

## The Search Suggestion Effect (SSE): How Search Suggestions Can Be Used to Shift Opinions and Voting Preferences Dramatically and Without People's Awareness

*Paper to be presented at the 98<sup>th</sup> annual meeting of the Western Psychological Association, Portland, OR, April 26, 2018.*

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*Summary.* A series of randomized, controlled experiments was conducted to quantify the power that search suggestions (sometimes called “autocomplete” suggestions) have to shift opinions and voting preferences. The investigation suggests that (a) a search engine has the power to manipulate people’s searches from the very first character people type into the search bar, (b) negative (“low valence”) search terms can attract 10-to-15 times as many clicks as neutral or positive terms can (an example of “negativity bias”), which means that a simple yet powerful way for a search engine company to manipulate elections is to suppress negative search suggestions for the candidate it supports, while allowing one or more negative search suggestions to appear for the opposing candidate (the “differential suppression of negative search suggestions”), (c) the optimal number of search suggestions for manipulating opinions is four, which was the default number of search suggestions Google showed people on laptop and desktop computers from 2010 until October 2017, (d) the higher a suggestion appears in a list of search suggestions, the more impact it has on search, and (e) overall, manipulating search suggestions can shift a 50/50 split among people who are undecided on an issue to a 90/10 split without people’s awareness and without leaving a paper trail for authorities to follow. We call the power that search suggestions have to affect opinions the Search Suggestion Effect (SSE).

### Introduction

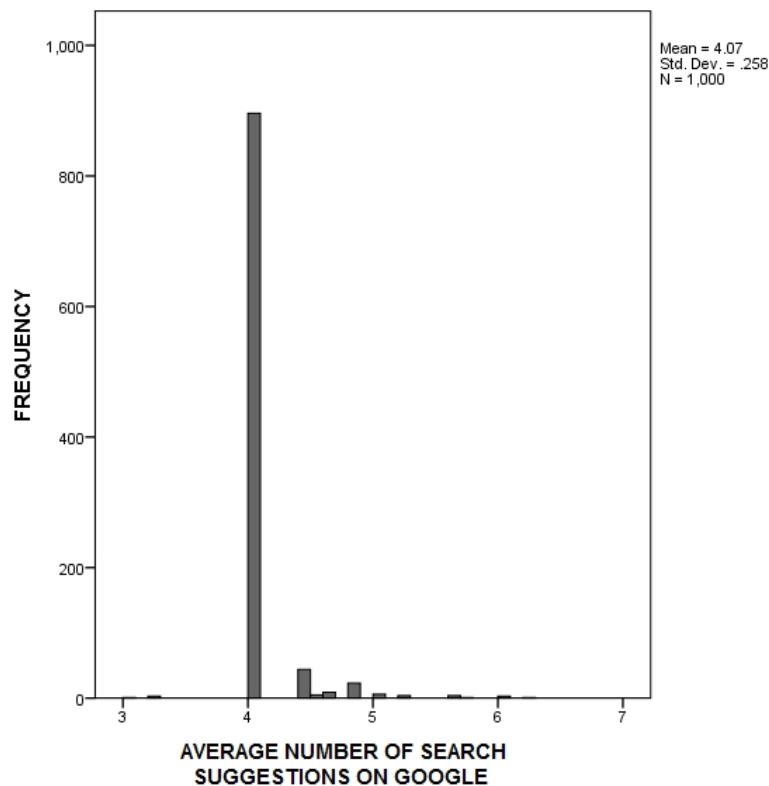
In a series of controlled experiments reported in the *Proceedings of the National Academy of Sciences* (PNAS) in 2015, Epstein and Robertson demonstrated the power that search results have to shift people’s opinions and voting preferences without their knowledge – up to 80 percent in some demographic groups. They labeled this phenomenon the “Search Engine Manipulation Effect” (SEME) (<http://bit.ly/1REqzEY>). That report has since been downloaded more than 94,000 times from PNAS’s website (<http://bit.ly/2BCEFTW>). Additional findings on

SEME were published in November 2017 in the *Proceedings of the ACM: Human-Computer Interactions* (<http://bit.ly/2xY4nB5>).

