

Where survey data fails: Measuring the size of the FoxHole

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Abstract

Surveys are a vital tool in understanding public opinion and knowledge, but self-reported behavior in surveys generally leads to inaccurate estimations. We explore a popular and important behavior frequently estimated with surveys: news consumption. Previous literature has documented that television news consumption is consistently over-reported in surveys. We extend this work in three ways: (1) We show that the bias extends to online and social media-based news consumption (for example: we show that the *Gallup* poll on consumption of news links from social media is at least 5x too high) (2) We demonstrate that survey data also fails to accurately capture trends (for example: we show that Pew poll on news in social media shows no trend in Facebook consumption, despite a clear downward trend) (3) We highlight how behavioral data is more easily adaptable to the wide-range of possible results that a researcher may need to answer different, but related, sets of questions

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about news consumption (for example: we show that the *Navigator* poll on *Fox News* consumption is about 2.5x too high with a standard consumption metric, but could range from 2x to 5x depending on a very reasonable set of metrics of consumption). This research is important because despite building on earlier research, highly publicized surveys by well respected organizations regularly deploy this method, and highly cited academic articles in top journals such as *Public Opinion Quarterly* and *Science* continue to cite their results. These survey-based estimates are frequently reported directly as findings indicating that consumption of certain types of news is multiples higher than it is in reality; and, due to the high variance of these errors, it is difficult to simply rescale these results. Further, these surveys are oftentimes measuring the impact of news consumption on knowledge and public opinion, and these estimates of media effects are difficult to interpret if the sample includes many people who did not actually consume the news being tested. In closing, we outline a framework for using a mix of behavioral and survey-generated attitudinal data to accurately estimate consumption of news and related effects on public opinion and knowledge, conditional on actual media consumption.

Introduction and Literature Review

Surveys are the dominant method in recording and dissecting public opinion and knowledge. Social media, online data, and other new forms of “big data” that track opinions and understanding of information continue to provide a noisy, misspecified version of public opinion and knowledge from highly unrepresentative samples (Diaz

et al., 2016; González-Bailón et al., 2014). Thus, surveys continue to provide a crucial role in understanding the pulse of Americans.

Social scientists frequently tie public opinion and knowledge to news consumption in order to better understand correlations between them or to try to determine the causal relationship of news consumption on public opinion and knowledge (Iyengar and Kinder, 2010; Levendusky, 2013). Frequently this relationship is examined with aggregated consumption patterns, determined with behavioral data, matched to aggregated surveys or even behaviors, such as voting (Martin and Yurukoglu, 2017; DellaVigna and Kaplan, 2007). More common, social scientists (and journalists) match individuals' self-reported consumption of news to their survey results on public opinion and knowledge, all within a single survey.

When asked in a survey people have trouble remembering behavior accurately and errors are asymmetric as they are susceptible to several biases. For example, self-reports of internet usage (Scharkow, 2016) have several (some conflicting) types of biases, including some social desirability bias. Social desirability bias, where respondents over-report doing socially desirable behaviors, is the dominant bias in self-reports of washing hands (Jenner et al., 2006), voting in elections (Ansolabehere and Hersh, 2012; Anderson and Silver, 1986), and, central to this paper, frequency and quantity of news consumption (Prior, 2009, 2013*a,b*).

Prior (2009) tested the assumption that frequency of television news consumption can be measured accurately with self-reported survey data. When comparing self-reported network news consumption, backed out from self-reported frequency of consumption measures in the National Annenberg Election Survey (NAES) 2000, to

behavioral consumption taken from Nielsen’s “people meters”, the company’s technology to monitor television consumption of a random sample of 5,000 U.S. households, Prior (2009) finds that self-reports over-estimate the size of the network news audience by a factor of 3.4. As Prior notes: “According to Nielsen, between 30 and 35 million people watched the nightly news on an average weekday. Based on NAES self-reports, that number is between 85 and 110 million for most of the year” (Prior, 2009).

More recently, Dilliplane, Goldman and Mutz (2013) readily acknowledge the deep flaws of relying on self-reported frequency of television news consumption, and paraphrase the consensus well: “Given the tendency to answer quickly, respondents likely rely on shortcuts to come up with off-the-cuff estimates, thus reducing exposure measures to little more than self-assessed levels of political interest” (Dilliplane, Goldman and Mutz, 2013, see p. 237). In response, they created a list-based measure in which survey respondents are asked: “Which of the following programs do you watch regularly on television?”, and, addressing the same concerns, Guess (2015) explores open-ended question. Yet, as Prior (2013*a*) notes, even if these measures could capture binary consumption of a program, they cannot easily get at frequency or quantity of consumption. In a related space, Guess et al. (2019) explores the self-reporting of production of news content on social media.

This paper extends the literature in three key ways: (1) We show that the bias extends to online and social media-based news consumption (for example: we show that the *Gallup* poll on consumption of news links from social media is at least 5x too high) (2) We demonstrate that survey data also fails to accurately capture trends (for

example: we show that Pew poll on news in social media shows no trend in Facebook consumption, despite a clear downward trend) (3) We highlight how behavioral data is more easily adaptable to the wide-range of possible results that a researcher may need to answer different, but related, sets of questions about news consumption (for example: we show that the *Navigator* poll on *Fox News* consumption is about 2.5x too high with a standard consumption metric, but could range from 2x to 5x depending on a very reasonable set of metrics of consumption).

Despite the previous literature already highlighting potential problems, this paper addresses a meaningful question as academic papers continue to rely on survey data for estimations of frequency and quantity of news consumption, including papers in the top journals of political science, such as *American Journal of Political Science* in Dilliplane (2014) and *Public Opinion Quarterly* in Schober et al. (2016) and Murphy et al. (2014), and general interest science, such as *Science* in Lazer et al. (2018) and Vosoughi, Roy and Aral (2018). One of the surveys examined in this paper – *Pew’s* annual “News Use Across Social Media Platforms” – has well over a 1,000 citations, including 605 for its 2016 iteration alone.¹

Survey-only estimates of news consumption used regularly in academic and popular literature have large errors, and due to high variance of the errors there is no reliable way to simply rescale results. Further, respondents are frequently separated into treatment and control groups for the impact of media consumption based on these unreliable self-reports; we address in the paper how it is hard to interpret the meaning of these results, as the treated sample has many untreated respondents.

¹Citations as of December 2, 2019 on Google Scholar.

As we document in closing, however, there are paths forward for building survey data on behavioral data, yielding valid estimates of (a) news consumption, and (b) attitudinal effects of news consumption.

