurrently controlling for potential confounders such as age, sex, sun sensitivity and geographic region (not shown). Next, each model with significant seasonal effects was re-examined using weighted logistic regression adjusting for the complex survey design with the PROC SURVEYLOGISTIC option of SAS 9.1 software (SAS Institute Inc., Cary, NC.).

Results

Descriptive data and bivariate associations

Table 1 provides unweighted data for demographics, personal characteristics, and frequencies of protective behaviors by season for both samples, with results from chi square tests. NHIS participants ranged in age from 18 to over 85 years old and the majority was female. Higher sun sensitivity (i.e., burn mildly, moderate burn, and severe burn) ranged from 54.3% to 57.7% across season of interview. A small proportion of participants reported consistent protection for sunscreen use, staying in the shade, wearing baseball cap/visor or wide brimmed hat, and wearing a long sleeved shirt or clothing to the ankles. All NHIS protective behaviors varied significantly by season of interview in bivariate analyses.

BRFSS participants ranged in age from 18 to 99 years old; the majority was female. Higher sun sensitivity ranged from 53.1 to 53.3% across seasons. Overall, consistently performing protective behaviors, such as using sunscreen, staying in the shade, wearing a hat, and wearing long-sleeved shirts during the summer months was low. Only the report of staying in the shade was significantly different across season of interview in bivariate analyses of the BRFSS data.

Multivariate models

As shown in Table 2, in the NHIS, season of interview was significant for reports of each protective behavior after controlling for demographics, sun sensitivity, and geographic region. The odds of participants reporting that they consistently wore sunscreen during the last warm sunny day were higher when participants were interviewed in the winter (OR=1.16, 95% CI 1.05 – 1.29) compared to summer. The odds of participants reporting that they consistently stayed in the shade were lower (relative to summer) when participants were interviewed in the fall (OR=0.83, 95%CI 0.76 – 0.91), winter (OR=0.74, 95%CI 0.67-0.83), and spring (OR=0.72, 95%CI 0.66 – 0.80). The odds for reporting wearing a baseball cap/visor (OR=1.16, 95%CI 1.05-1.28) and a wide brimmed hat (OR=1.20, 95% CI 1.05 – 1.38) were higher when interviewed in the winter compared to summer. The odds of reporting wearing a long sleeved shirt were higher when interviewed in the winter (OR=1.34, 95% CI 1.14 – 1.57) and spring (OR=1.27, 95% CI 1.11 – 1.46) compared to summer. Additionally, compared to summer-time interviews, the odds of reporting wearing long clothing to the ankles were higher for winter interviews (OR=1.18, 95% CI 1.06-1.32).

In the BRFSS, as presented in Table 3, the odds of reporting summer use of sunscreen, hats, or long sleeved shirts did not differ significantly by season of interview, after controlling for demographics, sun sensitivity, and geographic region. Consistent with the NHIS findings, the odds of participants reporting that they consistently stay in the shade during the summer were lower when participants were interviewed in the fall (OR = 0.85, 95% CI 0.74-0.98), winter (OR = 0.77, 95% CI 0.67-0.89), and spring (OR = 0.74, 95% CI 0.64-0.86) compared to interviews in the summer, after adjusting for the other variables.

Discussion

More research on self-reported sun protection behaviors is needed to advance the field of UVR measurement (4, 14). We attempted to address this gap by exploring whether season in which summer sun protection is assessed influences participants' self-report.

Season-of-interview differences were found for all of the NHIS sun protection items. Frequent use (during warm, sunny days) of sunscreen, baseball caps/visors, wide-brimmed hats, long-sleeved shirts, and clothing that reached the ankles each were more likely to be reported in non-summer seasons, while staying in the shade was less likely to be reported in non-summer seasons. Data from the summer-time administered interviews most consistently differed significantly from data from the winter-time administered interviews. Since wearing long-sleeved shirts, long pants, and long skirts may be more likely during cooler seasons (to provide warmth), the finding of reporting higher summer use in non-summer seasons may suggest a telescoping effect. More specifically, respondents may be combining their use of these clothing items across all seasons as they respond. The more frequent report of sunscreen use during the winter interviews relative to summer interviews is more difficult to explain. However, since winter may be the season in which sunscreen is *least* likely to be used, respondents may have had difficulty remembering their routine use of sunscreen during warm, sunny days and in light of this, opted to inflate their summertime use. In both the NHIS and BRFSS samples, the odds of reporting staying in the shade were lower in all other seasons compared to summer. This pattern may be due to a combination of 1) difficulty estimating and remembering frequency of shade use, which is a less concrete behavior than use of sunscreen and protective clothing; and 2) shade use may not have the same level of social demand as sunscreen use, and therefore when recollection is poor, it may be under-reported. No seasonal differences were found in reports for the other summer sun protection behaviors in BRFSS.