In more recent research, Epstein has demonstrated the predictability of people's clicks in response to "autocomplete" search suggestions, speculating that carefully constructed sets of search suggestions can be used to shift people's searches and hence their opinions (<http://bit.ly/2jk1rfS>). He labeled this manipulation the "Search Suggestion Effect" (SSE). SSE experiments have shown the following:

- (a) *Negativity bias*. Negative search suggestions (containing what linguists call "low valence" words) draw far more clicks than neutral or positive search suggestions do. This is an example of what social scientists call "negativity bias" (sometimes known as "the cockroach-in-the-salad" phenomenon).
- (b) *Confirmation bias*. People are more likely to click on negative search suggestions that are consistent with their beliefs, an example of what social scientists called "confirmation bias."
- (c) *High frequency*. Working together, negativity bias and confirmation bias can lead people in some demographic groups to click on negative search suggestions 10-to-15 times as frequently as they click on neutral or positive suggestions.
- (d) *Position in the list*. The higher the position of the negative search suggestion in the list, the more clicks it attracts.
- (e) *Optimal number of search suggestions*. To maximize control over what people search for, the optimal number of search suggestions to display is four, the default number of suggestions Google displayed on laptop and desktop computers from approximately 2010 until October 2017 (see below). Displaying four search suggestions minimizes the likelihood that people will type their own search term while simultaneously maximizing the likelihood that they will click a negative search suggestion (<http://bit.ly/2jk1rfS>). Differentially suppressing negative search suggestions for a candidate you support causes people to see far more positive information about your candidate than about the opposing candidate; this phenomenon is optimized when four search suggestions are displayed.

The graph below shows the number of search suggestions Google gave for 1,000 common search terms on March 21, 2017:



The present paper describes the fifth and final experiment in a series of experiments on autocomplete. The experiment is controlled, randomized, and counterbalanced, and it shows what happens to opinions and voting preferences when negative search suggestions are differentially suppressed or displayed. It does this by quantifying what happens when SSE and SEME work together.

## Methods

A diverse group of 661 people from 49 U.S. states (age range 18 to 85, mean age 35.0) was first given basic information about two candidates running for prime minister of Australia (this, in order to assure that participants were “undecided”) and then asked questions about their voting preferences and their opinions of the candidates. Participants in treatment groups were then shown a Google-type search engine in which one candidate’s name appeared in the search bar, with four search suggestions shown beneath it (see <http://bit.ly/2jk1rfS> for examples of the types of graphics we employed). Some of those participants were shown four positive search suggestions for that candidate; some were shown three positive search suggestions and one negative search suggestion; and some were shown four negative suggestions. If participants clicked a positive suggestion, they were shown search results favoring the candidate in the search bar; if they clicked a negative suggestion, they were shown results favoring the opposing

candidate. Participants in a control group did not see search suggestions but went directly to search results. After exploring search results and linked web pages for up to 15 minutes, participants were again asked questions about their opinions and voting preferences.

## Results

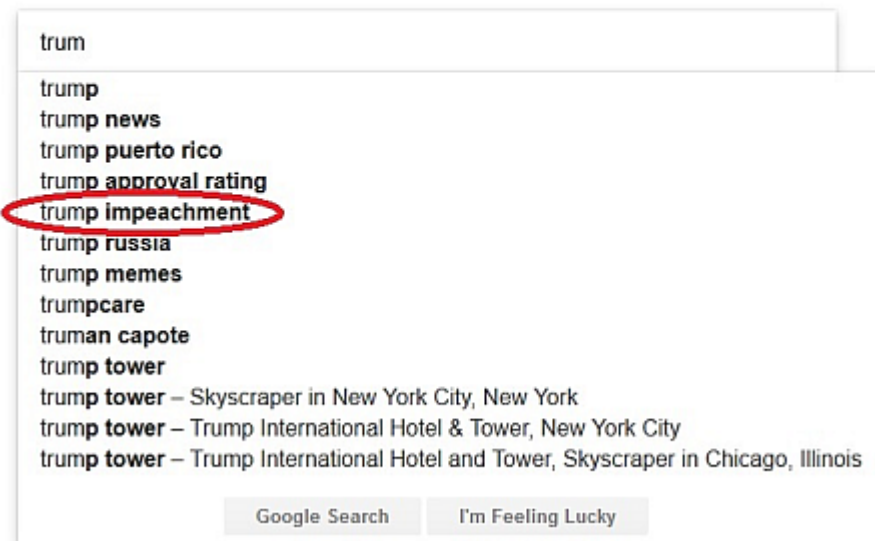
Consistent with previous SEME findings, the voting preferences of participants who saw no search suggestions shifted toward the favored candidate by 37.1%. The voting preferences of participants in the search suggestion groups who saw only positive search suggestions shifted similarly (35.6%). However, the voting preferences of participants who saw three positive search suggestions and one negative search suggestion barely shifted (1.8%); this occurred because the negative search suggestion attracted more than 40% of the clicks (negativity bias). In other words, *a single negative search suggestion can impact opinions dramatically*. Participants who were shown four negative suggestions (and no positives) shifted *away* from the candidate shown in the search bar (-43.4%). These findings suggest that search suggestions can be used to create a win margin among undecided voters of nearly 80% ( $35.6\% + 43.4\% = 79.0\%$ ).

