



Sex differences and risk behaviors among indoor tanners☆

Anne K. Julian^{a,*}, Jeffrey W. Bethel^b, Michelle C. Odden^b, Sheryl Thorburn^a

^a Oregon State University, College of Public Health and Human Sciences, 401 Waldo Hall, Corvallis, OR, United States

^b Oregon State University, College of Public Health and Human Sciences, 103 Milam Hall, Corvallis, OR, United States

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ABSTRACT

Objective. The objectives were to examine (1) sex differences in factors associated with indoor tanning, and (2) the relationship between cancer risk perception and skin cancer screening among indoor tanners.

Methods. Data are from the 2010 National Health Interview Survey. The sample was limited to U.S. adults (≥18 years) using an indoor tanning device in the last year (N = 1177). We conducted bivariate and multivariate weighted analyses.

Results. Among indoor tanners, less than 30% of men and women reported having ever had a skin exam. Male sex was significantly associated with rarely/never using sunscreen (51.4% of men vs. 36.4% of women) and with binge drinking of alcohol (47.6% of men vs. 37.4% of women). No sex differences in smoking were present. Indoor tanners who perceived themselves “about equally likely” to develop cancer (any type) as similar others were less likely to have received a skin cancer examination than those with high perceived risk.

Conclusion. The relationship of cancer risk perception to skin cancer screening is complex. Rates of risk and protective behaviors observed among men and women who indoor tan suggest mixed-sex tanning prevention efforts should target multiple risk behaviors.

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1. Introduction

Intentional ultraviolet (UV) exposure via indoor tanning is a significant risk factor for melanoma and non-melanoma skin cancers (Coelho and Hearing, 2010). In 2009, the International Agency for Research on Cancer (IARC) classified use of UV-emitting tanning devices as a known carcinogen (“IARC Monographs-Classifications”, 2014). In addition, the U.S. Surgeon General recently issued a *call to action* to prevent skin cancer intended to increase awareness and reduce skin cancer risk (U.S. Department of Health and Human Services, 2014). Despite the well-established association between UV exposure and melanoma, indoor tanning remains popular (Guy et al., 2015), U.S. studies estimate 23.3%–35.1% of young women and 6.3%–6.5% of young men tan indoors (Amrock and Weitzman, 2014; Basch et al., 2014; Choi et al., 2010).

Indoor tanning presents a health risk to both sexes, although important sex differences may exist. For example, frequency of sun-protective behaviors such as sunscreen use is lower among men (Holman et al., 2015). In addition, higher frequency of multiple skin cancer risk behaviors (e.g., not seeking shade on sunny days) is seen among men (Buller et al., 2012; Janssen et al., 2015). Men are generally not targets of

sunscreen advertising (Lee et al., 2006) although men's magazines more often promote protective clothing to prevent sunburn (McWhirter and Hoffman-Goetz, 2015). One approach of current tanning interventions (e.g., Hillhouse et al., 2010) is to focus on negative impacts of tanning such as wrinkles, premature aging, and hyperpigmentation (Holman et al., 2013), but such cosmetic concerns may not effectively motivate behavior change in male tanners. Furthermore, risky behaviors associated with tanning differ between men and women. Boys who tan report participation on multiple sports teams, and consumption of adequate fruits and vegetables, although they also report a history of illicit steroid use (Miyamoto et al., 2012). These findings diverge from female tanning correlates such as smoking and risky alcohol use (Coups et al., 2008; Mosher and Danoff-Burg, 2010), low levels of physical activity, personal importance of thinness, weight concern, and frequent dieting (Holman and Watson, 2013), depression and poor body image (Gillen and Markey, 2012; Mosher and Danoff-Burg, 2010). Thus, aggregating data from men and women may obscure sex differences that could inform tanning prevention efforts.

Men and women also differ in their estimation of risk (Finucane et al., 2000; Flynn et al., 1994; Johnson, 2002; Palmer, 2003), a discrepancy that has been validated in national (Flynn et al., 1994) and international samples (Morioka, 2014). Perceived risk and perceived susceptibility to disease are considered important motivators of health protective behavior (Rosenstock et al., 1988). The possibility that sex differences in perceived risk contribute to differences in health protective behaviors such as skin cancer screening highlights a knowledge gap that may

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* Corresponding author.

E-mail addresses: Juliana@onid.oregonstate.edu (A.K. Julian),

Jeff.Bethel@oregonstate.edu (J.W. Bethel), Michelle.Odden@oregonstate.edu

(M.C. Odden), Sheryl.Thorburn@oregonstate.edu (S. Thorburn).

undermine cancer risk reduction efforts among indoor tanners. In order to better understand the behaviors of indoor tanners, our objectives were to examine (1) differences in distribution of factors associated with indoor tanning by sex, and (2) the relationship between cancer risk perception and skin cancer screening among indoor tanners.

2. Methods

2.1. Data source

We analyzed data from the 2010 National Health Interview Survey (NHIS), an annual cross-sectional health survey of the U.S. civilian, non-institutionalized population. NHIS data collection follows a multi-stage clustered sampling design that includes oversampling of specific subpopulations. Interviews were conducted primarily in person and covered a broad variety of health topics. The NHIS 2010 sample included 27,157 adults (≥ 18 years), with a final adult response rate of 60.8%. The sample for analysis was limited to adults using an indoor tanning device in the last year ($N = 1,177$), hereafter referred to as indoor tanners. The NHIS methods, measures, and sampling scheme are described in detail elsewhere (“NHIS Survey Description”, 2010). Institutional Review Board approval was not needed, because this project utilized de-identified, publicly available data.

