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Short Communication

Can a selfie promote public engagement with skin cancer?

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ABSTRACT

Social media may provide new opportunities to promote skin cancer prevention, but research to understand this potential is needed. In April of 2015, Kentucky native Tawny Willoughby (TW) shared a graphic skin cancer selfie on Facebook that subsequently went viral. We examined the volume of comments and shares of her original Facebook post; news volume of skin cancer from Google News; and search volume for skin cancer Google queries. We compared these latter metrics after TWs announcement against expected volumes based on forecasts of historical trends. TWs skin cancer story was picked up by the media on May 11, 2015 after the social media post had been shared approximately 50,000 times. All search queries for skin cancer increased 162% (95% CI 102 to 320) and 155% (95% CI 107 to 353) on May 13th and 14th, when news about TW's skin cancer selfie was at its peak, and remained higher through May 17th. Google searches about skin cancer prevention and tanning were also significantly higher than expected volumes. In practical terms, searches reached near-record levels - i.e., May 13th, 14th and 15th were respectively the 6th, 8th, and 40th most searched days for skin cancer since January 1, 2004 when Google began tracking searches. We conclude that an ordinary person's social media post caught the public's imagination and led to significant increases in public engagement with skin cancer prevention. Digital surveillance methods can rapidly detect these events in near real time, allowing public health practitioners to engage and potentially elevate positive effects.

1. Introduction

Celebrity health disclosures can lead to significant media coverage and public engagement (Noar et al., 2014). For instance, Angelina Jolie's 2013 disclosure that she had undergone a prophylactic mastectomy resulted in large increases in online breast cancer search queries (Noar et al., 2015), followed by a near doubling of demand for BRCA1/2 testing (Evans et al., 2014). Similarly, Charlie Sheen's 2015 revelation that he was HIV positive caused large increases in HIV-related search queries (Ayers et al., 2016), followed by significant increases in HIV testing (Allem et al., 2017).

While the modern media environment is one that supports and may even amplify the effects of celebrity stories, it is also one that allows ordinary people to share their stories in ways that may engage the public. What is currently unknown, however, is whether an ordinary person's story could spark meaningful increases in engagement with health-related topics. On April 25, 2015, Tawny Willoughby (TW) - a then 27 year-old Kentucky native - posted a graphic selfie of her skin cancer treatment to Facebook. In it, she revealed that "this is what skin cancer treatment can look like," and advised readers to stay away from tanning beds and to not lay in the sun. She also revealed that she had tanned 4–5 times per week when she was younger and was first diagnosed with skin cancer at age 21.

Did TW's selfie resonate with the public, and did it motivate public engagement with skin cancer prevention? We sought to understand how her disclosure spread via social and mass media and to examine its impact on online information seeking about skin cancer.

2. Methods

Facebook engagement with TW's selfie was monitored by counting daily public comments to her public post and shares of her post. Google News (https://news.google.com/) articles that mentioned "skin cancer" were monitored daily along with reports that mentioned "Willoughby"