In all, we used five different measures of voting preference. In this summary, we are reporting only the measure that would normally be of greatest interest to campaign professionals, namely, the increase in the proportion of people who said they would likely vote for the favored candidate. But all five measures – of trust, liking, and so on – shifted in roughly the same way. In other words, manipulating search suggestions can affect both voting preferences and opinions.

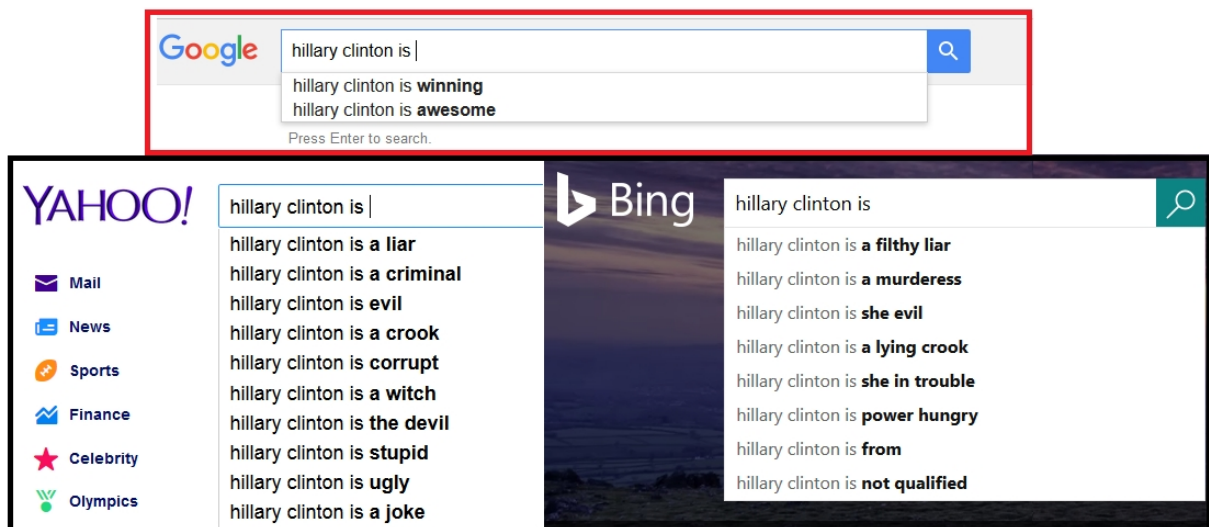
These findings demonstrate that search engine companies can shift opinions dramatically simply by varying the number of negative search suggestions shown for any product, cause or candidate they wish to support – in other words, by differentially suppressing negative search suggestions. The findings are pertinent to claims made during the 2016 U.S. presidential campaign that during the months leading up to the election, Google was suppressing negative search suggestions for Hillary Clinton but not for Donald Trump (<http://bit.ly/1Yfz3XB>).