Data, Estimation, and Results: three examples

In this section we explore three recent high-profile examples of survey-based estimation of television news viewership, along with online news websites and social media-based news consumption. These examples extend the literature into online and social media, show how survey data also fails to accurately estimate trends in news consumption, and highlights how only behavioral data can provide an array of useful answers necessary for the complexity of what varying researchers may want to know about news consumption.

Example of *Navigator*

With our first example we confirm prior results on over-reporting of news consumption on television, and highlight the complexity of media consumption: only behavioral data is feasible when reasonable researchers may need very different interpretations from similar queries.

The *Navigator* poll is a highly publicized joint-product of *Global Strategies Group* and *GBA Strategies*. Their March 2019 poll establishes that regular consumers of *Fox News* live in a different information reality or “Fox-Hole”. Examples: Only 12% of *Fox-News*-watching Republicans believe in man-made climate change, as opposed to

28% of non-*Fox-News*-watching Republicans, and 77% of *Fox-News*-watching Republicans are very concerned about “socialism among Democrats”, as opposed to only 58% of non-*Fox-News*-watching Republicans. The study finds that 34% of Americans overall and 51% of Republicans, including leaners, report to be watching *Fox News* at least “a few times a month”.² Further, 22% of Democrats and 31% of Independents report to be watching *Fox News* at least “a few times a month”. In sum, the study concludes, “[t]here is an alternate reality in American politics, and it plays an outsized role in the way many experience and form opinions on the most important issues facing the country.” (Global Strategy Group, 2019, see p.1). And, this study received some outsize attention in the mainstream media,³ particularly among progressives on social media.⁴

We used Nielsen’s television viewing panel to obtain individual-level consumption data of 100,000 random Americans. This Nielsen panel is composed of demographically and geographically representative samples of people residing in the US, and tracks individual-level television consumption starting in 2016 through the present. In multi-person households, panelists manually record who is watching television at a given time. To create the television consumption data, panelists’ televisions track the name of the program and station being watched on a minute-by-minute basis, for both live and digitally recorded, or “TIVoed”, national television (i.e., excluding

²See page 18: <https://navigatorresearch.org/wp-content/uploads/2019/03/Navigator-March-Tracker-Topline-F03.19.19.pdf>

³For example: *The Daily Beast* <https://www.thedailybeast.com/poll-78-of-gop-fox-news-viewers-say-trump-is-best-president-ever> and *Daily Kos* <https://www.dailykos.com/stories/2019/3/21/1844005/-POLL-The-FOX-News-Audience-is-a-Fanatical-Irredeemably-Warped-Cult-of-Right-Wing-Extremists>

⁴For example: Jon Favreau <https://twitter.com/jonfavs/status/1108720828307243008>

local programming).

The *Navigator* survey does not provide a precise definition of “a few times a month”, but we start the comparison to our behavioral data under a set of reasonable assumptions. First, we count as one “session” any six minute viewing block, be it live or via DVR/TIVO. Note that this is a conservative method as it includes the most casual viewers, who only watched six minutes of consecutive programming - barely more than a conventional advertising block. Finally, to match *Navigator’s* target population, we weight the *Nielsen* panel towards registered voters, who consume news at higher rates than un-registered Americans.⁵

Navigator estimates that 34% of registered voters watched *Fox News* “a few times per month” or more in February 2019, but according to our behavioral estimates, just 18% watched *Fox News* even once for six or more minutes, and just 13.5% of registered voters watched three or more six-minute viewing blocks, which is a generous interpretation of a “a few times a month”. Figure 1 shows the wide gulf between the survey data and the behavioral data. Conservatively, *Navigator* is over-estimating the percent of registered voters watching these particular stations by a factor greater than 2.5x, demonstrating that previous results continue to hold.

⁵Weights are raked weights matching the marginals on gender, age, race and education for the known population of registered voters, taken from the full *TargetSmart* voter files.

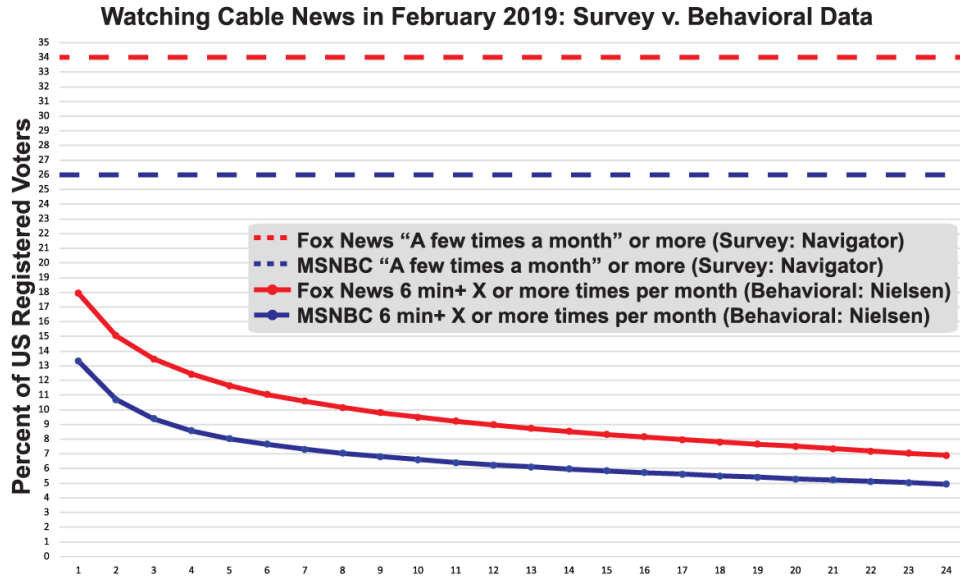


Figure 1: Size of *Fox News* Audience (watched at least “a few times a month”), as estimated by the *Navigator* survey and Actual Size of *Fox News* Audience (six-minute-sessions in February) derived from Nielsen viewing data. Both data from February 2019.

