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Social Media Use and Indoor Tanning among a National Sample of Young Adult Non-Hispanic White Women: A Cross-Sectional Study

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Online social media sites are increasingly utilized in public health efforts[1] and may represent a valuable avenue to target messages discouraging use of indoor tanning beds (IT) to young women, a group with high levels of engagement in social media and the highest rates of IT.[2] This study aimed to examine the association between use of social media sites and IT behavior.

Participants were women aged 18–25 years drawn from the nationally representative GfK Knowledge Networks online survey panel (www.gfk.com/us). GfK's panel is recruited using address-based and random-digit dialing probability sampling that covers 97% of United

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This study received University IRB approval.

States households. If needed, online survey access is provided to panel members at no cost. The study received IRB approval and all participants provided informed consent. Respondents received $5 for survey completion. Number of past 12-month IT sessions was assessed using an item recommended from a National Cancer Institute sponsored workshop[3] with open-ended responses recoded[1] to represent non-tanners (0 IT sessions), occasional users (1–9), and frequent users (≥10). Participants indicated their frequency of social media use (Table 1) on GfK's standard panel profile survey assessment[4] between December 2013 and June 2014. Data were analyzed using separate ordinal logistic regression models for each social media site with data weighting (adjusting for factors including probability of panel selection, potential post-stratification non-response, and non-coverage biases) and adjusting for demographic variables (age, household income, education level, and region of residence) (see online supplement for additional information about weighting available).

An email study notification was sent to a random sample of 2,217 eligible panelists in June 2014. Survey data collection was ended after the contracted number of completed surveys (n = 848; 38% response rate). Analyses were restricted to 463 non-Hispanic white participants (as in prior IT research[2]) who reported any past year Internet use for purposes other than GfK surveys (Table 1).

Frequency of use of Facebook or Pinterest was not associated with past 12-month IT (Table 2). For a one-unit increase in the IT variable (e.g., going from 0 to 1–9 sessions) the odds of reporting regular Twitter use versus none/little use were 1.96 greater. With Instagram, for a one-unit increase in IT, the odds of reporting occasional Instagram use versus none/little use were 2.01 greater and 2.50 greater for regular use versus none/little use.

Study limitations include a lack of questions that assessed specific social media activities and would help to establish the validity of the social media use measure. The use of web-panel participants and study participant self-selection may limit generalizability.

Higher rates of IT were associated with use of Twitter and Instagram among a national sample of young adult women. These social media platforms may provide a valuable means to deliver skin cancer prevention messages to audiences with a higher proportion of frequent IT users. The use of social media to disseminate IT industry counter-messages may be particularly important because tanning salons actively utilize social media marketing.[5] Future research should identify characteristics that may draw individuals to both IT and social media. For example, body image constructs including appearance comparison tendencies and body dissatisfaction have been linked to use of social media[6] and IT[7]. Twitter and Instagram are designed for actively communicating and sharing information and images and may encourage IT by increasing users' exposure to social norms and peer pressure to tan.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Appendix: Notes On Weights, Produced by GfK Custom Research

The design for KnowledgePanel® recruitment begins as an equal probability sample with several enhancements incorporated to improve efficiency. Since any alteration in the selection process is a deviation from a pure equal probability sample design, statistical weighting adjustments are made to the data to offset known selection deviations. These adjustments are incorporated in the sample's base weight.

There are also several sources of survey error that are an inherent part of any survey process, such as non-coverage and non-response due to panel recruitment methods and to inevitable panel attrition. We address these sources of sampling and non-sampling error by using a panel demographic post-stratification weight as an additional adjustment.

All the above weighting is done before the study sample is drawn. Once a study sample is finalized (all data collected and a final data set made), a set of study-specific post-stratification weights are constructed so that the study data can be adjusted for the study's sample design and for survey non-response.

A description of these types of weights follows.

The Base Weight

In a KnowledgePanel sample there are eight known sources of deviation from an equal probability of selection design. These are corrected in the Base Weight and are described below.

1. Under-sampling of telephone numbers unmatched to a valid mailing address

An address match is attempted on all the Random Digit Dial (RDD)-generated telephone numbers in the sample after the sample has been purged of business and institutional numbers and screened for non-working numbers. The success rate for address matching is in the 60 to 70% range. Households having telephone numbers with valid addresses are sent an advance letter, notifying them that they will be contacted by phone to join KnowledgePanel. The remaining, unmatched numbers are under-sampled as a recruitment efficiency strategy. Advance letters improve recruitment success rates. Under-sampling was suspended between July 2005 and April 2007. It was resumed in May 2007, using a sampling rate of 0.75. RDD recruitment ended in July 2009.

