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Exposure to Tobacco on the Internet: Content Analysis of Adolescents' Internet Use

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Abstract

OBJECTIVE—We performed a content analysis of all Web pages viewed by a random sample of adolescents to describe exposure to tobacco- and smoking-related text and images.

METHODS—Adolescents (14–17 years of age) with home Internet access were recruited. Internet-tracking software was installed on home computers used by 346 eligible consenting participants. All Web pages viewed by adolescent participants were captured during a 30-day period for each subject. Keywords on smoking and tobacco were used to identify tobacco images or text.

RESULTS—The 346 participants viewed 1.2 million Web pages, of which 8702 (0.72%) contained tobacco or smoking content. Exposure to tobacco content did not vary according to smoking status. Content was protobacco on 1916 pages, antitobacco on 1572, and complex or unclear on 5055. Social networking sites, mainly MySpace, represented 53% of pages ($n = 4612$) on which tobacco content was found. All pages with smoking content contained references in text, and 256 (3%) contained images. Many (43%) of the adolescents were exposed to pro-tobacco imagery (median: 3 pages per month). Cigarettes were mentioned on 20% of pages. Tobacco products were sold on 50 pages, and 242 pages contained links to tobacco products sold on other pages. On social networking sites, 4121 pages included a mention of smoking status in the authors' individual profiles, with 23% of authors identifying themselves as smokers.

CONCLUSIONS—Many adolescents are consistently exposed to tobacco content on the Internet, but the volume of exposure is limited and not all content represents protobacco content.

Keywords

Internet; tobacco advertising; tobacco control policy; social networking

Tobacco imagery in traditional media is common and makes adolescents more likely to smoke.
^{1–4} Exposure in movies fosters favorable attitudes and has a dose-response relationship with

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smoking.⁵ Similar connections may exist for Internet exposure to tobacco and smoking.^{6,7} Little is known about adolescents' exposure to tobacco content on the Internet.

With increasing Internet use, concern has been raised regarding the influence of online tobacco content, including advertisements, on adolescents' smoking. In 2006, 91% of 12- to 17-year-old respondents reported using the Internet; 61% reported doing so daily.⁸ Among online adolescents, 64% participated in content creation, and 55% used social networking sites such as MySpace or Facebook.⁹ In 2004, 34% of middle school students and 39% of high school students reported seeing tobacco advertisements on the Internet.¹⁰ Tobacco products are sold online¹¹⁻¹³ and frequently are sold to minors.¹⁴⁻¹⁷ Internet sales of tobacco products represent 6% to 14% of total US tobacco sales.¹⁸

Two studies examined tobacco content on the Internet, analyzing small samples of protobacco Web sites, the content of which could not be linked to actual viewers.^{19,20} Those studies suggested that sites with the greatest youth appeal are sites devoted to smoking as part of culture, often with interactive features designed to create online discussions and pro-smoking communities. However, little information is available regarding the tobacco and smoking content of Web pages encountered by adolescents in their regular use of the Internet. In this study, we examine the tobacco content of Web pages viewed by a random sample of adolescent Internet users.

METHODS

Study Design

To describe exposure to tobacco and smoking text and imagery on the Internet, we performed a content analysis of Web pages viewed by 346 adolescents 14 to 17 years of age who participated in the Tracking Teen Trends (T3) study. T3 study goals were to examine the associations between exposure to Internet sexual content and attitudes, beliefs, and behaviors.²¹ Actual Internet usage was observed by using specialized, proprietary software (comScore, Reston, VA). We analyzed data by using the Web page as the unit of analysis, describing general tobacco content as well as individual exposure to online tobacco content.

Study Population

Adolescents were recruited through random-digit dialing procedures, followed by mailing of recruitment packets. Between July and November 2004, telephone screening of 175 736 individual telephone numbers yielded 1253 households that met the study inclusion criteria. Eligible households were in the contiguous 48 states, had an Internet connection, and included a 14- to 17-year-old resident who reported using the Internet at home at least once in the month preceding the call. Parents or guardians in qualified households were mailed recruitment packets ($N = 1243$), which contained Internet-tracking software (on CD-ROM) and study incentives.

