

# Analysis of population inquiry on practices for ultraviolet radiation protection

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## Abstract

UV radiation exposure is one of the key modifiable risk factors for skin cancer. Hence, patient education regarding skin protection and sunscreen use is of tremendous importance to public health. To better understand patient practices regarding skin protection in a population level, we looked into the Internet search behavior of the US-based population. We investigated patient inquiries on the United States Food and Drug Administration (FDA) announcements regarding sunscreen use by quantifying search terms such as "broad spectrum sunscreen", "sunscreen" and "sunblock" with Google Trends, a novel methodology for understanding internet search practices. Our findings show that "broad spectrum sunscreen" searches were significantly increased post 2011 FDA announcements, which suggest increased public awareness regarding the importance of broad spectrum protection. It is encouraging these preliminary results indicate that skin protection practices are being increasingly investigated by the general public and may serve as a novel approach for identifying areas of improvement regarding patient education on the reduction of the risk for skin cancer.

*Keywords: sunscreen, ultraviolet radiation, internet query, population behavior, public health*

## Introduction

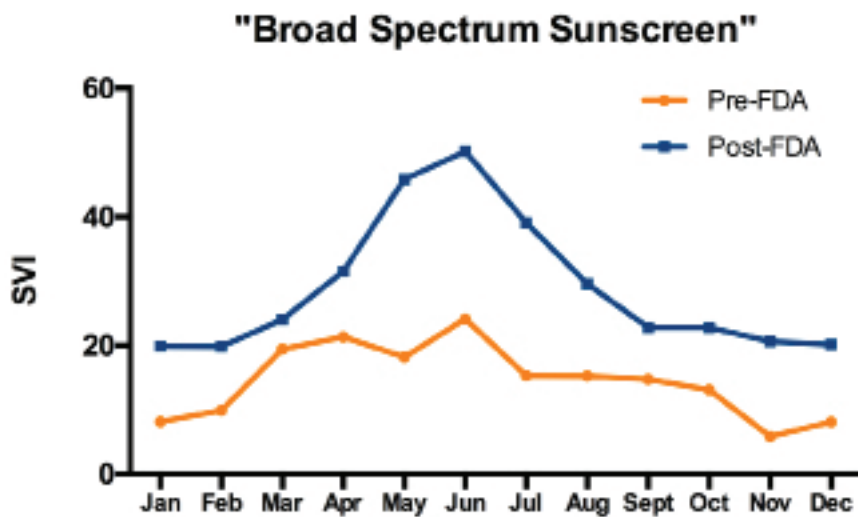
Exposure to both ultraviolet A (UV-A) and ultraviolet B (UV-B) radiation comprises a modifiable risk factor for developing skin cancer, offering a tremendous opportunity for patient education in the prevention

of skin cancer. A key driver in patient education is announcements issued by the FDA and continued dissemination to patients by healthcare providers. Herein, we present the utility of Google Trends [1], a novel methodology quantifying internet search data to monitor population behavior in relation to FDA announcements on UV protection in 2011 [2, 3].

