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Original or Commentary

Do non-melanoma skin cancer survivors use tanning beds less often than the general public?

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Abstract

Purpose

Indoor tanning is associated with an increased risk of non-melanoma skin cancers (NMSC), yet little is known about indoor tanning habits of individuals with a history of NMSC.

Methods

We examined self-reported history of NMSC and tanning bed use among non-Hispanic white respondents in the 2010 National Health Interview Survey (NHIS), a cross-sectional population-based survey designed to be representative of the civilian US population. We computed weighted population estimates and standard errors using the Taylor series linearization method. We then evaluated chi-square tests of independence and conducted weighted logistic regression analyses to evaluate if NMSC status was a predictor of indoor tanning.

Results

In our analytic sample of 14,400 non-Hispanic white participants, representing 145,287,995 in the population, 543 participants (weighted proportion = 3.45%) self-reported a history of NMSC or “skin cancer type not known.” In multivariate analyses, non-melanoma skin cancer survivors were no less likely to use tanning beds in the last 12 months than skin cancer free controls (OR = 0.70, 95% CI: 0.34-1.43, $p = 0.33$).

Conclusions

Non-melanoma skin cancer survivors should be educated on their increased risk of recurrence and other skin cancers and in particular the role of indoor tanning in skin tumorigenesis.

Introduction

Ultraviolet (UV) radiation exposure is the predominant environmental risk factor for both basal cell carcinoma and cutaneous squamous cell carcinoma [1]. A recent meta-analysis of epidemiologic studies found an increased risk of non-melanoma skin cancer (NMSC) with ever indoor tanning, a source of artificial UV, with 67% and 29% higher risks for squamous and basal cell carcinomas, respectively [2]. Indoor tanning has been growing in popularity in recent decades and approximately 30 million Americans tan indoors annually [3].

As continued UV radiation exposure may increase one's risk of developing future skin cancers, one might expect those diagnosed with skin cancer to cease indoor tanning, yet there is little research on this topic. One study of melanoma survivors found indoor tanning after diagnosis was similar to controls and noted that at least 6.4% reported tanning bed use after their diagnosis [4]. A second study reported a decrease in indoor tanning from 13 to 2% after melanoma diagnosis [5]. A recent study reported that among individuals who had tanned indoors prior to a diagnosis of early-onset basal cell carcinoma (under age 40), 15% reported tanning indoors after their skin cancer diagnosis, and 8% were considered frequent indoor tanners (defined as ≥ 10 sessions per year) [6]. To our knowledge, the current study is the first to examine indoor tanning in NMSC survivors compared to individuals without skin cancer in a nationally representative sample.

Methods

The National Health Interview Survey (NHIS) is a cross-sectional population-based survey designed to be representative of the civilian US population. Institutionalized individuals and those in the military are excluded. The survey, designed by the Center for Disease Control and Prevention's National Center for Health Statistics, is administered by US Census Bureau interviewers using computer assisted personal interviewing. The questionnaire focuses on health status and behaviors affecting health status, such as dietary preferences, medication use, dietary supplement use, tobacco use, and UV radiation exposure. Family medical history and past medical history are also collected.

The NHIS is a publically available dataset with completely deidentified data. This study, utilizing this data source, was deemed exempt by the Human Investigations Committee of Yale University. We examined self-reported history of NMSC and tanning bed use in the previous 12 months among non-Hispanic white respondents in the 2010 NHIS (overall response rate = 60.8%). Survey respondents were asked if they ever had cancer, and if they answered yes, they were then asked which type of cancer they had. Because of the structure of the data collection in which respondents were not presented with a list of cancer types, those participants who did not consider their NMSC to be a cancer would not have been classified as a NMSC survivor in the NHIS. In addition, participants who reported skin cancer without additional details to classify the type were coded as "skin cancer type not known." In this analysis, NMSC survivors were considered to be those who reported a history of NMSC, as well as those classified as "skin cancer type not known" because most skin cancers occurring in a population are NMSC. Individuals who reported a history of melanoma were excluded from the analytic population.

To account for NHIS' complex stratified, multistage probability sampling design, SUDAAN software 9.0 (RTI International, Research Triangle, NC) was used to compute weighted population estimates and standard errors using the robust Taylor series linearization method. Any estimate with a relative standard error (RSE) greater than 30% was flagged as statistically unreliable, as suggested by NHIS standards of reliability/precision.

We then conducted chi-square tests of independence comparing NMSC survivors to skin cancer free controls and weighted multiple logistic regression analyses to evaluate the association between NMSC survivor status and indoor tanning in the past 12 months. We adjusted for other characteristics that were associated with indoor tanning behavior.

Results

In our analytic sample of 14,400 non-Hispanic white participants, representing 145,287,995 in the population, 543 participants (weighted proportion = 3.45%) self-reported a history of NMSC or "skin cancer type not known." Table 1 reports demographic characteristics of the NMSC survivors and skin cancer free controls.