Enrollment required parental consent, adolescent assent, and installation of the software on a home computer (with a Microsoft Windows-based operating system) that was used by the participant. The Internet-tracking software did not require deactivation of parental filters or controls. During the recruitment period, 591 subjects were enrolled and attempted software installation. Of those, 58.5% ($n = 346$) became active (ie, their Internet traffic was recorded successfully on study servers). After installation of the tracking software, some participants never transmitted Internet activity; this was likely attributable to participants' computers flagging the T3 software as invasive spyware, because it tracked and reported on Internet use.

Among 346 subjects, 52.3% were female; 80.6% were white, 7.8% mixed race, 5.5% black, 2.6% Asian or Pacific Islander, 0.6% Native American or Alaskan Native, and 2.9% other race,

and 5.1% reported Hispanic ethnicity. Only 3.3% came from households earning \$14 999 or less; 22.9% reported \$15 000 to \$49 999, 23.6% reported \$50 000 to \$74 999, 21.1% reported \$75 000 to \$99 999, 21.1% reported \$100 000 to \$149 999, and 8% reported \$150 000 or more. There were no differences in gender, race, ethnicity, parental income, or adolescent smoking status between the 591 initially recruited subjects and the 346 active subjects.

Content Sampling

We examined all Web pages viewed by T3 subjects from their home computers during the 30-day time period. Teens also completed an Internet-based survey regarding certain behaviors, including smoking, at baseline and at 6- and 12-month follow-up times. Each Web page generated by a participant was routed through secure proxy Internet servers and was stored in a secure interface through which all stored Web pages could be accessed, including password-protected or otherwise inaccessible content.

Coding Procedures

Each page was reviewed by using a browser-like window that displayed embedded text content, images, and video as displayed when the teens viewed them. The interface included a keyword search function that was able to check URL and HTML Web page source code for words, phrases, tags, and metadata included on the Web page.

The T3 study captured the URL for each page a teen viewed. Web pages are the preferred unit of analysis for Internet-based content analyses; in addition, we were certain that pages were accessed, and they represented discrete units.^{21,22} To identify Web pages for content analysis, 25 keywords related to smoking and tobacco were used, including “smoke,” “smoking,” “addiction,” “cigarette,” “dip,” “Camel,” “tobacco,” “smoker,” “quitting,” “cigar,” “chew,” “Marlboro,” “snuff,” “nicotine,” “cessation,” “smokeless,” “Philip Morris,” “menthol,” “British American,” “RJ Reynolds,” “Altria,” and “quitline.” We also searched for misspelled words, including “cigarette,” “ciggarete,” and “cigarett.” The keyword search was performed, and a list of potentially tobacco-containing Web pages was generated (these were considered potential because many keywords can be used in nontobacco contexts). All Web pages retrieved in the keyword search were evaluated systematically for the characteristics detailed below. Consensus criteria for coding were established by the authors, and several rounds of test coding were performed until consistency was achieved.

Each Web page was examined for the presence of tobacco-related images. Images containing tobacco products were coded with respect to the number of images, the type of use, the product, and whether images were professional or consumer-generated pictures. Each Web page also was examined for tobacco-related words and text references.

Web pages with tobacco and/or smoking content were coded as protobacco, antibacco, complex or unclear, or neutral. Protobacco portrayal was defined as a positive description of tobacco use (eg, “Had fun smoking cigs outside in-between classes”) or a tobacco company site, with the latter coded as protobacco because of evidence that company advertisements, even antismoking ones, are associated with favorable attitudes toward the tobacco industry.^{23,24} Antibacco portrayals had a negative description (eg, “Smoking Kills!”), complex or unclear portrayals had both protobacco and antibacco messages on the same page or a smoking reference without a clear message (eg, a social network page on which an individual's profile indicated “smoke” with either a yes or no answer), and neutral indicated the presentation of tobacco use in an historical context (eg, “In 1950, 45% of people smoked”). We also identified any health effects mentioned, including short-term or long-term consequences of tobacco or secondhand smoke.