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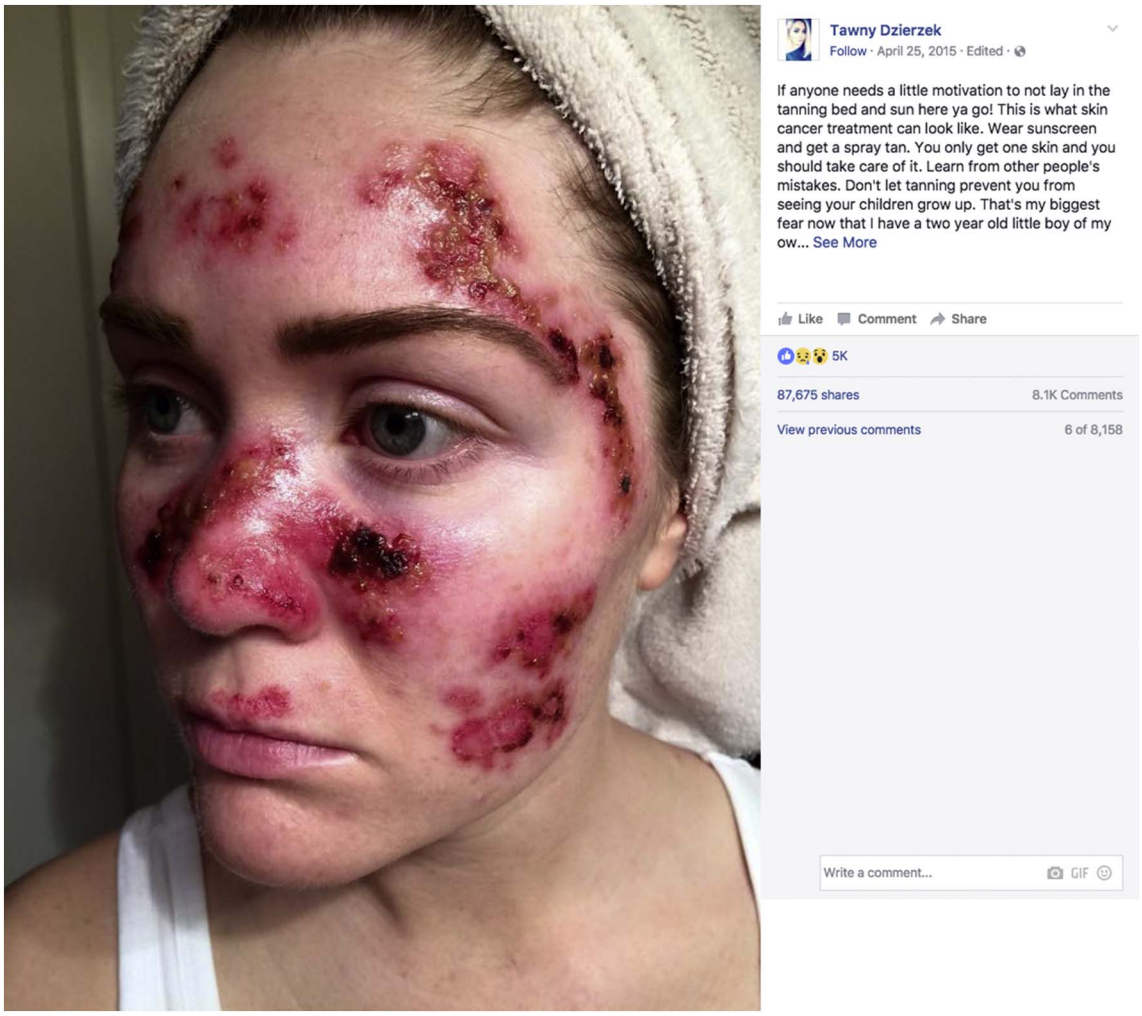

Fig. 1. Tawny Willoughby's (TW) Facebook Post. Note: This was captured in February, 2017, after TW changed her last name to Dzierzek.

(TW's surname). Google searches emerging from the United States (google.com/trends) that included the terms "skin" and "cancer" were monitored daily, along with the subset of searches focused on tanning (those including "tan(s)" or "tanning") and prevention (those including "prevention" or "prevent"). The fraction of searches with the focal terms relative to all searches were used to adjust for variations in population size (or Internet use) across time, with absolute volumes inferred from ComScore estimates.

Trends were described for the month after TW's selfie (April 25th, 2015–May 25th, 2015). The "Tawny effect" was calculated by comparing the observed outcome volumes to a counterfactual representing expected volumes had news coverage of TW's story not occurred (Shadish et al., 2002), an autoregressive integrated moving average (ARIMA) model fit using Hyndman and Khandakar's algorithm (Hyndman & Khandakar, 2008). This model uses historical data to estimate expected volumes for the time period after TWs post. These models are robust to the most well-known biases, including recurring periodicities and trending in the data, such as how the daily volume of searches may be growing as Google's user base grows. Search volumes were logit transformed to fit the models and transformed back to the linear scale to avoid negative predictions. Observed volumes were then compared to expected volumes as a percentage increase ([observed minus expected] divided by expected) for each day after coverage of TW's story began - May 11th, 2015 as determined by Google News - until estimates of increased search volumes were no longer statistically significant. Ninety-five percent prediction intervals were generated from 1000 simulations of the ARIMA model, resampling errors from the fitted model (rather than normal errors).

All analyses relied on public or private anonymized data, adhering to the terms and conditions, terms of use, and privacy policies of Facebook and Google. TW provided written consent to use her Facebook image and full name. All analyses were computed using R version 3.2.1.

3. Results

TW's skin cancer selfie was publicly posted on April 25th, 2015 (Fig. 1) and began spreading on Facebook soon thereafter. In fact, her selfie received more than 50 comments the day it was posted. As engagement increased, users began sharing her selfie on their Facebook pages, ultimately reaching 50,000 shares by May 11th - prompting the news site Byrdie to break the story. The single news story on May 11th was followed by nine additional news reports on May 12th, including one on CNN. News about TW's selfie increased on May 13th (35 news reports) and peaked on May 14th (117 news reports - including ABC's Good Morning America), while overall news coverage of skin cancer was declining (Fig. 2).