A limitation of our study is that we could not locate criterion validity data on the sun protection items used in NHIS or BRFSS, in which responses obtained at one time point (regarding behaviors performed near that time point) were verified using objective measures (4). Thus, it is difficult to ascertain whether the summer-administered interviews (our reference group) are yielding accurate data about summer sun protection behaviors. However, in other studies items similar to these had been validated when used to measure proximal sun safety behaviors (15-17).

Another limitation was that a participant's location could potentially confound the effects found with season of the year. To control for this possibility, we included geographic region as a control variable. Unfortunately, we did not have data on respondents' city of residence—only their state. Future studies would benefit from more accurate climatological data for the city of residence. Another challenge was that each study assessed sun safety behavior with different items, and different wording for similar items. The BRFSS asked about participants' summer protection, whereas the NHIS survey asked about a warm sunny day. Additionally, because much of the literature on UV radiation and cancer incidence relies on retrospective reports of sun exposure, future studies of the effect of season on verbal reports of sun exposure would be beneficial (4).

Measuring sun protection behaviors using questionnaires is common, and is typically the only measurement strategy in large, national studies. The current analysis explored seasonal differences on report of summer sun protection. The results provide evidence that season of the interview may affect adults' report of specific protection behaviors, particularly if summertime use of protection is not specified and operationalized. Based on these findings, we recommend that researchers assess summer sun protection during summer or in the months just after summer, to be inclusive of the entire summer season, and assess other seasons of interest in those seasons. Data for both adults and children suggest that verbal reports of *proximal* sun safety behaviors have acceptable validity (15-17). If proximal measurement is not feasible, season of interview should be controlled for in analyses. We also suggest that researchers use standardize anchors in their surveys (e.g., summer) when assessing sun protection behaviors for a general time-period, which would allow for more interpretable comparisons across studies (14).

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Table 1
Sun protection behavior and demographics of the NHIS and BRFSS samples.

NHIS					
Variable	Summer n=8,760	Fall n=8,185	Winter n=6,250	Spring n=8,233	p value
Age (M, SD)	47.6 (17.9)	47.3 (17.8)	47.5 (17.8)	47.3 (17.7)	0.62
Sex (%)					0.12
Male	43.6	43.2	45.1	43.6	
Female	56.4	56.8	54.9	56.4	
Sun Sensitivity (%)					<.0001
Nothing would happen	13.1	16.2	17.7	15.6	
Turn darker, without burn	29.2	29.6	27.6	28.8	
Burn mildly, with some or no tanning	24.8	25.2	23.9	25.3	
Moderate burn, with peeling	24.3	21.8	22.4	22.6	
Severe burn with blisters	8.6	7.3	8.4	7.7	
Geographic Region (%)					<0.0001
South	36.8	35.5	37.4	38.2	
West	21.8	21.5	24.3	23.2	
Midwest	24.3	24.8	21.9	21.9	
Northeast	17.1	18.2	16.4	16.8	
Consistently Use Sunscreen (%)	28.0	27.5	30.6	29.3	<.001
Consistently Stay in Shade (%)	40.1	34.9	33.9	32.9	<.0001
Consistently Wear Baseball Cap/Visor (%)	29.4	28.4	31.9	30.4	<.001
Consistently Wear Wide-Brimmed Hat (%)	13.3	12.5	15.1	13.2	<.001
Consistently Wear Long Sleeved Shirt (%)	10.4	10.2	13.2	12.6	<.0001
Consistently Wear Clothing to Ankles (%)	29.5	29.9	33.7	32.0	<.0001