Web site descriptions included categorization of the site, whether tobacco content was found on interactive features such as blogs, online journals, or message boards (which allow discussions among users), and whether profile sections identified an individual's smoking status. We coded for types of tobacco products, brands, whether tobacco products were sold (either on the site or through links), and advertisements for discount tobacco products or other products with tobacco company logos. Smoking cessation information was coded for references to quitting smoking or smoking cessation, offers of cessation products, and references to quitlines or other tools to facilitate quitting. Finally, we coded for references to alcohol, marijuana, or other drugs and for the presence of sexual imagery used in relation to smoking. We also coded for videos depicting tobacco imagery, bar or club promotions, information on how to use certain products, and portrayal of smoking as a right.

Data Analysis

To compare exposure to Internet tobacco content and smoking status at baseline and follow-up times, χ^2 analyses were performed with SPSS (SPSS Inc, Chicago, IL). As a secondary analysis of the T3 study dataset, our study was approved as an exempt study by the University of Rochester Research Subjects Review Board.

RESULTS

The 346 participants viewed a total of 1.2 million Web pages throughout their individual 1-month data collection periods. Adolescents viewed a mean of 3481 Web pages per participant (median: 1337 pages per participant; range: 1–58 889 pages per participant). The search string of 25 keywords generated 36 471 Web pages, all of which were analyzed for tobacco-related text or images.

Overall, 8702 pages (0.72% of the total 1.2 million pages) contained tobacco-and/or smoking-related content. The mean number of references found on pages with tobacco content was 1.7 (median: 1 reference; SD: 2.6 references). Among the pages identified through text references, only 256 contained images of tobacco or smoking. Tobacco content was viewed by 235 of the subjects (68%) who contributed to the Web page database. Among pages with tobacco content, 1916 (22%) were protobacco, 1572 (18%) antitobacco, 5055 (58%) complex or unclear, and 159 (2%) neutral. Nearly one half of the participants viewed ≥ 1 Web page with a positive portrayal of tobacco use (Table 1).

Social networking sites, such as MySpace and Xanga, represented 53% of pages (4612 pages) on which tobacco content was found. Among those pages, 4121 (89%) included a profile identifying smoking status; these accounted for nearly one half (47%) of all pages with textual tobacco content. Nearly one fourth of the pages (23%; 1061 pages) indicated their author as a smoker. Interactive features were present on 33% of tobacco content pages. MySpace sites alone represented almost one half of the pages with tobacco content (Table 2). Other types of Web sites that commonly contained tobacco content included pornographic sites and MSN and Yahoo search engine sites. Adolescent participants were exposed to tobacco portrayals on a variety of types of Web sites (Table 3).

Particular tobacco products were mentioned on 2053 pages (24%). Among those, cigarettes were mentioned most frequently, on 1773 pages. Tobacco brands, mainly Camel, were mentioned on 406 pages. Cigarettes or cigars were sold on 50 pages, whereas 242 Web pages contained links to tobacco products sold on other pages. No advertisements for discount tobacco products were found.

References to smoking cessation were found on 874 pages (10%) with tobacco content. Only 2 pages offered cessation products, but 614 had links to cessation products on other sites.

Cessation messages often were found on the search engine MSN One, a link titled “Stop Smoking (for Good!)” was on 93 pages, and 17 participants were exposed to this message. Among pages with references to cessation, 81% portrayed tobacco use negatively and 9% portrayed it positively.

The long-term and short-term health consequences of smoking were mentioned on 358 and 24 pages, respectively. Lung cancer and “bad smell” were the long-term and short-term effects, respectively, mentioned most commonly. Secondhand smoke was mentioned on 64 pages, whereas addiction in the context of tobacco use was mentioned on 60 pages.

Images containing tobacco products were found on 256 pages (3%). Tobacco use was portrayed as protobacco in 84 images, antitobacco in 29, and complex or unclear in 131. Tobacco products were being consumed in 179 images and were present but not being used in 71 images. Cigarettes were the products shown almost exclusively (found in 233 images). Most images (220 images) were of professional quality, including pictures of cigarettes, cigarette packs, and, rarely, celebrities. A small number (16 images) showed the Web pages' authors and/or friends. No Web pages contained videos of people smoking, promotions about bars or clubs, or how-to explanations.