2. RDD selection proportional to the number of telephone landlines reaching the household

As part of the field data collection operation, information is collected on the number of separate telephone landlines in each selected household. The probability of selecting a

multiple-line household is down-weighted by the inverse of the number of landlines. RDD recruitment ended in July 2009.

3. Some minor oversampling of Chicago and Los Angeles in early pilot surveys

Two pilot surveys carried out in Chicago and Los Angeles when the panel was initially being built increased the relative size of the sample from these two cities. With natural attrition and growth in size of the overall panel, that impact has declined over time. It remains part of our base adjustment weighting because of a small number of extant panel members from that initial panel cohort.

4. Early oversampling the four largest states and central region states

At the time when the panel was first being built, survey demand in the four largest states (California, New York, Florida, and Texas) necessitated oversampling during January–October 2000. Similarly, the central region states were oversampled for a brief period of time. These now diminishing effects still remain in the panel membership and thus weighting adjustments are required for these geographic areas.

5. Under-sampling of households not covered by the MSN® TV service network

Certain small areas of the U.S. are not serviced by MSN®, thus the MSN®TV units (Web-TV) distributed to non-Internet households prior to January 2009 could not be used for those recruited nonInternet households. Overall, the result is a small residual under-sample in those geographic areas which requires a minor weighting adjustment for those locations. Since January 2010, laptop computers with dial-up access are being distributed to non-Internet households, thus eliminating this under-coverage component.

6. RDD oversampling of African American and Hispanic telephone exchanges

As of October 2001, oversampling of telephone exchanges with a higher density of minority households (specifically, African American and Hispanic) was implemented to increase panel membership for those groups. These exchanges were oversampled at approximately twice the rate of other exchanges. This oversampling is corrected in the base weight. RDD recruitment ended in July 2009.

7. Address-based sample phone match adjustment

Toward the end of 2008, GfK began recruiting panel members by using an address-based sample (ABS) frame in addition to RDD recruitment. Once recruitment through the mail, including follow-up mailings to ABS non-respondents was completed, telephone recruitment was added. Non-responding ABS households where a landline telephone number could be matched to an address were subsequently called and telephone recruitment was initiated. This effort resulted in a slight overall disproportionate number of landline households being recruited in a given ABS sample. A base weight adjustment is applied to return the ABS recruitment panel members to the sample's correct national proportion of phone-match and no phone-match households.

8. ABS oversample stratification adjustment

In late 2009 the ABS sample began incorporating a geographic stratification design. Census blocks with high density minority communities were oversampled (Stratum 1) and the

balance of the census blocks (Stratum 2) were relatively under-sampled. The definition of high density and minority community and the relative proportion between strata differed among specific ABS samples. In 2010, the two strata were redefined to target high density Hispanic areas in Stratum 1 and all else in Stratum 2. In 2011, pre-identified ancillary information and not census block data were used to construct and target four strata as follows: Hispanic ages 18–24, Non-Hispanic ages 18–24, Hispanic ages 25+ and Non-Hispanic ages 25+. An appropriate base weight adjustment is applied to each relevant sample to correct for these stratified designs. Also in 2011, a separate sample targeting only persons ages 18–24 was fielded across the year also using predictive ancillary information. Combined with the four-stratum sample, the base weight adjustment compensates for cases from this unique young adult over-sample. In 2012, a similar four-stratum design is used but the ages have been changed to 18–29 and 30+ for both the Hispanic and Non-Hispanic strata.

The Panel Demographic Post-stratification Weight

To reduce the effects of any non-response and non-coverage bias in the overall panel membership (before the study sample is drawn), a post-stratification adjustment is applied based on demographic distributions from the 2013 March Supplement data from the Current Population Survey (CPS). The benchmark distributions for Internet access among the U.S. population of adults are obtained from the most recent special CPS supplemental survey measuring Internet access (October 2012).

