Changes in Internet Searches Associated With the "Tips from Former Smokers" Campaign

John W. Ayers, PhD, MA,[1] Benjamin M. Althouse, PhD, ScM,[2] Sherry Emery, PhD, MBA[3]

Introduction

"Tips from Former Smokers" (Tips) was the first federally funded anti-smoking campaign. Multimedia advertisements showcased former smokers describing their tobacco-related illnesses and encouraging quitting.[1] Costing $106 million for 2012 and 2013, Tips is the nation's most costly tobacco control initiative. However, little is known about its effectiveness.[2]

Examining the types and frequency of Internet queries can reveal population thoughts and engagement.[3–5] Herein, changes in searches for Tips topics and smoking cessation were monitored as possible precursors to Tips' aim of increased cessation.

Methods

Tips 2012 (March 19 to June 10) depicted former smokers with Buerger's disease (causing gangrene and amputation); stroke; neck/throat cancers; asthma; and heart disease. Tips 2013 used the same advertisements initially (Wave 1, March 4–31) and then new advertisements highlighting chronic obstructive pulmonary disease (COPD), lung disease, diabetes, and asthma related to secondhand smoking, together with general cessation advertisements (Wave 2, April 1 to June 23).

Google Trends (google.com/trends) allows investigators to monitor Google search trends normalized to a 0–100 scale (100, highest proportion of all searches; 50, 50% of the highest proportion; relative search volume [RSV]).

Searches monitored in the U.S. included key content terms (*amputation/leg(s)*, *asthma*, *heart(s)*, *stroke(s)*, or *neck/throat(s)* in 2012 and 2013 Wave 1; *COPD*, *lung(s)*, *diabetes*, *asthma*, or *second hand* and misspellings [e.g., *second hand*] in 2013 Wave 2) in combination with *smoking* and any other terms collapsed by risks. For example, *smoking and amputation*, *missing legs smoking*, and all queries with *amputation(s)/leg(s)* and *smoking* were combined into a single RSV trend by using the logic command *amputation smoking + amputations smoking + leg smoking + legs smoking* on Google Trends. All queries including *quit* or *stop* with *smoking* (excluding *pot*, *weed*, and *marijuana*) were pooled to capture cessation-related queries (Appendix 1, Appendix Figure 1).

Mean RSV during Tips was compared with March through June 2011, the first year before Tips. Because Trends returns weekly aggregations, weeks that included any days during the Tips or control period were used to estimate the means as described. The final results are described as ratios (Tips/control period) using Bonferroni-corrected (α=0.05/6, p=0.008)[6] t-tests and CIs (R, version 3.0.2).

Results

During Tips 2012, amputation/leg queries increased by a factor of 1.09 (95% CI=0.70, 1.58, $p<0.001$) and neck/throat queries by a factor of 0.67 (95% CI=0.45, 0.91, $p<0.001$). By contrast, queries for asthma, heart disease, and strokes did not increase significantly (Table 1).

The same advertisements in 2013 Wave 1 were concurrent with smaller search changes compared with 2011. For example, only two trends showed significant increases: amputation/leg (0.74; 95% CI=0.17, 1.44, $p<0.001$) and throat/neck (0.37; 95% CI=0.13, 0.62, $p<0.001$) queries, with each increase significantly smaller than those observed during 2012 ($p<0.05$).[6] No new advertisements in Tips 2013 Wave 2 corresponded with more risk-related queries.

During 2012, cessation-related queries increased by a factor of 0.14 (from 57 to 65 RSV, 95% CI=0.08, 0.24, $p<0.001$), representing roughly 1.35 million excess searches by applying the estimate to search volumes for *quit smoking* and the next 100 related terms (adwords.google.com), but did not during 2013 Waves.

Discussion

Tips was associated with increased queries for some smoking risks and cessation in 2012, but associations during 2013 were tempered.