## Discussion

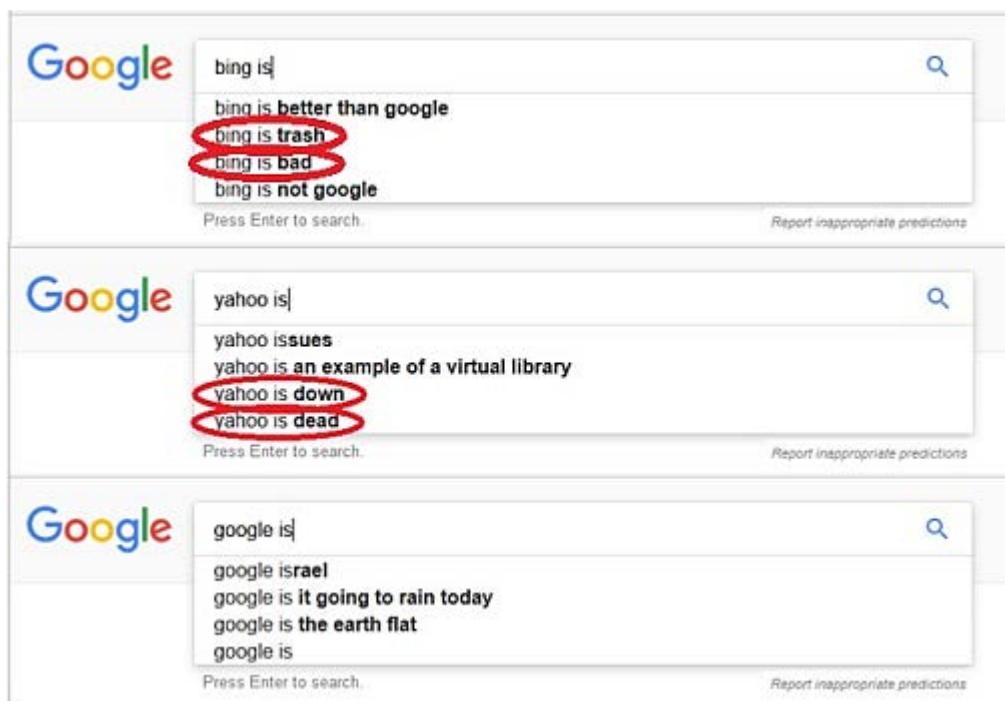
Below is an example of search suggestions given for “trum” on October 2, 2017. Three of the suggestions – “trump puerto rico,” “trump approval rating,” and “trump russia” – could be considered neutral with negative connotations, but one suggestion contained an especially negative term (“impeachment”) – in other words, a low-valence term – specifically, with a valence of 3.08, similar to the valences of terms such as “traitor,” “sin,” and “guilty.” According to SSE research, this type of term is likely to draw a disproportionately large number of clicks:



In the months leading up to the 2016 presidential election in the U.S., it was difficult to get Google to show you negative search suggestions for Hillary Clinton, even though negative search terms were predominant for Clinton on Google Trends (<http://bit.ly/2cHEtHV>). Note the dramatic difference in search suggestions made for Clinton on Google, Bing and Yahoo on August 3, 2016:



Suppressing negative search suggestions can be used not only to shift opinions about political candidates; it can also be used to shift opinions about any topic – even about Google itself. In the three examples shown below (recorded on July 7, 2017), note that Google appears to show negative search suggestions for its competitors, Bing and Yahoo, but not for itself. This could be considered an example of the mind control machine controlling the opinions people form about the mind control machine:



Although our SSE experiments have so far focused on how varying the presentation of negative search suggestions can shift opinions, we believe the real lesson from this research is that *if you have collected population data that reveal the relative power that different terms and phrases have to attract clicks, you can generate lists of search suggestions of any length that reliably nudge searches in a desired direction*. If you have collected similar data for demographic groups, you can control searches conducted by people in those groups with greater precision, and if you have collected similar data for individuals, you can control searches conducted by those individuals with still greater precision.

Bear in mind that our experiments have simulated the crude population case only and that even here, showing or suppressing negative search suggestions was sufficient to create a win margin of close to 80%. This means, roughly speaking, that SSE appears to have the power to change a 50/50 split in preferences among people who are undecided on an issue to a 90/10 split (90 - 10 = 80). With personalized search suggestions, the effect will likely be even larger.