The overall panel post-stratification variables include:

- Gender (Male/Female) □
- Age (18–29, 30–44, 45–59, and 60+) □
- Race/Hispanic ethnicity (White/Non-Hispanic, Black/Non-Hispanic, Other/Non-Hispanic, □2+ Races/Non-Hispanic, Hispanic) □
- Education (Less than High School, High School, Some College, Bachelor and beyond) □
- Census Region (Northeast, Midwest, South, West) □
- Household income (under $10k, $10K to <$25k, $25K to <$50k, $50K to < $75k, $75K to <$100k, $100K+) □
- Home ownership status (Own, Rent/Other) □
- Metropolitan Area (Yes, No) □
- Internet Access (Yes, No) □The Panel Demographic Post-stratification weight is applied prior to a probability proportional to size (PPS) selection of a study sample from KnowledgePanel. This weight is designed for sample selection purposes. □

Study-Specific Post-Stratification Weights □

Once the sample has been selected and fielded, and all the study data are collected and made final, a post-stratification weight is computed to adjust for any survey non-response as well as any non-coverage or under- and over-sampling resulting from the study-specific sample design. Demographic and geographic distributions for the female non-institutionalized, civilian population ages 18 to 25 from the most recent CPS are used as benchmarks in this adjustment. □

The following benchmark distributions are utilized for this post-stratification: □

- Age (18–20, 21–23, and 24–25) □
- Race/Hispanic ethnicity (White/Non-Hispanic, Black/Non-Hispanic, Other/Non-Hispanic, □2+ Races/Non-Hispanic, Hispanic) □
- Education (Less than High School, High School, Some College, Bachelors and higher) □
- Household income (under <$25k, $25K to <$50k, $50K to <$75k, $75K+) □
- Census Region (Northeast, Midwest, South, West) □
- Metropolitan Area (Yes, No) □ Comparable distributions are calculated by using all completed cases from the field data (n = 823). Since study sample sizes are typically too small to accommodate a complete cross- tabulation of all the survey variables with the benchmark variables, a raking procedure is used for the post-stratification weighting adjustment. Using the base weight as the starting weight, this procedure adjusts the sample data back to the selected benchmark proportions. Through an iterative convergence process, the weighted sample data are optimally fitted to the marginal distributions. □After this final post-stratification adjustment, the distribution of the calculated weights are examined to identify and, if necessary, trim outliers at the extreme upper and lower tails of the weight distribution. The post-stratified and trimmed weights are then scaled to the sum of the total sample size of all eligible respondents.

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Table 1

Characteristics of the Study Sample

	Sample (%)
Age (years)	
18	15.4
19	12.2
20	11.5
21	9.8
22	13.6
23	15.4
24	8.0
25	14.2
Region of state of residence	
Northeast	19.5
South	30.1
Midwest	30.6
West	19.8
Annual household Income	
$9,999 or less	4.5
$10,000 to $24,999	9.0
$25,000 to $39,999	13.9
$40,000 to $74,999	27.1
$80,000 or higher	45.5
Highest education received	
Less than high school	19.5
High school	19.8
Some college	45.8
Bachelor's degree or higher	14.8
Number of past 12-month indoor tanning sessions	
0	80.7
1–9	8.7
10 or more	10.2

Note. N = 463 participants who reporting being non-Hispanic white. All percentages are weighted.

Table 2

Prevalence of Social Media Use and Past 12- Month Indoor Tanning among a National Sample of Young Adult, Non-Hispanic White Women

How often do you use the following websites and online services?	Sample Response %	Indoor tanning[a] *OR* (95% CI)	*p*
Facebook			
None/Little[b]	19.7	Ref	–
Occasional	15.6	0.92 (0.50–1.68)	.58
Regular	64.2	1.24 (0.57–2.69)	.78
Twitter			
None/Little	70.2	Ref	–
Occasional	11.8	1.42 (0.68–2.93)	.35
Regular	17.4	1.96 (1.09–.54)	.03
Instagram			
None/Little	66.9	Ref	–
Occasional	12.5	2.01 (1.01–4.02)	.05
Regular	19.7	2.50 (1.42–4.39)	<.01
Pinterest			
None/Little	65.2	Ref	–
Occasional	21.7	1.16 (0.65–2.08)	.61
Regular	12.6	0.92 (0.44–1.94)	.83

Note. Data were analyzed using separate ordinal logistic regression models for each social media service. The assumption of proportional odds was met for each model.

Analyses were weighted and adjusted for age, region of residence, household income, and education level (regression results for adjustment variables not presented).

[a]Response options for past 12-month indoor tanning were recoded into one of three categories: 0 sessions, 1–9 sessions, 10 or more sessions.

[b]Response options for social media items were recoded for analyses as follows: *I never use this site* or *less than once a month* recoded as none/little; *at least once a month* or *at least once a week* recoded as occasional; *and daily or multiple times every day* recoded as regular.