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Brief report

Twelve Million Smokers Look Online for Smoking Cessation Help Annually: Health Information National Trends Survey Data, 2005–2017

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Abstract

Background: This study quantified the potential reach of Internet smoking cessation interventions to support calculations of potential population impact (reach × effectiveness). Using a nationally representative survey, we calculated the number and proportion of adult smokers that look for cessation assistance online each year.

Methods: Five waves (2005, 2011, 2013, 2015, 2017) of the National Cancer Institute's Health Information National Trends Survey were examined. The survey asked US adults whether they ever go online to use the Internet, World Wide Web, or email and had used the Internet to look for information about quitting smoking within the past 12 months. We estimated the proportion and number of (1) all US adult smokers, and (2) online US adult smokers that searched for cessation information online. Cross-year comparisons were assessed with logistic regression.

Results: The proportion of all smokers who searched online for cessation information increased over the past decade ($p < .001$): 16.5% in 2005 (95% CI = 13.2% to 20.4%), 20.9% in 2011 (95% CI = 15.55% to 28.0%), 25.6% in 2013 (95% CI = 19.7% to 33.0%), 23.4% in 2015 (95% CI = 16.9% to 31.0%), and 35.9% in 2017 (95% CI = 24.8% to 48.9%). Among online smokers only, approximately one third searched online for cessation information each year from 2005 through 2015. In 2017, that proportion increased to 43.7% (95% CI = 29.7% to 58.7%), when an estimated 12.4 million online smokers searched for cessation help.

Conclusions: More than one third of all smokers turn to the Internet for help quitting each year, representing more than 12 million US adults.

Implications: This research provides contemporary estimates for the reach of Internet interventions for smoking cessation. Such estimates are necessary to estimate the population impact of Internet interventions on quit rates. The research finds more than 12 million US smokers searched online for cessation information in 2017.

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Introduction

The population impact of a public health intervention is a function of its effectiveness multiplied by its reach, where reach is defined as the absolute number, proportion, and representativeness of individuals willing to participate.[1] Population impact is often a key element in the allocation of resources and decision making by policy makers and stakeholders.[2] Ideally, a public health intervention maximizes both effectiveness and reach. However, mathematically equivalent metrics of impact can be yielded by one intervention with modest effectiveness but high reach, and a second intervention with higher levels of effectiveness but lower reach.

In the smoking cessation literature, the population impact of various treatment modalities can be estimated—albeit imperfectly—using data from clinical trials. Recognizing that clinical trial data likely represent an upper bound of the effectiveness of any cessation intervention, estimates from recent meta-analyses can be used to illustrate the relative public health impact of different treatment modalities. Telephone quitlines reach roughly 325 000 smokers each year[3] and yield a quit rate of 12.7% (95% CI = 11.3% to 14.2%),[4] representing a potential population impact of 41 275 quitters. Brief advice to quit from a health care provider yields a quit rate of 13.4% (95% CI = 10.9% to 16.1%)[4] and is estimated to reach slightly more than half of all smokers (57.2%) each year.[5] With 36.5 million smokers in the United States,[6] the population impact of brief advice from a health care provider is estimated at roughly 2.8 million quitters annually. Nicotine replacement therapy (NRT) is used by roughly 30% of all smokers each year,[7] but its population impact is challenging to calculate given uncertain estimates of its "real-world" effectiveness.[8] If NRT used as an over-the-counter product is assumed to yield quit rates at the lower bound of clinical trial efficacy estimates for the nicotine patch (ie, 21.3% for 6–14 weeks of nicotine patch[4]), the estimated population impact is roughly 2.3 million quitters each year.

Estimating the population impact of Internet smoking cessation interventions is more challenging. The effectiveness of Internet interventions is well established,[9,10] with quit rates that range from 12.8%[10] to 14.3%[9] for interactive and tailored interventions. However, metrics of reach are sparse and outdated. In 2006, the Pew Research Center reported that 9% of Internet users in the United States had searched online for information about quitting smoking in the past year, up from 6% in 2002.[11] Internet use has increased dramatically over the past 15 years, from 52% in 2000 to 88% in 2016.[12] There are no recent population-based estimates of the actual reach of Internet smoking cessation interventions.

This study calculated the reach of Internet cessation interventions to US adult smokers in order to estimate the potential impact of this treatment modality. Across five waves of the National Cancer Institute's Health Information National Trends Survey (HINTS),[13] respondents were asked whether they had searched online for information about smoking cessation. We used this item as a proxy for the potential reach of Internet interventions. We calculated the absolute number and proportion of adult smokers in the United States that had searched online for help quitting smoking from 2005 to 2017 and examined whether the reach of Internet interventions changed over this time period.