## Methods

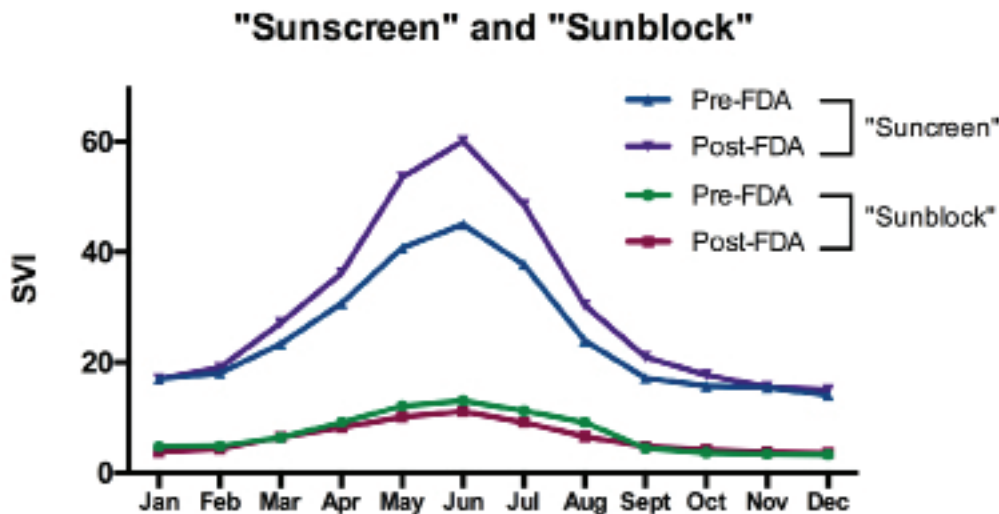
Using Google Trends, we extracted data in September 2016 from the United States from January 1, 2004, to December 31, 2015, for the search terms "broad spectrum sunscreen", "sunscreen", and "sunblock." The determination of search terms was based on the subject of FDA announcements [2, 3]. Data were extracted as search volume index (SVI), a normalized value based on any given inquiry standardized to total inquiries on Google at any given time and region. SVI was plotted over time to depict temporal trends in search inquiry. Cosinor analysis was used to identify peak and troughs [4]. Based on FDA announcements made in 2011 regarding UV protection, SVI data sets were compared pre- and post-FDA announcement using Wilcoxon Rank Sum Test to determine p value (R software, version 3.2.1).

**Results and Discussion:** Mean SVI for "broad spectrum sunscreen" displayed a temporal pattern with peaks in June and troughs in the winter (November-January), a pattern which has persisted for the entire duration of 2004-2015 (**Figure 1**). Further, SVI was significantly increased across the entire year post-FDA announcement compared to pre-FDA announcement [2], (Figure1,  $p << 0.0001$ ). SVI for "sunblock" and "sunscreen" displayed a



**Figure 1.** Mean SVI for "broad spectrum sunscreen" pre-FDA and post-FDA announcement [2] from 2004-2015.

2011, suggesting increased awareness and understanding of the importance of broad-spectrum protection. In 2011, the FDA also denounced the terminology "sunblock" to help the population understand that UV radiation cannot be fully blocked [3]. However, no changes in population behavior were found after this announcement suggesting that misconceptions may still exist regarding the nature of UV radiation protection. Furthermore, our findings show that "broad spectrum sunscreen" searches have a temporal pattern, with peaks in summer months and troughs during the winter ones. This may reveal a potential gap in the public knowledge and interest



**Figure 2.** Mean SVI for "sunscreen" and "sunblock" pre-FDA and post-FDA announcement [3] from 2004-2015.

seasonal pattern with peaks in June and troughs in December, similar to that of "broad spectrum sunscreen" (Figure 2). However, distinct from "broad spectrum sunscreen", no significant changes in population search behavior were detected post-FDA announcement [3] for either "sunscreen" or "sunblock" (Fig. 2,  $p=0.09$  and  $0.91$ , respectively). Our study is among the earliest to utilize Google Trends as a novel approach to monitor population internet search behavior in relation to FDA announcements. In 2011, FDA announced the importance of broad spectrum sunscreen labeling to communicate comprehensive protection against harmful UV-A and UV-B radiation [2]. Encouragingly, mean SVI for "broad spectrum sunscreen" has increased since

regarding the importance of sunscreen use year-round. Overall, these data suggest that increased counseling by dermatologists and primary care health providers to address the aforementioned discrepancies may be greatly beneficial.

### Conclusion

Taken together, our preliminary data suggest that Google Trends may serve as a valuable metric to monitor educational campaigns employed both from physicians and national agencies regarding skin

protection and minimizing radiation risk. Several limitations intrinsic to Google Trends methodology exist. Google Trends does not capture the demographics of the population entering search queries and only reflects the population using the Google search engine as a source of information, which can be dependent on variables such as accessibility and age. Nevertheless, Google Trends provides a unique vantage point on a large scale and has been increasingly acknowledged as a valuable tool in public health research [5-7].

### References

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