Although Google searches are not a validated measure of tobacco attitudes/behaviors, their application herein has face validity, building on theories where interest and engagement foreshadow action,[7] and research showing searches

From the [1]Graduate School of Public Health, San Diego State University, San Diego, California, [2]Santa Fe Institute, Santa Fe, New Mexico and [3]Institute for Health Research and Policy (Emery), University of Illinois at Chicago, Chicago, Illinois

Address correspondence to: John W. Ayers, PhD, MA, Graduate School of Public Health, San Diego State University, 9245 Sky Park Court, Suite 230, San Diego CA 92123. E-mail: ayers.john.w@gmail.com.

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Table 1. Differences in Risk and Cessation Queries During Versus Before Tips

Period[a]	Queries[b]	Change[c] (CI[d])	*p*-value[e]
2012	Amputation/leg(s)	1.09 (0.70, 1.58)	<**0.001**
	Asthma(s)	−0.09 (−0.29, 0.15)	0.142
	Heart(s)	0.16 (−0.05, 0.41)	0.027
	Stroke(s)	0.34 (−0.31, 1.46)	0.104
	Throat/neck(s)	0.67 (0.45, 0.91)	<**0.001**
	Quit/Stop smoking[f]	0.16 (0.08, 0.22)	<**0.001**
2013 Wave 1	Amputation/leg(s)	0.74 (0.17, 1.44)	<**0.001**
	Asthma(s)	0.06 (−0.32, 0.46)	0.361
	Heart(s)	0.09 (−0.27, 0.48)	0.257
	Stroke(s)	0.11 (−0.96, 2.07)	0.420
	Throat/neck(s)	0.37 (0.13, 0.62)	<**0.001**
	Quit/Stop smoking[f]	0.01 (−0.10, 0.12)	0.420
2013 Wave 2	Asthma(s)	−0.03 (−0.23, 0.20)	0.355
	COPD	0.22 (−0.38, 1.34)	0.182
	Diabetes	0.10 (−0.13, 0.37)	0.127
	Lung(s)	−0.02 (−0.15, 0.11)	0.305
	Secondhand smoke[g]	−0.06 (−0.19, 0.07)	0.874
	Quit/Stop smoking[f]	−0.03 (−0.10, 0.03)	0.120

[a]Shows the period of the Tips campaign, as it took effect in 3 waves over 2012 and 2013.
[b]Shows the root terms for the monitored queries, that included these terms and their plural ("s") as appropriate and "smoking" along with any other combination of terms as they corresponded to advertisements in the campaign, with the exception of notes *f* and *g* as described below.
[c]Shows the ratio of the change in mean RSVs during Tips compared to the 2011 period [i.e., (Tips−reference)/reference)].
[d]The 99.2% (Bonferroni-corrected) CI for this ratio.
[e]The corresponding *p*-value testing the null hypothesis that queries were unchanged during Tips using the Bonferroni-corrected (alpha=0.05/6, *p*=0.008), with boldface indicating statistical significance.
[f]Queries included all those with quit or stop and smoking, after excluding queries with "pot," "weed," and/or "marijuana."
[g]Queries included misspellings and plurals as described in the text.
COPD, chronic obstructive pulmonary disease.

forecast many population behaviors.[8,9] Still, the findings are limited by an ecologic before/during design, lack of data on an individual-level relationship with searches and outcomes, and reliance on a single (though leading) search engine.

The factors influencing the findings are many, but have implications for the implementation of Tips going forward. For example, the most graphic advertisement (an amputee with a poorly known disease) initially coincided with the largest increase in risk- and cessation-related searches, but when repeated was associated with a smaller increase in risk-related and no increase in cessation-related queries. This example suggests that frequently changed advertisements for poorly known and graphic risks may evoke more searches.[10]

Last, further research is always needed, but the approach herein may be used in real time to inform advertisement selection while Tips is active, and should be added to existing Tips evaluation protocols.

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Appendix

Supplementary data

Supplementary data associated with this article can be found at http://dx.doi.org/10.1016/j.amepre.2015.03.015.