Google searches that included the terms "skin" and "cancer" increased around the time when news about TW's skin cancer broke (Fig. 2). All skin cancer searches were 162% (95% CI 102 to 320) and 155% (95% CI 107 to 353) higher than expected volumes on May 13 and 14, when news about TW's skin cancer selfie peaked. Searches about skin cancer remained significantly higher than expected on the 15th (88%; 95% CI 45 to 218), 16th (52%; 95% CI 11 to 152) and 17th

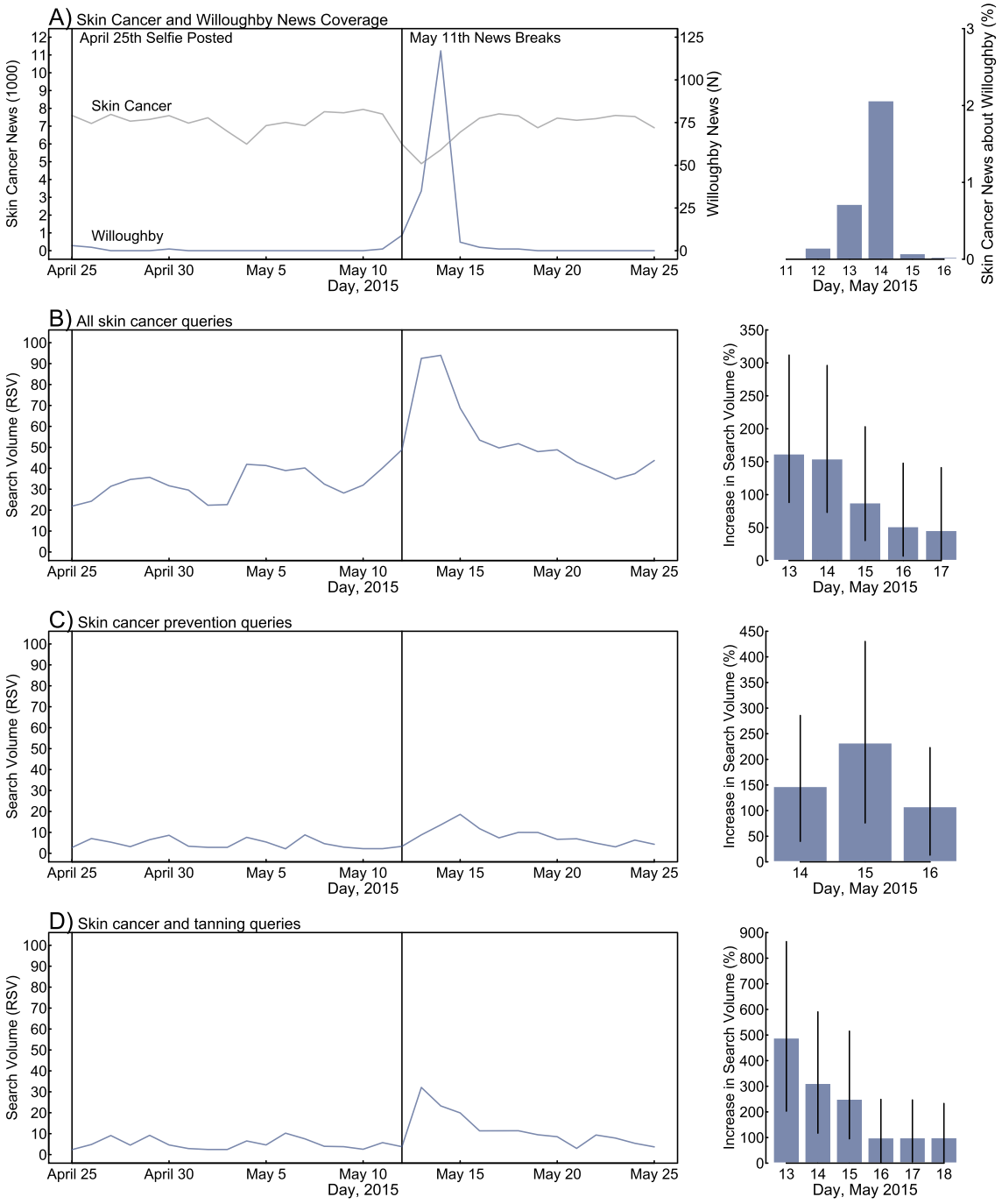

Fig. 2. News and Search Query Volume before and after TW's Post. Note: Panel A is news volume; Panel B is all skin cancer search queries; Panel C is skin cancer and prevention queries; and Panel D is skin cancer and tanning queries (Note: Bar graphs on right are on different scales. Only days with statistically significant increases are displayed in the search query bar graphs).