BRFSS					
Variable	Summer n=5,106	Fall n=6,046	Winter n=5,428	Spring n=4,542	p value
Age (M, SD)	46.2 (17.2)	46.5 (17.1)	46.0 (17.1)	46.2 (17.0)	0.41
Sex (%)					0.05

Variable	BRFSS				p value
	Summer n=5,106	Fall n=6,046	Winter n=5,428	Spring n=4,542	
Male	40.1	39.9	42.2	41.2	
Female	59.9	60.1	57.8	58.8	
Sun Sensitivity (%)					<.0001
Not have anything happen	16.1	19.0	19.6	17.7	
Darken without sunburn	27.1	27.8	27.2	28.9	
Sunburn	56.7	53.3	53.1	53.3	
Geographic Region (%)					.0001
South	30.9	29.2	32.4	32.8	
West	45.1	45.3	45.4	44.6	
Midwest	24.0	25.5	22.2	22.6	
Northeast	0.0	0.0	0.0	0.0	
Consistently Use Sunscreen (%)	32.8	31.7	32.1	31.5	0.52
Consistently Stay in Shade (%)	31.9	28.3	25.9	26.0	<.0001
Consistently Wear Hat (%)	30.4	30.1	29.8	29.0	0.50
Consistently Wear Long Sleeves (%)	10.9	11.3	11.9	11.9	0.29

NHIS = National Health Interview, and BRFSS = Behavioral Risk Factor Surveillance System.

Table 2

Weighted logistic regression models of individual sun protection behaviors for NHIS sample.

Use sunscreen on warm sunny day (n=182,976,177)					
Variable	B	SE	OR	95%CI	
Season					
Summer	---	---	1	---	---
Fall	-0.06	0.03	0.99	0.90	1.10
Winter	0.10	0.03	1.16	1.05	1.29
Spring	0.02	0.03	1.08	0.98	1.19
Age (continuous)	0.0002	0.0010	1.00	1.00	1.00
Sex					
Male	---	---	1	---	---
Female	0.48	0.02	2.63	2.47	2.81
Sun Sensitivity					
Nothing would happen	---	---	1	---	---
Turn darker, without sunburn	-0.50	0.03	1.68	1.48	1.91
Burn mildly, some or no tanning	0.15	0.03	3.22	2.85	3.63
Moderate sunburn with peeling	0.40	0.03	4.13	3.66	4.67
Severe sunburn with blisters	0.98	0.05	7.40	6.33	8.65
Geographic Region					
South	---	---	1	---	---
West	0.16	0.03	1.30	1.17	1.44
Midwest	-0.20	0.03	0.90	0.82	0.99
Northeast	0.13	0.04	1.26	1.13	1.41
Stay in shade on warm sunny day (n=182,254,932)					
Variable	B	SE	OR	95%CI	
Season					
Summer	---	---	1	---	---
Fall	0.01	0.03	0.83	0.76	0.91
Winter	-0.09	0.03	0.74	0.67	0.83

Stay in shade on warm sunny day (n=182,254,932)				
Variable	B	SE	OR	95%CI
Spring	-0.12	0.03	0.72	0.66 0.80
Age (continuous)	0.02	0.00	1.02	1.02 1.02
Sex				
Male	---	---	1	---
Female	0.28	0.02	1.75	1.63 1.87
Sun Sensitivity				
Nothing would happen	---	---	1	---
Turn darker, without sunburn	-0.42	0.03	0.75	0.68 0.84
Burn mildly, some or no tanning	-0.36	0.03	0.80	0.71 0.90
Moderate sunburn with peeling	0.08	0.03	1.24	1.11 1.40
Severe sunburn with blisters	0.85	0.05	2.68	2.31 3.10
Geographic Region				
South	---	---	1	---
West	0.21	0.04	1.09	0.97 1.23
Midwest	-0.28	0.03	0.67	0.60 0.74
Northeast	-0.04	0.04	0.85	0.77 0.94