If we focus on Republicans alone, *Navigator* estimates that around 51% of registered voters watch *Fox News* “a few times a month”. In the partisan breakdown assumed by the *Navigator* poll, 39% of respondents identify as Republicans. According to our behavioral data, if every single member of the *Fox News* audience were Republican and we generously assume that watching just three or more times/month makes you a “few times a month” viewer, then just 34.5%, as opposed to the 51% stated by *Navigator*, of Republicans watch *Fox News* a few times a month. *Navigator*’s result is, at least, 1.5x too high on this central metric.⁶

Regardless of how inaccurate the survey results are, it is meaningful that they

⁶In reality, of course, it is highly unlikely that *everybody* in the *Fox News* audience identifies as Republican – so the 34.5% is an upper-bound.

are displayed as static, horizontal line on Figure 1 (as they will be on all figures); it is costly in a survey to ask multiple questions under various possible definitions of consumption, while it is easy for us to chart 25 possible frequencies for consumption, based on a single definition of engagement (viewing blocks of six or more minutes), with the behavioral data. We assume that viewing a channel one (or more) times/month (18% of registered voters) is a very extreme estimate of consumption, and that three (or more) times/month (13.5%) is a meaningful, but conservative estimate of “A few times a month”. But, it is reasonable that some researchers may need people who consume two or more times/week (i.e., eight or more times/month), which is 10%, or maybe 10 or more times/month at 6.5%. All of these are reasonable thresholds for “a few times a month”, depending on the questions a researcher is pursuing, and they span from a low of 6.5% to a high of 18%, for a spread of nearly 3x the smaller value. Thus, while we estimate that for one reasonable metric (3 times/month) the *Navigator* poll it is 2.5x too high, the poll could be 2x to 5x too high, depending on a very reasonable set of metrics of consumption.

Taking this point one step further, cross-program or cross-mode consumption is imperative to understanding the full news diet comprehensively. While the data exists in the individual-level survey results, *Navigator* does not report the overlap of Fox News and *MSNBC* viewership (image in Appendix, Figure S3); any errors in estimating consumption within one program would compound if a survey published consumption between various programs. Yet, it is easy to show crossover results in the behavioral data and be confident in their accuracy. Figure 2 shows that in 2016 about 17% of people who watched *Fox News* also watched *MSNBC* in a given week,

this about half of what Prior (2013b) estimated from similar data in 2008. By 2019 that estimate is a mere 10%. In short, *MSNBC* consumption has been going up since 2016, but cross-consumption has been declining rapidly from 2008 to 2016.

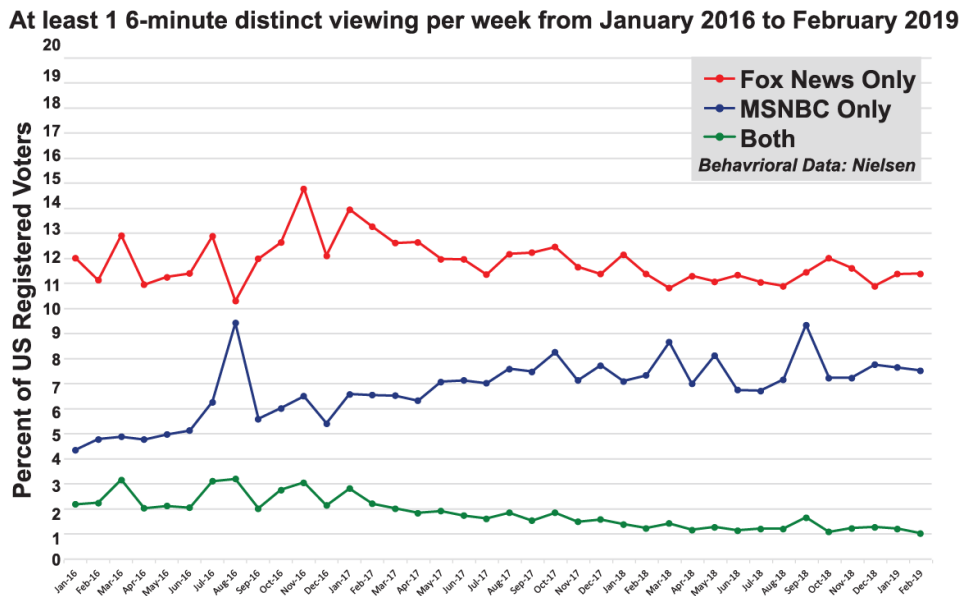


Figure 2: Average weekly consumption of one 6-minute (or more) continuous consumption block from 2016 to 2019.

We have proven that the sample of respondents who report watching *Fox News* includes many people who did not, yet we see massive attitudinal differences between self-reported-*Fox News*-watching Republicans and self-reported-non-*Fox News*-watching Republicans. For example, 60% of self-reported-non-*Fox-News*-watching Republicans wanted the Mueller investigation shut down, but 78% of self-reported *Fox-News*-watching Republicans did, and 49% of self-reported-non-*Fox-News*-watching Republicans believe members of the intelligence community are out to sabotage President Trump, but 79% of self-reported *Fox-News*-watching Republicans do.

There are two credible alternative causal mechanisms that could bring about these discrepancies. First, it is possible that *Fox News* consumption is not the causal agent. We cannot know who of those Republicans claiming to be regularly consuming *Fox News* speaks the truth and who is over-reporting. It is possible that the underlying causal agent here is not *Fox News*, but a broader information environment from which virtually all Republican respondents reporting to regularly watch *Fox News* receive the same cues, be it through social networks (e.g., President Trump’s Twitter feed) or alternative media. Critically, being part of this broader information environment would have to be correlated with over-reporting – a highly credible assumption.

Second, it is possible that the real difference between *Fox-News*-watching Republicans and non-*Fox-News*-watching Republicans is even starker than reported. In this view, Republicans who over-report consumption to *Fox News* have more moderate attitudes, and water down the radicalism of the exposed few. In effect, as opposed to a sizable and fairly radical chunk of Republicans that *Navigator* identifies, we would be dealing with a small, but extremely radical chunk of Republicans.⁷

Example of *Gallup*

With our second example we move deeper into the complexity of media consumption, while also showing the the phenomena of over-reporting news consumption holds for online and social media-based news.

The Knight Foundation has created a \$2.5 million “Trust, Media and Democracy”

⁷Only a selection of the beliefs and attitudes asked in the Navigator poll include breakdowns by self-reported *Fox News* consumption. Thus, we do not know how representative the differences between self-reported viewer types in the questions they report, versus the complete set of questions.

initiative⁸, to which Gallup polling of the US population is a key input. Its first major release was a poll of 19,196 adults on August 4 to October 2, 2017. The first question read “How much, if at all, do you use each of the following approaches for staying up-to-date on the news?” Key top-lines⁹ for a combined “a great deal” or “a fair amount” included 65% for watching television news, 41% for reading newspapers (printed or online), 41% for seeing or reading links to news stories on social media sites, 47% for news websites, 42% for commentary on TV or radio, etc.