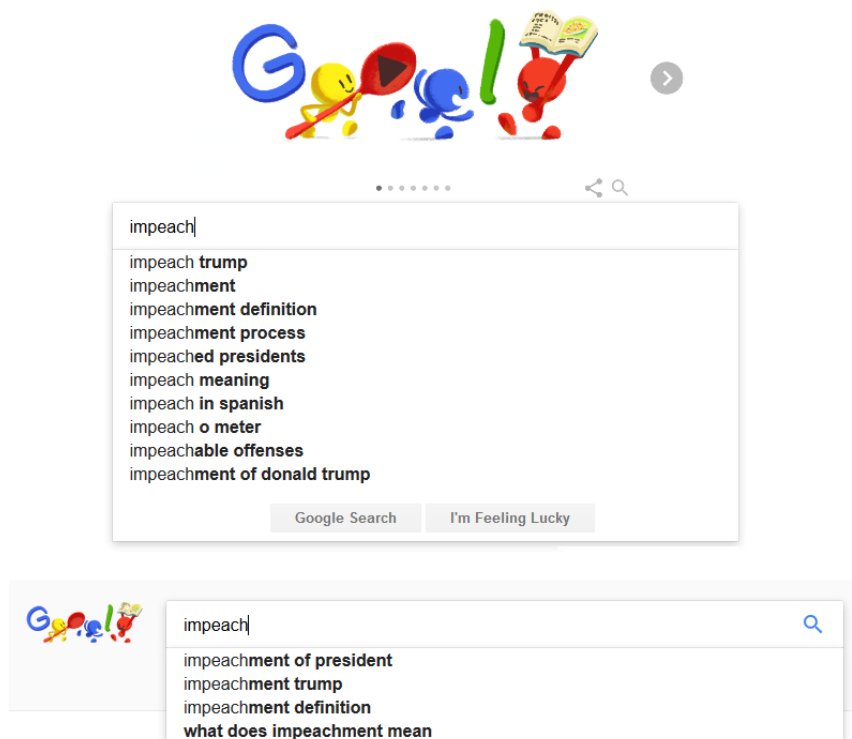
Because search engines are currently unregulated, and because SSE is largely invisible to people, it is potentially quite dangerous as a possible means of manipulation, especially when used in combination with SEME.

## Postscript, November 7, 2017

Some initial findings about SSE were published by the first author of this paper in the popular press on September 12, 2016 (<http://bit.ly/2cHEtHV>). More detailed findings were presented at scientific conferences in March and April, 2017 (<http://bit.ly/2jk1rfS>) and were also described in media reports at that time. The summary you just read (above this Postscript) was submitted online to a professional organization on September 19, 2017 for possible presentation at a scientific conference, and it was also shared with colleagues by email at that time.

We claim no credit for this shift, but on October 1, 2017 and without explanation, Google switched (on laptop and desktop computers) from displaying four search suggestions on Google.com to displaying 10 search suggestions. At this writing, Google is still displaying four suggestions when you are on the results page and click on the search bar to modify your search (see the November 7, 2017 screenshots below). It also continues to display just five search suggestions on mobile devices.

No matter how many search suggestions Google is displaying, our research demonstrates the enormous power that search suggestions have to shift opinions and voting preferences without people's awareness – a matter that we believe should be of concern to regulators, lawmakers and internet users in general.

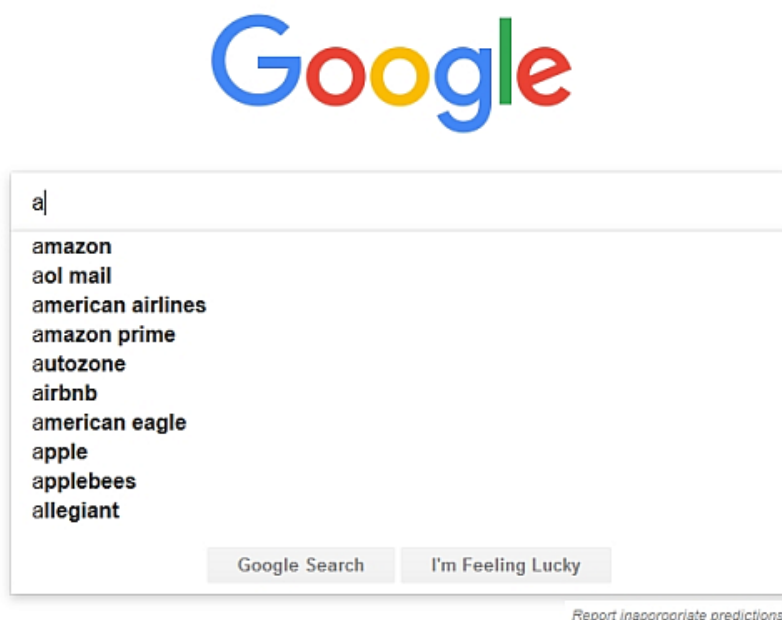


China's <http://baidu.com> search engine is still using four search suggestions (presumably, to maximize control over search), and Russia's <http://yandex.com> is using five.