Wear baseball cap/visor on warm sunny day (n=182,914,946)				
Variable	B	SE	OR	95%CI
Season				
Summer	---	---	1	---
Fall	0.002	0.05	1.00	0.91 1.10
Winter	0.15	0.05	1.16	1.05 1.28
Spring	0.10	0.05	1.11	1.00 1.23
Age (continuous)	0.02	0.001	1.02	1.01 1.02
Sex				
Male	---	---	1	---
Female	-1.40	0.04	0.25	0.23 0.26
Sun Sensitivity				
Nothing would happen	---	---	1	---
Turn darker, without sunburn	0.11	0.06	1.12	1.00 1.25

Wear baseball cap/visor on warm sunny day (n=182,914,946)				
Variable	B	SE	OR	95%CI
Burn mildly, some or no tanning	0.20	0.06	1.23	1.09 1.38
Moderate sunburn with peeling	0.45	0.06	1.57	1.39 1.76
Severe sunburn with blisters	0.78	0.08	2.19	1.88 2.55
Geographic Region				
South	---	---	1	---
West	-0.04	0.05	0.96	0.87 1.06
Midwest	-0.19	0.05	0.83	0.76 0.91
Northeast	-0.22	0.05	0.80	0.72 0.89
Wear wide-brimmed hat on warm sunny day (n=182,634,229)				
Variable	B	SE	OR	95%CI
Season				
Summer	---	---	1	---
Fall	-0.08	0.06	0.93	0.82 1.05
Winter	0.18	0.07	1.20	1.05 1.38
Spring	0.04	0.07	1.04	0.92 1.19
Age (continuous)	0.03	0.00	1.03	1.03 1.03
Sex				
Male	---	---	1	---
Female	-0.16	0.05	0.86	0.78 0.94
Sun Sensitivity				
Nothing would happen	---	---	1	---
Turn darker, without sunburn	0.12	0.08	1.13	0.96 1.32
Burn mildly, some or no tanning	0.10	0.08	1.11	0.95 1.29
Moderate sunburn with peeling	0.34	0.08	1.41	1.20 1.65
Severe sunburn with blisters	1.02	0.09	2.78	2.33 3.31
Geographic Region				
South	---	---	1	---
West	0.34	0.06	1.41	1.25 1.60
Midwest	-0.40	0.07	0.67	0.59 0.76
Northeast	-0.37	0.07	0.69	0.61 0.79

Wear long sleeved shirt on warm sunny day (n=182,647,190)				
Variable	B	SE	OR	95%CI
Season				
Summer	---	---	1	---
Fall	-0.01	0.08	0.99	0.85 1.15
Winter	0.29	0.08	1.34	1.14 1.57
Spring	0.24	0.07	1.27	1.11 1.46
Age (continuous)	0.04	0.001	1.04	1.03 1.04
Sex				
Male	---	---	1	---
Female	-0.29	0.05	0.75	0.67 0.83
Sun Sensitivity				
Nothing would happen	---	---	1	---
Turn darker, without sunburn	-0.18	0.09	0.84	0.71 1.00
Burn mildly, some or no tanning	-0.26	0.09	0.77	0.65 0.91
Moderate sunburn with peeling	-0.03	0.09	0.97	0.82 1.16
Severe sunburn with blisters	0.74	0.10	2.09	1.73 2.53
Geographic Region				
South	---	---	1	---
West	0.61	0.07	1.84	1.62 2.09
Midwest	-0.35	0.07	0.70	0.61 0.81
Northeast	-0.32	0.08	0.73	0.62 0.86

Wear long clothing to ankles on warm sunny day (n=182,654,271)				
Variable	B	SE	OR	95%CI
Season				
Summer	---	---	1	---
Fall	-0.001	0.06	1.00	0.89 1.12
Winter	0.17	0.06	1.18	1.06 1.32
Spring	0.11	0.06	1.11	1.00 1.25
Age (continuous)	0.02	0.001	1.02	1.02 1.03
Sex				
Male	---	---	1	---

Wear long clothing to ankles on warm sunny day (n=182,654,271)					
Variable	B	SE	OR	95%CI	
Female	-0.73	0.03	0.48	0.45	0.51
Sun Sensitivity					
Nothing would happen	---	---	1	---	---
Turn darker, without sunburn	-0.22	0.06	0.80	0.72	0.90
Burn mildly, some or no tanning	-0.31	0.06	0.74	0.66	0.82
Moderate sunburn with peeling	-0.11	0.06	0.90	0.80	1.00
Severe sunburn with blisters	0.27	0.07	1.31	1.13	1.51
Geographic Region					
South	---	---	1	---	---
West	0.52	0.05	1.68	1.51	1.86
Midwest	0.11	0.05	1.12	1.00	1.24
Northeast	-0.30	0.05	0.74	0.66	0.82

Table 3
Weighted logistic regression models of individual sun protection behaviors for BRFSS sample.