Below, we address three survey questions for which we have relevant comparisons from our behavioral data. Specifically we document what percentage of Americans (1) watched news on television, (2) read news stories that link out of social media, and (3) visited news URLs, at least “a fair amount” during the same time frame the *Gallup* survey was in the field.

We make a set of different assumptions to ensure the survey data is comparable to our behavioral data. We interpret the question, “how much, if at all, do you use the following approaches for staying up-to-date on the news?”, as *on how many days during the month do you use the following approaches to obtain at least a minimum amount of news?*. This measure of unique days of news consumption reflects the wording “staying up-to-date”. Generally, the news at a given time covers current events, so consumption on a range of days is required for staying up-to-date. Of course, one could use online sources to become up-to-date on a month’s worth of news

⁸<https://www.knightfoundation.org/press/releases/knight-foundation-announces-major-trust-media-and-democracy-initiative-to-build-a-stronger-future-for-journalism>

⁹https://kf-site-production.s3.amazonaws.com/media_elements/files/000/000/130/original/Knight-Gallup_Survey_Topline_FINAL.pdf

in one sitting. To address this alternate interpretation, we analyzed the behavioral data assuming the question means *how much news are you exposed to on average over the month?* and the resulting plots are shown in Figure S1.

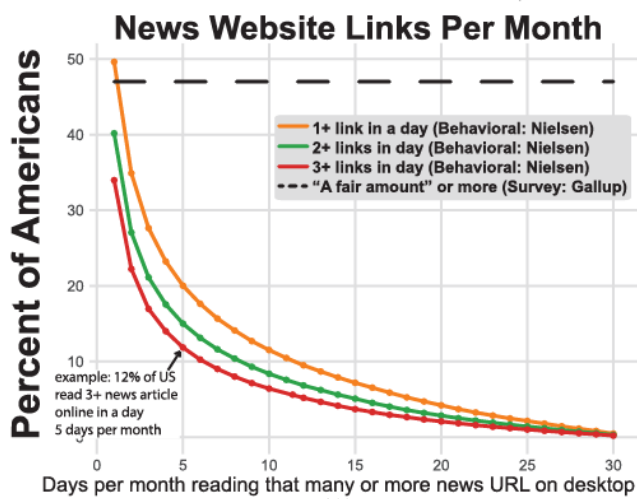
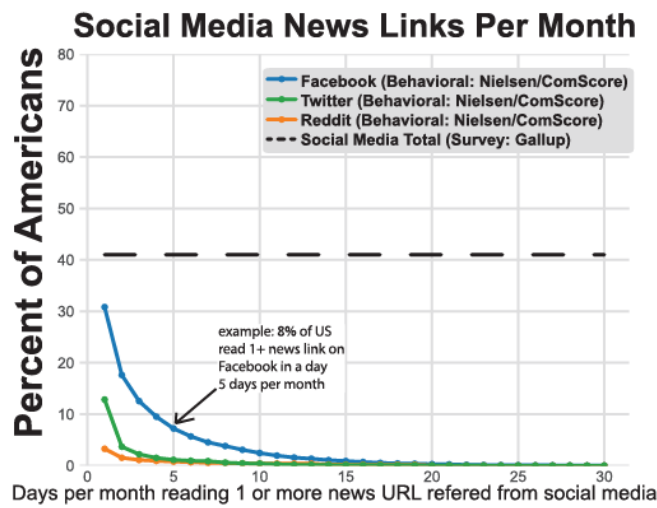
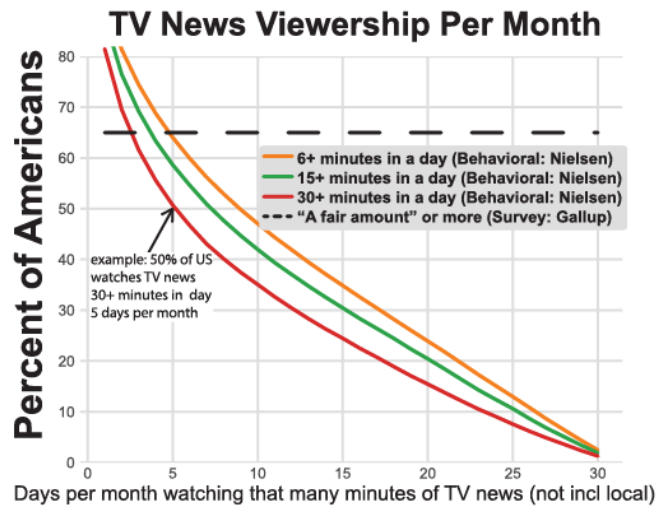


Figure 3: Percent of Americans consuming (a) TV news, (b) news websites linked social media, (c) news websites for x days a month in September 2017.

In Figure 1 we address how the “answer” can be a wide-range if the researcher requires different thresholds of frequency with a set definition of engagement (in that case six or more minutes of television viewing). In Figure 3a and 3c we show that it is not just frequency, but also how you define engagement, that adds further depth to possible set of reasonable answers. For example in Figure 3a, we consider not just six or more minutes, but 15 and 30 or more minutes as well. The result from the *Gallup* survey is plotted as a horizontal line at the value of the percent of respondents who answered “a fair amount” or “a great deal”.

News on Television

We use the Nielsen television panel to create the television news behavioral curves. We rely on Nielsen’s categorization of which television programs are news.¹⁰ Nielsen’s set of news programs is expansive, including many “soft news” programs, such as *Good Morning, America* and *Inside Edition*. See (Allen et al., 2019) for more details on list construction. To measure the amount of news watched on television for a given panelist in a day, we simply count the time spent watching news programs on that day.

The majority of possible definitions of “a fair amount” lead to significant discrepancies between the *Gallup* survey and behavioral data. For example, if one interprets a fair amount of television news consumption to mean watching at least fifteen minutes on at least ten days in a month, then the estimate from the *Gallup* survey (showing Figure 3a) is inflated by a factor of 1.5 from the behavioral data. But, if a researcher wants at least 30 minutes ten days in a month, then the estimate

¹⁰This categorization excludes local news programs.

is inflated by a factor 2 from the behavioral data. One caveat to our analysis is the exclusion of local news programs from our categorization scheme.

News URLs Linked from Social Media

For this part of the study we use ComScore’s aggregated digital traffic data in addition to Nielsen’s desktop panel. Like Nielsen for television, ComScore is a leading provider of digital traffic data, particularly of media and publisher data. Its competitive advantage is its proprietary “Unified Digital Measurement” method, which combines both census-based site analytics and panel-based audience measurement data to more accurately estimate digital consumption. In addition to its desktop and mobile user panel, participating websites place tags on all their content web pages, videos, apps and ads, that record calls by ComScore servers every time content is accessed. This combined approach allows it to validate their panel data with the census data, and vice versa, to more accurately estimate consumption.