Other drugs and sexual imagery were often found on pages with tobacco content. A total of 2558 pages (29%) contained references to drugs, most frequently to alcohol (2405 pages), marijuana (404 pages), and mescaline (64 pages). Sexual references (equivalent to R- or X-rating in the T3 study²¹) were present on 931 pages as text and on 418 pages as images. “Fetish” or “fetishism” in the context of smoking was found on 74 pages.

Finally, we examined the relationship between exposure to Internet tobacco content and smoking status. At baseline, 12.5% of adolescents indicated that they had smoked at least once in the past 30 days. At the 6- and 12-month follow-up evaluations, 9.9% and 13.7% of respondents reported smoking in the past 30 days. There were no differences between smokers and non-smokers with respect to exposure to Web pages with protobacco content, antitobacco content, complex content, or tobacco products sold, at either baseline or follow-up assessments. There also were no differences in MySpace tobacco content according to smoking status. In addition, there were no differences in exposure when nonsmokers and ever-smokers or subgroups of smoking (eg, frequent, less-frequent, and not-current smokers, on the basis of the total number of days of smoking in the past 30 days) were compared.

DISCUSSION

Adolescent exposure to tobacco content on the Internet is limited in volume. Within this national probability sample of youth in Internet-using households, 43% were exposed to, on average, 13 pages of protobacco tobacco content within the average 3481 overall pages viewed per adolescent per month (for comparison, 33% of participants visited Web pages accessing their MySpace account but viewed, on average, 314 MySpace Web pages). Most references were found on social networking sites, with almost one half being found on MySpace. Antitobacco messages also were viewed by many of the adolescents in the sample but, like the protobacco content, the average number of pages viewed was small. Few participants were exposed to corporate tobacco sites or sites selling tobacco products. Finally, smoking-related references were usually found on pages with a majority of content unrelated to tobacco.

The clustering of tobacco content on MySpace, mainly in the form of smoking status as a demographic characteristic, is intriguing. MySpace, with >38 million unique visitors (by far the most popular social networking site), has received increased attention within the literature. 9-25-28 Our sample of Web pages contained ~28 000 MySpace pages viewed by adolescents, 15% of which contained tobacco-related content. Social networking sites have grown in

popularity since the time of data collection, with recent reports suggesting that 55% of online teens have profiles on such sites and $\geq 21\%$ of all online teens communicate every day with their friends on these sites⁸ (Facebook was not open to adolescents until September 2005, because the previous policy required a valid e-mail address from a university or a selected group of secondary schools and businesses). Therefore, these data might be an underestimation of youth exposure. However, the simple mention of smoking status (yes or no) is fairly minimal, compared with more intensive depictions of smoking in traditional media, especially movies.²⁹

Designating one's smoking status in an interactive environment may contribute to promoting smoking as an adolescent cultural norm. Consistent with social norm theory,³⁰ networking sites that prompt a choice of smoking status may create the assumption of normality for this harmful behavior. In addition, providing choice of status as a determinant of smoking rather than recognizing the role of addiction in smoking behavior parallels the false choice portrayed by tobacco advertising, including paradoxical, tobacco industry-sponsored, antitobacco educational messages.²⁴

Although searching for tobacco- or smoking-related keywords with search engines (eg, Google or Yahoo) yields millions of pages, our sample of sites reflects the actual Internet usage of adolescents over time. Rather than describing what could be found by someone looking for tobacco content, our analysis provides insight into Web pages with tobacco content that actually have been viewed by a national sample of teens.

Our study has several limitations. First, the Web page sample might not be representative of all of the adolescents' Internet experiences. Many adolescents access the Internet from their homes and also at schools, libraries, and elsewhere.⁸ Participants might have altered their Internet activity because they were being monitored. This effect might have been mitigated by the unobtrusive monitoring and the length of the monitoring period. In addition, spyware detection might have interfered with the Internet-tracking software, leading to systematic biases in the content sampled. Although most Internet users use Microsoft Windows-based operating systems, users of other operating systems (eg, Macintosh) might view different Internet content. Finally, use during the sampling period (December to February) might differ from Internet use during school or summer months.