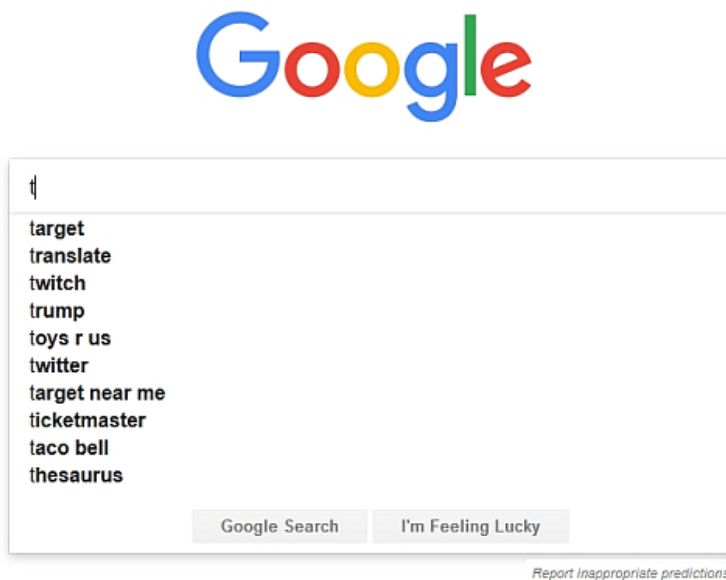
## New Postscript, March 7, 2018

In response to media inquiries, we are adding some information regarding our assertion that a search engine has the power to manipulate people's searches "from the very first character people type into the search bar":

Here is what you might get if you type "a" into Google's search bar right now (screenshot dated March 4, 2018):

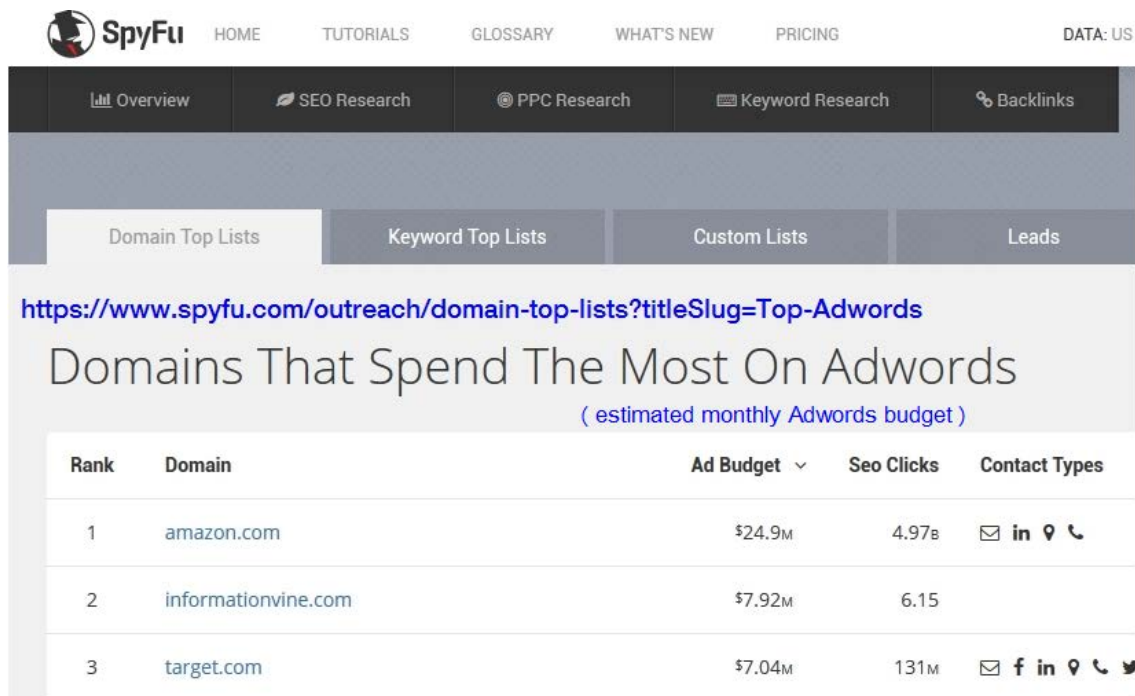


And here is what you might get if you type "t" (March 4, 2018 screenshot):