One limitation of ComScore’s mobile consumption data is that it is aggregated at the domain level, as opposed to reflecting individual browsing histories. As a result, we cannot directly measure the number of people who navigate from social media platforms to a news URLs using the Comscore Data. In order to estimate this quantity, we assume that the likelihood of a social media user to navigate from social media to a news story is equal on desktop and on mobile.

$P(\text{getting news URLs on social media} \parallel \text{using social media on desktop}) =$

$P(\text{getting news URLs on social media} \parallel \text{using social media on mobile}).$

Provided this assumption, the percentage of Americans that get “a fair amount”

of news URLs from social media is equal to

$$\frac{100 \times (\# \text{ of Unique social media users across mobile and desktop}) \times P(\text{getting news URLs on social media} | \text{using social media on desktop})}{\text{The size of the US population}} \quad (1)$$

The number of unique users for Reddit, Facebook, and Twitter across mobile and desktop is provided by Comscore, and the conditional probability can be derived from the Nielsen desktop panel as in the comparison between behavioral data and *Pew's* poll.

One argument against this assumption is that the population of mobile users is different than the population of desktop users. A second argument is that some people may not get “a fair amount” of news URLs from social media on either desktop or mobile alone, but across both modes their amount of social media news consumption surpasses the key threshold of “a fair amount”. A third argument is that individuals’ news reading behavior is different on mobile and desktop.

We address these objections in order. First, since more time is spent consuming news on desktop than mobile (Allen et al., 2019), there is no reason to think that mobile users are more likely to click social media news than desktop users to the extreme degree that would be necessary to invalidate the measurement. Second, we set the threshold of news URLs having to be visited to one, so as to make this argument irrelevant. Third, news reading behavior is unlikely to change significantly between mobile and desktop because an individual’s content preferences and the individual’s friends and associated accounts (i.e., the content creators) are the same on desktop and mobile. Past research (cite <https://research.fb.com/publications/exposure->

to-ideologically-diverse-information-on-facebook/) has shown that these two factors play the largest role in determining what content an individual will be exposed to on Facebook, as opposed to, for example, an algorithm which conceivably could be different on mobile and desktop

Moreover, the discrepancy between desktop and mobile social media users' propensity to navigate to news content would have to be implausibly large to meaningfully close the gap between the survey and behavioral curves in figure 3b.

Gallup examines any social media collectively, while we explore the various social media platforms separately, but there is no meaningful interpretation of the *Gallup* results that is not substantially higher than the behavioral estimates. 41% of people told *Gallup* they are getting a fair amount of news links from social media, but just 8% of US users are consuming any news on Facebook five or more times/month. This measure is inflated by a factor of at least 5x for any meaningful interpretation of "a fair amount".

News URLs Online

We use the Nielsen desktop panel to create the online URLs behavioral curve by recording the number of news URLs visited by each panelist on each day of the month. *Gallup* specifically asks respondents about their consumption of "Internet-only news websites", so from our master list of news domains we remove those which are the online version of a print newspaper or magazine. Inclusion of all news domains (see figure S2) yields curves which are different from the ones shown in Figure 3c by less than 2% for the entire domain.

The behavioral curves, which do not account for mobile consumption, fall well

below the *Gallup* estimates for all but the weakest definitions. Since we are not able to obtain a principled individual-level estimate of news consumption on mobile devices, a direct comparison between behavioral data and self-report cannot be made.

However, examining the behavioral curves can show the level of mobile news consumption that must be true in order for the overall self reports to be accurate. For example, if “a fair amount” is assumed to mean viewing at least one news URL on ten different days, an additional 35% of the United States population (i.e., not overlapping with the original 12%) would have to consume a fair amount of news on their mobile devices for the attitudinal estimates to be correct. I.e., the penetration of news websites on mobile must be at least three times greater than on desktop, but in reality, the amount must be more than three times greater, because some people who consume news on mobile also do so on desktop. Given that total consumption of news URLs on mobile is less than the total consumption of news URLs on desktop Allen et al. (2019), this is improbable.

Gallup appears to overestimate news consumption in every category; this phenomena of over-reporting on survey-based estimates extends from television-news to online and social media-based news. *Gallup* estimates that 65% of people are getting a fair amount of television news each month, but reasonable estimates should be closer to 40%. *Gallup* estimates that 41% of people are getting a fair amount of news links from social media, but reasonable estimates should be closer to 5 or 10%. Their estimate of the usage of news websites online, while not perfectly comparable to our behavioral data, is an over-estimation by several times true consumption.

Example of *Pew*

With our third example we add one final extension to the literature by showing that survey-based estimations of news consumption do not hold for trends.

Pew has a massive series on media consumption that is anchored in self-reported surveys. We focus on “News Use Across Social Media Platforms 2018” published on September 10, 2018¹¹ and also cite the two previous years of 2017¹² and 2016¹³. The survey is a yearly series which has been cited in academic publications over 1,000 times according to Google Scholar and has over 15,000 hits on Google.

According to the 2018 publication, “[a]bout two-thirds of American adults (68%) say they at least occasionally get news on social media, about the same share as at this time in 2017[...].” Again, we have to place some assumptions on the presented buckets of frequency to make this data comparable to our behavioral data, as there is no objective definition of “occasionally”, in which *Pew* includes “Hardly ever” in their survey write-up. But, this is an annual survey, so we are interested in comparing trends along with levels. The 2018 survey shows that Facebook continues to be the most common pathway to news among social media with 64% of Americans reporting to spending time on Facebook, 43% of Americans reporting to be getting news from it, thus 67% of Facebook users consuming news. According to the *Pew* survey, that news consumption is relatively stable from 2017 when 66% of Americans reported to

¹¹<https://www.journalism.org/2018/09/10/news-use-across-social-media-platforms-2018/>

¹²<https://www.journalism.org/2017/09/07/news-use-across-social-media-platforms-2017/>

¹³<https://www.journalism.org/2016/05/26/news-use-across-social-media-platforms-2016/>

have spent time on Facebook, 45% reported to have consumed news on Facebook, thus 68% of Facebook users consumed news. YouTube is another common source of online news, according to the survey in 2018 55% of Americans used YouTube, 21% consumed news, thus 38% of users of YouTube consumed news. That is a big shift from 2017 when 58% of Americans used YouTube, just of 18% Americans consumed news on YouTube, thus 32% of YouTube users consuming news.