Table 1. Demographic characteristics of non-Hispanic white NMSC survivors and skin cancer free controls in the 2010 NHIS

	NMSC Survivors	Skin Cancer Free Controls
Sample size ^a	543	13857

Estimated population size	5,009,058		140,278,937	
Characteristic	Cases ^a	Proportion (%) (SE) ^b	Cases ^a	Proportion (%) (SE) ^b
Sex				
Male	259	52.24 (2.45)	6,188	48.21 (0.50)
Female	284	47.76 (2.45)	7,669	51.79 (0.50)
Insurance				
No insurance	23	4.39 (1.01)	1,775	13.72 (0.38)
Medicare	310	52.10 (2.54)	3,435	20.98 (0.44)
Medicaid	3	0.47 (0.29) ^c	546	4.06 (0.22)
Military	15	3.01 (0.90) ^c	362	2.32 (0.19)
Private	182	40.03 (2.64)	7,449	58.92 (0.62)
Income				
\$0-34,999	172	26.33 (2.36)	4,819	29.36 (0.60)
\$35-74,999	169	33.31 (2.56)	4,257	32.88 (0.55)
\$75-99,999	60	13.85 (1.91)	1,533	13.43 (0.41)
≥ \$100,000	105	26.51 (2.43)	2,512	24.33 (0.61)
Education				
Less than grade 12	44	8.09 (1.37)	1,366	9.69 (0.33)
High school graduate	139	23.65 (2.03)	3,704	26.85 (0.49)
Some college/associate's degree	158	26.67 (2.03)	4,460	32.10 (0.50)
Bachelors	111	22.25 (2.12)	2,790	20.51 (0.44)
Masters	60	12.09 (1.60)	1,109	8.04 (0.28)
Professional/Doctoral	31	7.25 (1.25)	394	2.80 (0.18)
Region				
West	72	15.69 (1.92)	2,378	18.81 (0.64)
Northeast	136	23.21 (2.25)	3,977	27.93 (0.68)
Midwest	223	42.08 (2.54)	4,553	32.70 (0.76)
South	112	19.01 (1.99)	2,949	20.55 (0.68)
Mean age, years (± SD)	543	63.77 ± 0.76	13,857	47.36 ± 0.22
Indoor Tanning				
Yes	10	2.07 (0.65) ^c	1,039	7.66 (0.31)
No	533	97.93 (0.65)	12,818	92.34 (0.31)

^a Unweighted sample size. ^b Weighted estimates. ^c: Estimates with a relative standard error (RSE) ≥ 30%.

NMSC survivors had a significantly lower unadjusted rate of indoor tanning than the skin cancer free controls in the previous 12 months (2.07 vs. 7.66%, $p < 0.001$); however, in the multivariate model adjusting for age, gender, education, income and insurance status there was no statistically significant difference in indoor tanning between NMSC survivors and controls (OR = 0.70, 95% CI: 0.34-1.43, $p = 0.33$, see Table 2).

Table 2. Results of the weighted multiple logistic analysis with the dependent variable: indoor tanning in previous 12 months.

Characteristics	OR (95% CI)	P-value ^a
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NMSC survivor		
No	1.00	
Yes	0.70 (0.34-1.43)	0.33
Sex		< 0.001
Male	1.00	
Female	4.69 (3.87-5.67)	
Insurance		< 0.001
No insurance	1.00	
Medicare	0.60 (0.39-0.91)	
Medicaid	0.76 (0.52-1.12)	
Military	0.84 (0.51-1.40)	
Private	1.18 (0.94-1.48)	
Income		0.09
\$0-34,999	1.00	
\$35-74,999	1.07 (0.86-1.33)	
\$75-99,999	1.39 (1.07-1.80)	
≥ \$100,000	1.21 (0.92-1.58)	
Education		< 0.001
Less than grade 12	1.00	
High school graduate	1.43 (0.97-2.09)	
Some college/associate's degree	1.59 (1.13-2.23)	
Bachelors	0.95 (0.63-1.42)	
Masters	0.70 (0.44-1.10)	
Professional/Doctoral	0.62 (0.29-1.31)	
Region		< 0.001
West	1.21 (0.83-1.76)	
Northeast	2.10 (1.60-2.76)	
Midwest	1.62 (1.22-2.14)	
South	1.00	
Age, per year	0.95 (0.94-0.96)	< 0.001

^a: Wald F-test *P*-value

Discussion

In this national sample, a small percentage of individuals who self-identified as NMSC survivors reported indoor tanning after their skin cancer diagnosis. Despite indoor tanning being associated with skin cancer risk, little is known about this behavior in skin cancer survivors [4-6]. Since indoor tanning is more common among young people, and the NMSC survivors in NHIS were primarily older individuals, additional work should continue to explore indoor tanning behavior in young skin cancer survivors.

While these data are unique for evaluating indoor tanning in NMSC survivors and controls, there are several limitations. Both cancer diagnosis and indoor tanning were collected via self-report. Therefore, recall and reporting biases are possible. NMSC is the most common cancer in the US, and yet only 3.45% of non-Hispanic white NHIS respondents reported a history of NMSC or “skin cancer type not known.” This percentage is low, perhaps because NMSC is often misunderstood and may not be considered a cancer by the general population. It is also possible that the “skin cancer type not known” group may include some individuals with melanoma rather than NMSC, but in sensitivity analyses excluding these individuals from the NMSC survivor group all results were similar.

In addition, the prevalence of indoor tanning among the NMSC survivors had an RSE greater than 30%, which is above the NHIS threshold for reliability and precision. Therefore, this estimate of indoor tanning prevalence should be interpreted cautiously. However, given the lack of national data on this behavior in skin cancer survivors, it is still noteworthy that some individuals who are aware of and report on their prior skin cancer diagnosis continue to indoor tan after their diagnosis. Finally, respondents were only asked about indoor tanning in the previous 12 months, and we assumed this entire time period was after their NMSC diagnosis.

Despite these limitations, in this large, nationally representative study, self-identified NMSC survivors were no less likely to report using tanning beds than a sample of skin cancer free controls from the general population. This suggests that there is room for improvement in this minority of NMSC survivors who continue to indoor tan after skin cancer diagnosis.

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