That “amazon” and “target” appear first in these lists (as opposed to “anxiety,” “addiction,” “allergies,” “Alicia Vikander” or other popular search terms) is probably not just a coincidence. According to a company that tracks online advertising, Amazon.com is Google’s largest advertiser, currently spending nearly \$300 million a year on Google Adwords alone (<https://www.spyfu.com/outreach/domain-top-lists?titleSlug=Top-Adwords>). Target currently spends about \$85 million a year on Adwords. See this screenshot from Spyfu.com, which was last updated on February 4, 2018:



Rank	Domain	Ad Budget	Seo Clicks	Contact Types
1	<a href="#">amazon.com</a>	\$24.9M	4.97B	✉ in 9
2	<a href="#">informationvine.com</a>	\$7.92M	6.15	
3	<a href="#">target.com</a>	\$7.04M	131M	✉ f in 9 9

Google, in turn – in part by featuring these companies prominently in search suggestions – is the single largest source of traffic for both Amazon.com and Target.com. 25.4% of Amazon’s visitors are sent directly from Google.com, and an additional 3.8% of Amazon’s visitors are sent by YouTube, which Google owns. 38.5% of Target’s visitors are sent directly from Google.com, and an additional 5.2% of Target’s visitors are sent from Yahoo, which draws its search results from Google. See the following screenshots from Alexa.com, dated March 4, 2018, which show the “upstream sites” for Amazon and Target:



An  
amazon.com  
company

Find Website Traffic Statistics: amazon.com

How popular is amazon.com?

#### Alexa Traffic Ranks

How is this site ranked relative to other sites?



Global Rank ?

10 ▲ 1

Rank in United States ?

5

#### Upstream Sites

Which sites did people visit immediately before this site?

Site	Percent of Unique Visits
1. google.com	25.4%
2. youtube.com	3.8%
3. facebook.com	2.6%
4. reddit.com	1.7%
5. ebay.com	1.7%



An  
amazon.com  
company

Find Website Traffic Statistics: target.com

How popular is target.com?

#### Alexa Traffic Ranks

How is this site ranked relative to other sites?



Global Rank ?

344 ▼ 27

Rank in United States ?

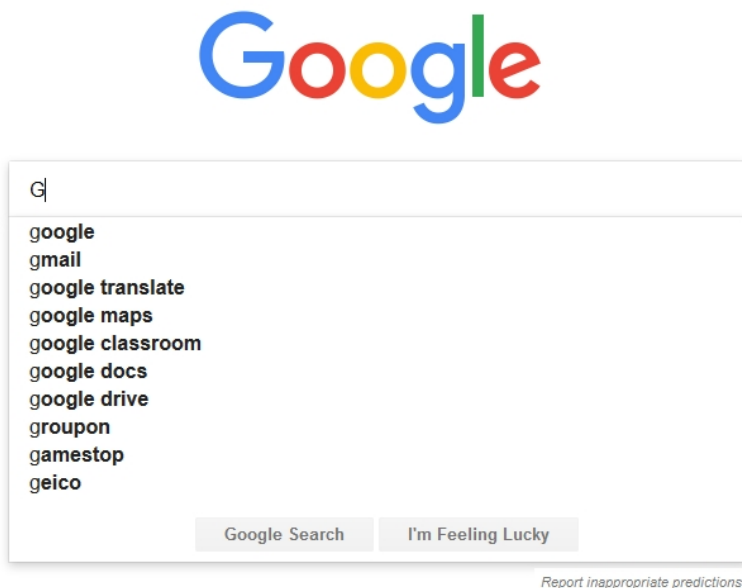
92

#### Upstream Sites

Which sites did people visit immediately before this site?

Site	Percent of Unique Visits
1. google.com	38.5%
2. yahoo.com	5.2%
3. amazon.com	5.1%
4. facebook.com	2.2%
5. walmart.com	1.8%

The same pattern occurs for other major advertisers on Google, among them Best Buy, Home Depot, Lowe's, and Zillow. The only companies that are shortchanged by this arrangement are those with names beginning with "g." See the following screenshot (dated March 4, 2018), in which the top seven suggestions are all for Google products:



Is it possible that Google is simply showing you what other people are searching for? Of course, and your individual results might vary, given Google's interest in providing users with customized results that satisfy their wants and needs. Our point is simply that search suggestions are likely influencing people's searches in ways that might benefit the search company from the very first character people type into the search bar. Under certain conditions, this influence can be dramatic.

To explore this matter further, try typing single alphabet letters into the search bars of Bing, Yahoo, and DuckDuckGo. Start with the letter "g." You might be surprised by what you see.