(46%; 95% CI 4 to 142), but returned to normal volumes on May 18. In practical terms, May 13th, 14th and 15th were respectively the 6th, 8th, and 40th most searched days for skin cancer of all time (encompassing more than 4500 days since January 1, 2004). Over the TW effect period (May 13–18), there were between 197,000 and 229,000 searches for the term "skin cancer" alone.

Skin cancer queries that also included "prevent" or "prevention" did not change on May 13 but increased 147% (95% CI 45 to 304) on May 14th and remained significantly elevated on the 15th (232%; 95% CI 88 to 499) and 16th (108%; 95% CI 22 to 298), returning to expected volumes on May 17. Skin cancer queries that included "tan(s)" or "tanning" were also higher on May 13th (489%; 95% CI 228 to 864), 14th (313%; 95% CI 123 to 953), 15th (251%; 95% CI 100 to 796), 16th (99%; 95% CI 4 to 384), 17th (100%; 95% CI 12 to 400) and 18th (100%; 95% CI 4 to 408) compared to expected volumes.

4. Discussion

TW's skin cancer selfie appears to have engaged the public in ways only previously seen with celebrity disclosures (Noar et al., 2014). Given the participatory nature of social media, it is likely that more of these kinds of events will occur in the future. Digital surveillance methods are needed to quantify the effects of such events (Noar et al., 2013; Ayers et al., 2014a; Ayers et al., 2014b), which may not be

captured by traditional surveillance systems. Such methods can rapidly detect events while they are happening in near real time, allowing public health practitioners to engage and potentially elevate positive effects.

Social media has recently garnered attention in the skin cancer prevention literature. Studies have shown that social media use is associated with greater pro-tanning beliefs (Myrick et al., 2017) and indoor tanning (Stapleton et al., 2016) among young women. This has led researchers to suggest social media as a key venue for reaching indoor tanners with skin cancer prevention interventions (Myrick et al., 2017; Stapleton et al., 2016; Falzone et al., 2017). The TW event - while not a formal public health intervention - supports this approach. TW's announcement led to significant increases in skin cancer queries, and such searches are an important metric of public engagement (Wehner et al., 2017). Research has demonstrated that searches are a valid proxy for syndromic and behavioral surveillance (Goel et al., 2010), with information seeking often presaged by later behavioral changes (Noar et al., 2014).

Why did TW's story resonate with the public? Research on narrative communication demonstrates that stories can be more impactful than didactic communication (Green, 2006). Mechanisms by which this occurs include identification with characters, less counter-arguing against the message, and greater message recall (Green, 2006). Research also suggests that graphic images may increase the impact of skin cancer prevention messages (Mays & Tercyak, 2015; Sontag & Noar, 2017). TW's story and her selfie likely proved a powerful combination, demonstrating that organic events that are not part of planned health campaigns can have a significant impact on engagement with skin cancer that over time may yield important public health benefits.

This study was limited in several ways. First, we only examined search queries for one search engine - Google - although it captures more than 70% of all internet searches (Search Engine Watch, 2017). Second, our methodology did not allow us to examine who searched or what sites they visited. Third, we only examined news volume and not placement or prominence of news stories. Finally, this study was quasi-experimental and thus we cannot rule out the possibility that other factors besides TWs post influenced news and search volume.

In conclusion, this study demonstrated impact of a Facebook post that included a selfie on search queries about skin cancer. This “organic” event (Leas et al., 2016) was made possible by the participatory nature of social media. Additional research is needed to understand how to harness the potential of both organic and planned communication interventions to improve public health outcomes and subsequently reduce morbidity and mortality.

Transparency document

The Transparency document associated with this article can be found, in online version.

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Drs. Ayers and Althouse share an equity stake in Directing Medicine, LLC, which advises how to implement some of the methods embodied in this work. Dr. Dredze has received consulting fees from Directing Medicine LLC and Sickweather LLC, who use social media for public health surveillance. The methods described in this article are not proprietary.

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