Second, tobacco content, especially smoking-related images, might have been missed because of limitations in our searches. Slang terms for tobacco were not included in our keywords. Also, images would have been excluded unless they appeared on Web pages that had text tobacco content or their file names included a smoking term. However, 36 471 pages (3% of the database) were scanned individually for smoking-related images; only 256 (<0.7% of all of the Web pages analyzed) had such images. In addition, no smoking-related images were identified in a random sample of 200 MySpace Web pages viewed by our participants. The limited number and lack of smoking images in these samples suggest that adolescents are exposed to few tobacco images.

Third, there might have been subjectivity in coding of the content analysis. In addition, information about participants' experiences with the Web page content is lacking. Information also is lacking concerning participant time spent viewing Web pages, whether participants sought out tobacco content or encountered it unintentionally, and whether participants actually viewed a particular section of the Web page. Finally, despite evidence and speculation that the tobacco industry engages in word-of-mouth advertising³¹ and potentially creates protobacco content on various Web sites,^{32,33} we could not distinguish genuine user-generated content from industry-sponsored product placement.

Societal concerns about adolescent exposure to Internet tobacco content include speculation about the presence of pervasive tobacco advertisements or sites with alluring images dedicated to enticing youths to use tobacco. We found that only a small proportion of Internet sites visited by adolescents contained tobacco messages. The significance of these messages in social networking and their impact on adolescent tobacco attitudes and use remain unclear. As more communication occurs online, peer influences on smoking may manifest themselves differently than previously encountered.

From a policy perspective, if search engines and social networking sites included antitobacco messages, then they would have the potential to reach a large proportion of online adolescents. Although the amount of Internet tobacco content seems limited, understanding the origin of this content is important for youth tobacco control efforts. The Framework Convention for Tobacco control stipulates restricting or banning tobacco advertising, promotion, and sponsorship. Whether the profile of an adolescent who smokes represents advertising is not clear. A full understanding of the influence of Internet tobacco content requires an appreciation of the impact of smoking status within social networking sites on social norms with respect to tobacco.

WHAT'S KNOWN ON THIS SUBJECT

Tobacco imagery in traditional media is common and makes adolescents more likely to smoke. Although similar connections may exist for Internet exposure to tobacco and smoking, no studies have examined Internet tobacco content viewed by actual adolescent Internet users.

WHAT THIS STUDY ADDS

Examination of Web pages viewed by adolescent Internet users revealed that exposure to Internet tobacco content was limited in volume. Most references were on social networking sites, mainly in the form of smoking status as a demographic characteristic.

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ABBREVIATION

T3 Tracking Teen Trends

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TABLE 1

Individual Participant Exposure to Different Tobacco Use Portrayals on Web Pages

Tobacco Use Portrayal	No. Of Individuals (%)^a	No. of Pages per Participant, Mean (Median)
Protobacco	148 (43)	13 (3)
Antitobacco	154 (45)	10 (4)
Complex/unclear	147 (43)	34 (5)
Neutral	38 (11)	4 (2)

Exposure was defined as a participant who viewed ≥ 1 Web page with the specified tobacco use portrayal.

^aPercentages do not add up to 100% because individuals could be exposed to >1 type of tobacco use portrayal.

TABLE 2
 Number of Web Pages According to Type of Tobacco Use Portrayal and Specific Web Site (N = 8702)

Web Site	No. of Pages (%)				
	Total	Protobacco	Antitobacco	Complex/Unclear	Neutral
MySpace	4202 (48)	287	59	3854	2
Other sites	3045 (35)	961	1035	892	157
Pornographic site	550 (6)	528	1	21	0
Xanga	446 (5)	41	302	103	0
MSN	342 (4)	22	150	170	0
Yahoo	63 (1)	25	24	14	0
Tobacco company site	54 (1)	54	0	0	0

TABLE 3Number of Adolescents Exposed to Specific Sites According to Type of Tobacco Use Portrayal ($N = 346$)

Web Site	No. of Adolescents		
	Protobacco	Antitobacco	Complex/Unclear
MySpace	21	13	47
Pornographic site	43	1	6
Xanga	8	18	20
MSN	6	34	38
Yahoo	12	11	8
Tobacco company site	2	0	0

Exposure was defined as a participant who viewed ≥ 1 Web page with the specified tobacco use portrayal. Individuals could be exposed to >1 type of site.