In August 2018, the same month as the *Pew* survey was in the field, 83% of Americans used Facebook and 89% used YouTube according to our behavioral data. The survey data was dramatically under-counting use of these social media giants. It is probable that social desirability cuts the other way in this example, in that people do not want to admit using certain social media.

It is much tougher to measure news consumption, but we use Nielsen's desktop panel to proxy the percentage of people that consume any news on these social media sites in a given month. For Facebook, Reddit, and Twitter we can see every website that people go to directly after leaving the social media site in question. We count any person with at least one clicked link as a user (i.e., as our denominator), and if they ever click on a news site, even once, as consuming news in that month (i.e., as our numerator). This is an upper-end proxy for the percent of people that ever use social media to consume news, because news is much more likely than non-news to contain links. Thus, the percent of people that click on links and consume news should be higher than the percent of people that do not click on links and consume news. On YouTube, we have a link to every video that anyone visits, and we code those links using YouTube's categorization to document if people consume any news

in any given month.¹⁴

Figure 4 documents that the Pew survey results are 2 to 3x higher than estimates derived from the behavioral data. Approximately 28% of Facebook users and 11% of YouTube users consumed any news on the platform in the month of August 2018, according to our behavioral data – as opposed to the survey-based measures of 43% and 21%, respectively. Further, in looking at results from 2016 and 2017, we document that Facebook news consumption, conditional on being on the site, actually dropped heavily from 38% to 28%, something important that the *Pew* survey missed entirely. And, conversely, while the *Pew* survey shows a dramatic increase in news consumption on YouTube, we do not see this reflected in the behavioral data.

¹⁴Since the categorization is done by the video producer, it tends to slightly overstate news in the consumption-weighted random sample of YouTube videos we reviewed.

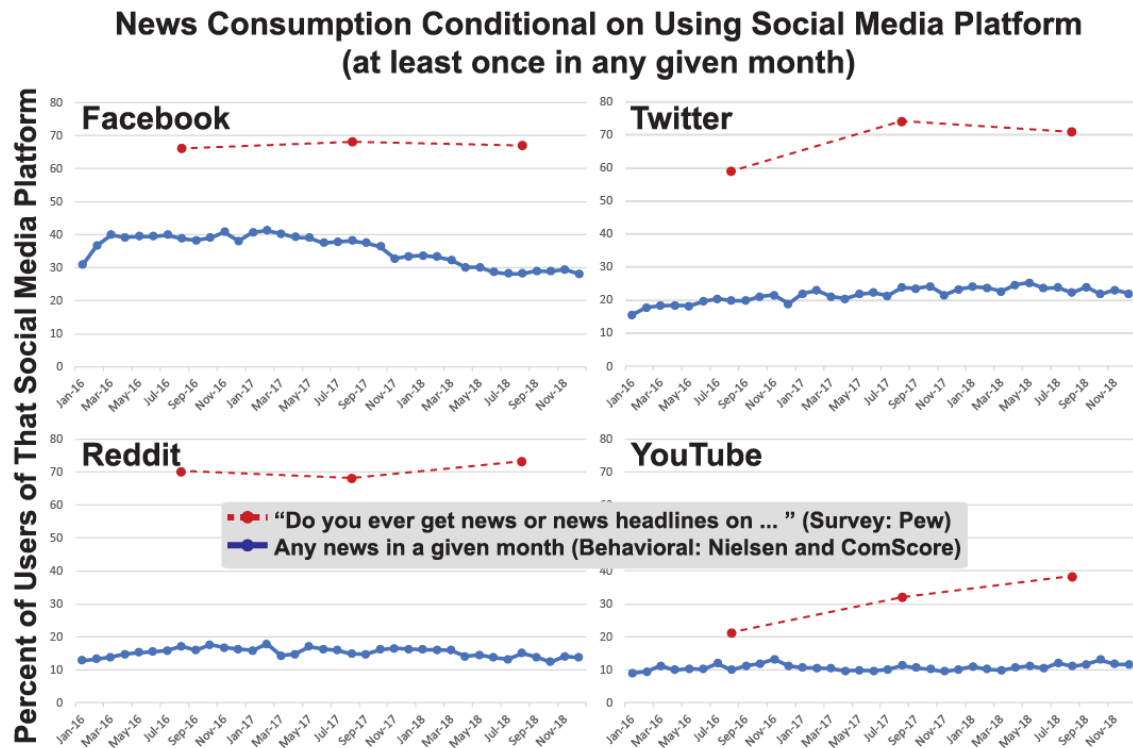


Figure 4: Percent of users consuming one one (or more) news articles in any given month on these social media platforms for 2016 through 2018.

We have already provided multiple possible explanations for discrepancies between behavioral and survey data in estimating news consumption. With perfectly interpretable questions, social desirability in how people answer surveys about consuming news is likely the dominant problem. And, as we have been documenting, most survey questions create a range of reasonable interpretations for the respondents. But, it is also possible that the individual respondents answer accurately, and the aggregation and framing of those responses result in a misleading conclusion relative to what most people would naturally assume as the reasonable interpretation. One of the questions reported in this Pew survey reads: “How often do you get

news from a social media site (such as Facebook or Twitter)?” with the responses “Often”, “Sometimes”, “Hardly ever”, and “Never”. As stated earlier, Pew’s claim that “[a]bout two thirds of American adults say they at least occasionally get news on social media” actually includes the “Hardly ever” category. Additionally, *Pew* clarifies that by news, it means “information about events and issues that involve more than just your friends or family”. By this definition, an event for a concert on Facebook or tweets with a viral hashtag like “icebucketchallenge” could be considered news. Thus, people who have consumed news on social media to a minimal extent, or who use the definition of news that encompasses all non-friend-and-family, content are considered active consumers of news on social media by *Pew*.

If coverage of this survey acknowledged these methodological constraints and definitions correctly, there would be less cause for concern. However, both the academic literature and the mainstream media focus on the top-line takeaways from this type of survey rather than the underlying data. For example, numerous highly-cited papers on fake news reference this survey as justification for research, quoting both the misleading magnitudes, e.g. “62 percent of US adults get news on social media” in Allcott and Gentzkow (2017) as well as the incorrect directional results, e.g. “more and more access to information and news [is] guided by [social media]” in Vosoughi, Roy and Aral (2018). Mainstream media outlets cite the misleading “two thirds of Americans” statistic almost verbatim and use it as evidence of social media’s growing, pernicious influence. An editorial in the New York Times on October 31, 2019 actually read “Half of all Americans say Facebook is their main source of news.” which was only corrected a few hours later to read, “Last year, over 40 percent of

Americans said they got news from Facebook.”¹⁵ However, if the results of the study had been instead framed as “two-thirds of Americans claim to have seen non-friend-and-family content on social media at least one time”, it is possible that journalists and academics might not be affording news on social media the same level of intense scrutiny.