2.2. Measures

Socio-demographic variables included age, education, geographic region, and insurance status (covered by private or public health insurance or not). Questions also assessed skin response to one hour in the sun and frequency of sunscreen use on a warm, sunny day. Based on the response distribution, the *never* and *almost never* response categories for sunscreen use were collapsed into *low sunscreen use*; *always* and *almost always* were collapsed into *high sunscreen use* in some analyses. Because non-daily smoking is increasing in the U.S. (Shiffman et al., 2012), we defined smoking by whether or not participants had ever smoked one hundred cigarettes to capture smoking of a non-daily nature, in addition to frequent smoking. The measure of binge drinking was the average number of drinks consumed on a day when drinking; binge drinking was defined as 4 or more drinks for women and 5 or more drinks for men, as recommended by the National Institute of Alcohol Abuse and Alcoholism (2004). NHIS items measuring physical activity were recoded to reflect an activity level that either does not meet or meets recommendations of at least 150 min per week (Physical Activity Guidelines Advisory Committee, 2008). Participants indicated whether they had seen a mental health professional in the last 12 months. They also rated their general overall mental health, mood, and ability to think; responses of *good*, *fair* and *poor* were combined. Participants indicated their perceived likelihood of developing cancer (any type) compared to a person of similar age and sex (*more likely*, *about equally likely*, and *less likely*, hereafter referred to as *high*, *average*, and *low* risk perception, respectively). Participants who responded “don’t know” were combined with the *average* risk perception category ($n = 31$). The primary outcome was skin cancer screening, measured by whether or not the respondent reported ever receiving a skin cancer examination.

2.3. Analyses

Analyses were conducted using Stata, version 13.0 (StataCorp., 2013). Data were weighted using the sampling weights provided by NHIS. Except where noted otherwise, we coded *don't know* and *refused* responses as missing. All variables were determined to have a frequency of missingness lower than 3%. Patterns of missing data were analyzed by examining tabulations and summaries, and missing data were assumed to be missing at random. Analyses were performed using pairwise deletion, so all available data would be used for each analysis.

We assessed the association of each independent variable with sex in contingency tables, using Pearson's chi-squared test to assess statistical significance. We similarly examined the bivariate association between cancer risk perception and skin cancer screening among all indoor tanners and stratified by sex. We next examined the adjusted associations between select independent variables and skin cancer screening using hierarchical multiple logistic regression. A priori, we included sex and cancer risk perception, and tested for an interaction between these variables. The interaction term was not significant and, therefore, was not included in subsequent analyses. Other variables were included if they were associated with skin cancer screening in bivariate analyses; variables that met this criterion were education, insurance status, and sunscreen use. In this analysis, education was treated as an ordinal variable based on its linear association with screening. A significance level of $p < 0.05$ was set for all analyses.

3. Results

Among indoor tanners, sex was significantly associated with binge drinking, with more men reporting binge drinking (Table 1). Male and female indoor tanners also significantly differed in their sunscreen use; a greater proportion of men rarely or never used sunscreen, and a smaller proportion used sunscreen always or most of the time. No significant sex differences in skin cancer screening were found.

Cancer risk perception was significantly associated with skin cancer screening ($\chi^2 = 14.02$, $p = 0.01$). Skin cancer screening was lowest among the *average* risk perception group (18.3%); among the *high* and *low* risk perception groups, 30.6% and 24.4%, respectively, reported skin cancer screening. Similarly, the association was significant among women ($\chi^2 = 12.47$, $p = 0.02$); 17.4% of the *average* risk perception group reported skin cancer screening, and 29.8% and 23.9% of those with *high* and *low* cancer risk perception, respectively, reported screening. Cancer risk perception was not significantly associated with skin cancer screening among men.

Hierarchical multiple logistic regression models indicated that skin cancer screening was significantly more likely among indoor tanners with *high* risk perception compared to those with *average* risk perception, but the *low* and *average* risk groups did not significantly differ (Table 2). Greater education was associated with having ever been screened for skin cancer. Sex and insurance status were not significantly associated with skin cancer screening.

4. Discussion

The low rate of cancer screening observed among those with *average* cancer risk (i.e., those perceiving their cancer risk to be “about the same” as similar others), although not statistically significantly different from that observed among the *low* risk perception group, suggests a non-linear relationship of cancer risk perception to skin cancer screening behavior. One possible explanation for the observed relationship is that the *average* risk perception response may reflect the absence of opinion or adequate reflection on the topic, or a low level of health information, which precludes recognition of the cancer risk inherent in indoor tanning. If so, these individuals may be at the highest risk for poor health outcomes compared with those with high or low perceived risk.

Although men and women tanners differed on some variables, the similar levels of cancer risk perception, smoking, and alcohol use, as well as low levels of screening, observed in a clearly high-risk group suggest that female tanners mirror men in risky health behaviors. These patterns may clarify whether men and women should be treated as a single population for indoor tanning intervention. In line with our findings, women who tan indoors have been reported to drink alcohol more commonly and in larger quantities than their non-tanning counterparts (Bagdasarov et al., 2008; O’Riordan et al., 2006), yet women in the general population binge drink much less than men (Nolen-

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