Methods

Design

This study used five waves of HINTS data (2005, 2011, 2013, 2015, 2017). The purpose of HINTS is to collect nationally representative data at regular intervals about the American public's use of cancer-related information. All survey respondents were adults aged 18 and over. The survey was administered by telephone in 2005 and by mail in the other waves included in these analyses. Population weights were calibrated to the American Community Survey of the US Census Bureau.[14] Additional details about sampling methodology are available at https://hints.cancer.gov.

Measures

Smoking Status

Smoking status was assessed with two items: "Have you smoked at least 100 cigarettes in your entire life?" and "Do you now smoke cigarettes every day, some days, or not at all?" Current smokers indicated that they had smoked at least 100 cigarettes and now smoked "every day" or "some days."

Internet Use

Respondents were considered Internet users if they answered "yes" to the item "Do you ever go on-line to access the Internet or World Wide Web, or to send and receive e-mail?"

Cessation Information Seeking

The key survey item of interest was "In the past 12 months, have you used the Internet for any of the following reasons?" Response option "c" was "Looked for information about quitting smoking" (yes/no). This wording was used in the 2011, 2013, 2015, and 2017 waves. In 2005, the question was worded slightly differently ("In the past 12 months, have you done the following things while using the Internet?"), but the response option ("Looked for information about quitting smoking") was identical. This item was asked only of respondents who previously indicated that they use the Internet.

Statistical Analyses

Analyses were conducted with the "survey" package in R, version 3.4. Standard errors were calculated using replicate weights included with the HINTS dataset and the JKn jackknife method. For each year, we estimated the proportion and number of US adult cigarette smokers who went online and searched for cessation information. The primary analysis considered all US smokers; values for the key item ("Did you search online for cessation information?") were imputed as "no" for smokers who responded that they never used the Internet. A secondary analysis included only smokers who reported using the Internet. Confidence intervals for proportions were created by fitting logistic regression models with the "svyciprop()" function of the "survey" package. Trend analyses were conducted as logistic regressions, treating year as a continuous variable with 2005 coded as 0. National estimates of numbers of smokers were obtained by calculating prevalence rates following casewise deletion of missing values, and then multiplying those prevalence rates by the total sum of population weights in the dataset.

We also compared estimates from the HINTS dataset with results from other datasets to assess convergent validity. We compared US adult smoking prevalence in 2005 and 2015 to estimates published by the Centers for Disease Control and Prevention based on the National Health Interview Survey (NHIS), which used an identical item to assess smoking status.[6] For 2005, we estimated the proportion of online adults who had searched for online cessation information (regardless of smoking status) in comparison with the 2006 estimates reported by the Pew Research Center.[11]

Results

Primary Analysis: All Smokers Searching Online for Cessation Information

The proportion of all adult smokers who searched online for cessation information increased from 16.5% in 2005 to 35.9% in 2017 (Table 1). There was a linear effect of time, such that the likelihood a smoker searched online for cessation information increased by an average of 8% each year relative to 2005 (relative risk = 1.08, 95% CI = 1.04% to 1.12%, $p < .001$). In 2017, an estimated 12 434 691 US smokers searched online for cessation information.

Secondary Analysis: Online Adult Smokers Searching for Cessation Information

The proportion of US adult smokers who use the Internet increased from 2005 to 2017: 2005: 56.9% (95% CI = 53.0% to 60.6%); 2011: 71.2% (95% CI = 63.4% to 77.9%); 2013: 73.1% (95% CI = 66.5% to 78.8%); 2015: 73.0% (95% CI = 66.1% to 79.0%); 2017: 76.6% (95% CI = 65.3% to 85.0%). Although the pairwise comparison of these endpoints was significantly different, the test for an overall linear trend in Internet use among smokers was not ($p = 0.09$): the percentage of smokers who used the Internet increased sharply from 2005 to 2011, then remained comparatively stable through 2017. As shown in Table 1, the proportion of online adult smokers who searched for cessation information online remained relatively stable between 2005 and 2015 (range = 29.4% to 32.7%) then spiked in 2017 to 43.7% (95% CI = 29.7% to 58.7%). The test for a linear effect of time was not significant (p value for trend = .1).

Comparison with Previous Results

Based on 2005 HINTS data, an estimated 9.8% of online US adults searched for cessation information in that year (95% CI = 8.31% to 11.7%). This estimate is within the ±3% margin of error for the Pew estimate of 9.0% in 2006,[11] suggesting convergent validity across both surveys. Adult cigarette smoking prevalence in the US was 22.1% (95% CI = 20.5% to 23.8%) in 2005 and 14.8% (95% CI = 13.0% to 17.0%) in 2015 based on HINTS data. The confidence intervals for both estimates overlap with the respective confidence intervals from the NHIS dataset[6]—(95% CI = 22.9% to 24.8%) and (95% CI = 15.9% to 17.6%), respectively—again suggesting convergent validity.