Combining behavioral and attitudinal data

An obvious way forward is conceiving an analytics framework which directly combines behavioral data (consumption) and attitudinal data (consumption affects). Oftentimes, record or ID linkage/resolution may be necessary, other times this can be done with smaller opt-in samples that span both television and surveys. For example, we could link television consumption to voter files to be able to sample off of the file and layer attitudinal data on top of the behavioral data we have presented here. While this remains difficult, progress has been made in linking set-top boxes or addressable-TV boxes to central identifiers from the consumer realm, and, ultimately, voter records (with, of course, deference to privacy and both General Data Protection Regulation, GDPR, and California Consumer Privacy Act, CCPA, compliance).

Less directly, at minimum, television consumption can be projected onto attitudes. Probabilistic models of consumption, however, come with heavy endogeneity constraints.

¹⁵See correction in <https://www.nytimes.com/2019/10/31/opinion/aaron-sorkin-mark-zuckerberg-facebook.html>

Discussion

There are three main results in this paper: (1) Similar to television, online and social media-based news consumption is over-reported in surveys (2) Survey-based consumption data also fails on trends, as well as levels (3) Beyond any errors of survey-based data, behavioral data has the flexibility to answer potentially broad and complex set of questions that a researcher may need, which is simply too costly to even consider with survey-based data.

This is a meaningful problem to address as both academia and media itself continue to rely heavily on survey-based estimates of news consumption to understand who is consuming what, and how that affects them. We conclude that the raw results are too far off reasonable definitions of news consumption to be useful, and has too high of variance in its errors to be easily rescaled. Further, they create corrupted samples of treated respondents, confusing any results of studies on the impact of news.

Yet, analyzing effects of news consumption has remained crucial (or become even more so), and attitudinal data will continue to play an important part in this undertaking. As we have documented here, however, while surveys remain the best tool we have for documenting attitudes, they are not the right tool in determining who was exposed to what kind of news and who was not. Moving forward, both academia and industry should embrace new hybrid technology that allow surveys to gauge attitudes of those who have been shown, behaviorally, to have consumed various media in general, and news more specifically.

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Appendix

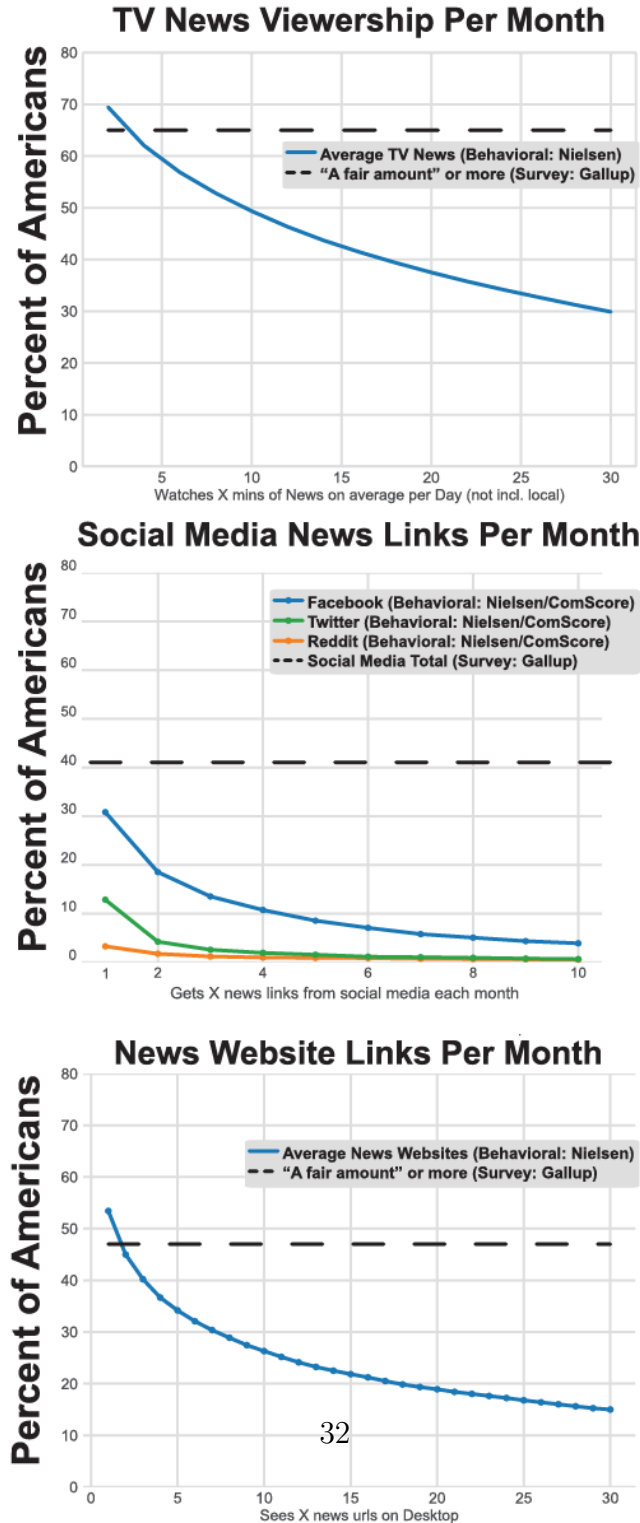


Figure S1: Monthly consumption, averaged, rather than viewed by daily frequency.