Use sunscreen in summer (n=17,250,774)				
Variable	B	SE	OR	95%CI
Season				
Summer	---	---	1	---
Fall	-0.07	0.07	0.93	0.82 1.07
Winter	0.02	0.07	1.02	0.89 1.17
Spring	-0.03	0.07	0.97	0.85 1.12
Age (continuous)	0.002	0.002	1.00	1.00 1.01
Sex				
Male	---	---	1	---
Female	0.91	0.05	2.47	2.24 2.73
Sun Sensitivity				
Not have anything happen	---	---	1	---
Darken without sunburn	0.35	0.08	1.42	1.20 1.67
Sunburn	1.22	0.08	3.39	2.92 3.93
Geographic Region				
South	---	---	1	---
West	0.09	0.05	1.09	0.99 1.21
Midwest	-0.28	0.06	0.76	0.67 0.84
Stay in shade in summer (n=16,951,221)				
Variable	B	SE	OR	95%CI
Season				
Summer	---	---	1	---
Fall	-0.16	0.07	0.85	0.74 0.98
Winter	-0.26	0.07	0.77	0.67 0.89
Spring	-0.30	0.08	0.74	0.64 0.86
Age (continuous)	0.02	0.002	1.03	1.02 1.03
Sex				

Stay in shade in summer (n=16,951,221)				
Variable	B	SE	OR	95%CI
Male	---	---	1	---
Female	0.73	0.05	2.07	1.86 2.30
Sun Sensitivity				
Not have anything happen	---	---	1	---
Darken without sunburn	-0.16	0.08	0.86	0.73 1.01
Sunburn	0.12	0.07	1.13	0.98 1.29
Geographic Region				
South	---	---	1	---
West	-0.43	0.05	0.65	0.59 0.72
Midwest	-0.52	0.06	0.59	0.53 0.67
Wear hat in summer (n=17,262,043)				
Variable	B	SE	OR	95%CI
Season				
Summer	---	---	1	---
Fall	0.02	0.07	1.02	0.89 1.17
Winter	-0.08	0.07	0.92	0.80 1.06
Spring	-0.13	0.07	0.87	0.76 1.01
Age (continuous)	0.03	0.002	1.03	1.03 1.04
Sex				
Male	---	---	1	---
Female	-1.10	0.05	0.33	0.30 0.37
Sun Sensitivity				
Not have anything happen	---	---	1	---
Darken without sunburn	0.03	0.08	1.03	0.89 1.20
Sunburn	0.42	0.07	1.52	1.33 1.74
Geographic Region				
South	---	---	1	---
West	0.02	0.05	1.02	0.92 1.13
Midwest	0.36	0.06	1.43	1.28 1.60

Wear long-sleeved shirt in summer (n=17,245,812)				
Variable	B	SE	OR	95%CI
Season				
Summer	---	---	1	---
Fall	0.06	0.10	1.06	0.88 1.29
Winter	0.13	0.11	1.14	0.92 1.40
Spring	0.17	0.11	1.18	0.96 1.46
Age (continuous)	0.05	0.002	1.05	1.04 1.05
Sex				
Male	---	---	1	---
Female	-0.31	0.07	0.73	0.64 0.84
Sun Sensitivity				
Not have anything happen	---	---	1	---
Darken without sunburn	-0.55	0.12	0.58	0.46 0.73
Sunburn	0.09	0.10	1.10	0.90 1.33
Geographic Region				
South	---	---	1	---
West	0.54	0.08	1.71	1.45 2.01
Midwest	0.59	0.09	1.81	1.52 2.15