Discussion

Our analyses of five waves of HINTS data yielded the following findings: (1) The proportion of all smokers who search online for information about quitting smoking each year has more than doubled over the past 12 years, most likely a function of increased Internet use throughout all segments of the US population; (2) The proportion of online adult smokers who have searched online for quit smoking assistance has remained stable at roughly 30% for nearly a decade, until a recent spike in 2017 to 43.7%; (3) In 2017, we estimate that more than 12 million smokers searched online for quit smoking information.

This estimate of reach helps to define the potential population impact of Internet cessation interventions. Assuming treatment effectiveness of 12.8% for tailored and interactive interventions as reported in the most recent Cochrane meta-analysis[10] and a potential reach to 12 million smokers yields roughly 1.6 million quitters each year. Table 2 presents these estimates alongside other treatment modalities. These numbers are intended to be illustrative (not determinative), but they make clear the important role of Internet interventions in comprehensive tobacco control.

Two limitations of this study warrant comment. First, searching for smoking cessation information on the Internet is not synonymous with engaging with an evidence-based cessation treatment program capable of promoting abstinence. While our analyses indicate that more than 12 million smokers search for assistance online, the behavior that follows may range from casual browsing to full engagement. Minimal use of online cessation resources may be sufficient for some smokers to quit,[15] but this should not be presumed for all smokers. Relatedly, many publicly available Internet cessation programs are not evidence-based and lack features of interventions tested in clinical trials.[16] Such programs may be less effective, entirely ineffective, or even iatrogenic. Our estimates of potential impact, therefore, may represent an upper bound of the number of quitters that could be expected if all smokers engaged with proven, evidence-based Internet programs. This limitation is not unique to Internet programs. Estimates of the potential impact for other cessation modalities delivered "in the wild" may also represent an upper bound. For example, health care providers may not deliver brief advice at all or as effectively as in clinical trials,[17–19] and smokers may not adhere to recommended dosing or usage guidelines for NRT. Our analyses illustrate the potential impact of each modality based on best available estimates of reach and effectiveness.

Table 1. Online Cessation Information Seeking, 2005–2017: Point Estimates and 95% Confidence Intervals from Health Information National Trends Survey

	2005	2011	2013	2015	2017
Unweighted survey sample size	*n = 5586*	*n = 3959*	*n = 3185*	*n = 3738*	*n = 1736*
Estimated number of smokers (millions) that searched online for cessation information	7.88	8.73	11.46	8.25	12.43
Percentage of all US adult smokers[a]					
that searched online for cessation information	16.5%	20.9%	25.6%	23.4%	35.9%
	[13.2, 20.4]	[15.5, 27.5]	[19.7, 32.6]	[16.9, 31.5]	[24.8, 48.9]
Percentage of online US adult smokers					
that searched online for cessation information	29.4%	32.3%	32.7%	29.4%	43.7%
	[23.8, 35.7]	[24.6, 41.0]	[25.3, 41.2]	[21.1, 39.3]	[29.7, 58.7]

[a]Values for the key item ("Did you search online for cessation information?") were imputed as "no" for smokers who responded that they never used the Internet.

Table 2. Population Impact (Illustrative) of Smoking Cessation Treatment Modalities As a Function of Reach and Effectiveness

Treatment modality	Estimated reach	Effectiveness	Potential impact[a]
Telephone quitlines	325 000[3]	12.7%[4]	41 275
Brief advice from health care provider	20 878 000[5,6]	13.4%[4]	2 797 652
OTC NRT (eg, nicotine patch)	10 950 000[6,7]	21.3%[4]	2 332 350
Internet interventions	12 434 691	12.8%[9]	1 591 640

NRT = nicotine replacement therapy; OTC = over-the-counter.

[a]Impact defined as the number of quitters each year.

Second, we are puzzled by the spike in the proportion of online adults who reported searching for information in 2017. Sample size was not consistent across all cycles of HINTS, including a smaller sample size in 2017. This observed increase should be interpreted in the context of a larger confidence interval. The 2017 HINTS administration was the only wave that started in January, so New Year's resolutions may also account for some of this spike. Alternatively, this spike may be linked to state and federal antitobacco campaigns that included online calls to action or some other environmental change.

In summary, this research provides contemporary estimates for an upper bound to the reach of Internet interventions for smoking cessation. Previously, the most recent available estimates were from 2006—a different era in terms of Internet usage. These analyses found that, in 2017, 35.9% of US smokers searched online for help quitting. Each search represents an opportunity to connect smokers with evidence-based treatment options. Given the ability to reach roughly one third of all smokers and the demonstrated effectiveness that is comparable to other recommended forms of cessation treatment, Internet interventions have the potential for substantial impact on population quit rates.

Declaration of Interests

The authors are employed by Truth Initiative, a nonprofit public health foundation that runs BecomeAnEX, a digital smoking cessation intervention.

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