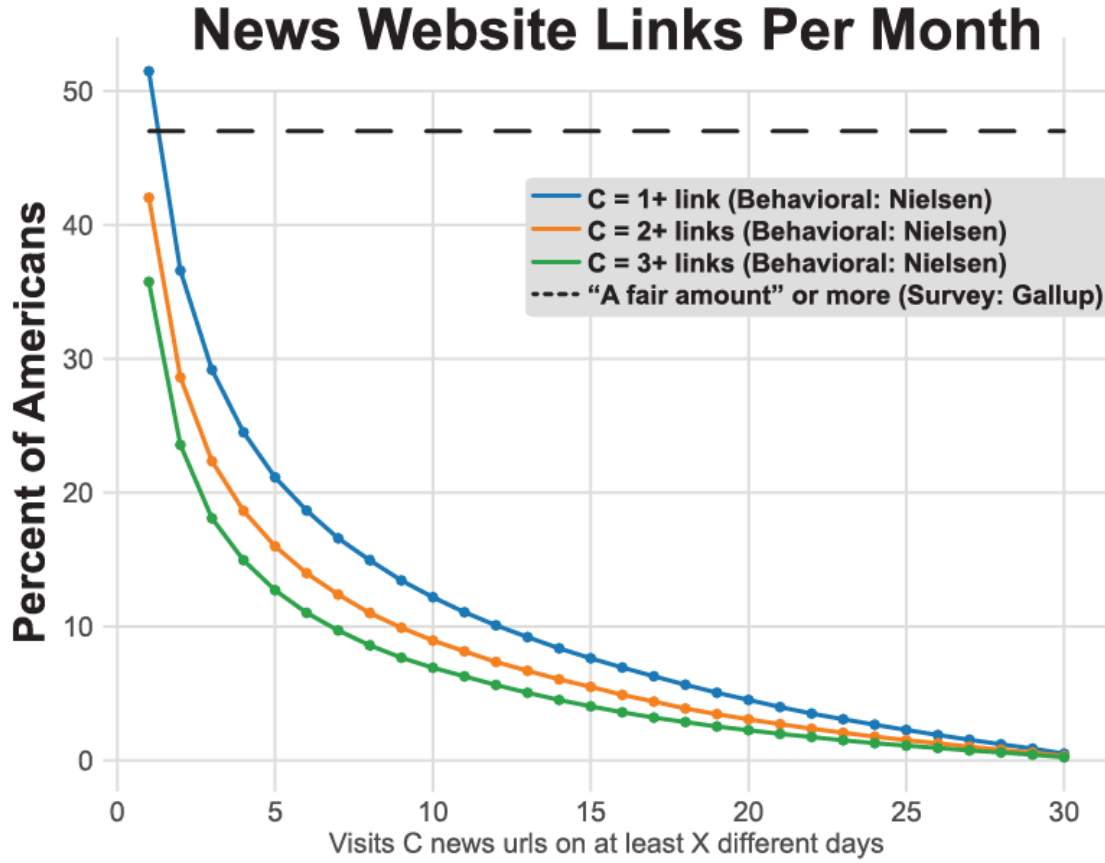


Figure S2: Monthly consumption of news websites including websites with offline versions.

Q3. You will now see the names of some TV networks again. For each, please indicate how often you personally watch this network.

	REGULAR VIEWER			IRREGULAR/NON			DK/NA	NET	
	Several hours a day	Once a day	A few times a week	A few times a month	Rarely	Never		REGULAR VIEWER	IRREGULAR/ NON
	• Fox News Channel.....	8%	7	12	8	23		39	4
Dem	3%	4	10	5	18	58	4	16%	80
Ind	3%	2	14	12	20	42	7	19%	74
Rep	15%	12	13	10	31	16	3	41%	56
• CNN.....	5%	11	14	10	22	33	5	30%	65
Dem	9%	19	18	13	17	18	5	46%	49
Ind	3%	3	16	13	21	36	9	21%	70
Rep	1%	6	7	5	29	48	3	14%	82
• MSNBC.....	4%	6	9	7	25	41	7	19%	73
Dem	8%	10	12	8	25	29	7	31%	62
Ind	2%	1	11	9	24	42	11	14%	75
Rep	*	3	5	5	26	54	6	9%	85

Figure S3: Image of the Navigator’s results from their survey and question cited in this paper in Figure 1.

1. How much, if at all, do you use each of the following approaches for staying up-to-date on the news?

<i>2017 Aug 4-Oct 2 Sorted by a "great deal"</i>	A great deal	A fair amount	Only a little	Not at all	No answer
Watching television news programs that report the day's news	41	24	21	12	1
Reading a newspaper (printed or online version)	20	21	32	25	2
Seeing or reading links to news stories on Facebook® or other social media sites	20	21	20	36	2
Visiting Internet-only news websites	19	28	29	21	2
Tuning in to TV or radio talk shows that provide commentary on the news	19	23	28	29	2
Getting news alerts on your smartphone	17	17	21	43	2
Listening to news programs on the radio that report the day's news	16	20	30	33	2
Subscribing to a particular news source that sends you links to its top news stories for each day	9	11	17	61	3
Using a website or app that organizes news links for you from a variety of sources, often called a news aggregator	8	9	15	66	2

Figure S4: Image of the Gallup’s results from their survey and question cited in this paper in Figure 3, Figure S1, and Figure S2.

ASK IF AT LEAST YES TO 1 ITEM SNS; SHOW ONLY THOSE SITES USED (SNSA-K=1):
 SNSNEWS Do you ever get news or news headlines on any of the following sites? By news we mean information about events and issues that involve more than just your friends or family.
[RANDOMIZE]

	<u>Yes</u>	<u>No</u>	<u>No Answer</u>
BASED ON FACEBOOK USERS:			
a. Facebook			
Jul 30- Aug 12, 2018 [N=3,196]	67	33	*
Aug 8- Aug 21, 2017 [N=3,635]	68	32	1
Jan 12-Feb 8, 2016 [N=3,210]	66	34	*
Mar 13-15, 20-22, 2015 [N=1,343]	63	37	*
Aug 21-Sep 2, 2013 [N=3,268]	47	53	0
BASED ON TWITTER USERS:			
b. Twitter			
Jul 30- Aug 12, 2018 [N=1,018]	71	28	1
Aug 8- Aug 21, 2017 [N=1,088]	74	25	1
Jan 12-Feb 8, 2016 [N=908]	59	41	1
Mar 13-15, 20-22, 2015 [N=347]	63	37	0
Aug 21-Sep 2, 2013 [N=736]	52	48	0
BASED ON YOUTUBE USERS:			
h. YouTube			
Jul 30- Aug 12, 2018 [N=2,648]	38	61	1
Aug 8- Aug 21, 2017 [N=3,180]	32	67	1
Jan 12-Feb 8, 2016 [N=2,542]	21	77	1
Aug 21-Sep 2, 2013 [N=2,506]	20	80	0
BASED ON REDDIT USERS:			
i. Reddit			
Jul 30- Aug 12, 2018 [N=357]	73	26	*
Aug 8- Aug 21, 2017 [N=369]	68	32	*
Jan 12-Feb 8, 2016 [N=288]	70	30	*
Aug 21-Sep 2, 2013 [N=114]	62	38	0

Figure S5: Image of the Pew's results from their survey and question cited in this paper in Figure 4.