

Evaluating Population Interest in Vitiligo Through an Analysis of Google Trends and Social Media

Simone Nicole Boeckmann Montgomery BA and Nada Elbuluk MD MSc

Department of Dermatology, Keck School of Medicine at the University of Southern California, Los Angeles, CA

INTRODUCTION

Vitiligo is an autoimmune pigmentary condition with a complex, multifactorial pathogenesis resulting in depigmentation of skin. It affects between 0.4-2% of the population worldwide.¹ In recent years, vitiligo has seen a significant increase in attention in both mainstream media and on social media. Prior to the emergence of body positivity campaigns and supermodel Winnie Harlow, representation of vitiligo in the media was sparse, focusing mostly on the skin lightening transformation of artists like Michael Jackson and Sinbad. In contrast, today, there are numerous advertising campaigns and platforms from makeup and clothing companies to patient-organized support groups encouraging representation of vitiligo and positive awareness about the condition.

Nearly 90% of Americans use the internet, which has transformed the way information is provided and accessed.² The domain of health-related information is no exception. More than 72% of Americans report having used the internet for health-related questions, including exploring the potential diagnosis for symptoms, a diagnosis given to them, disease progression information, and symptom management.³ Furthermore, it has been reported that the internet, has become the first, and sometimes only, source of health information for patients.⁴ Google holds 88.5% of the market share of search engines, with over 3.5 billion daily queries – 7% of which are reported to be health-related.^{5,6}

Google Trends is a search tool which tracks and reports the search volume of a specific query over time and/or within a specific region. Recognizing the power of having access to the over 3.5 billion daily queries, the field of medicine has begun to adopt Google Trends and the use of big data as a powerful epidemiological tool to track population trends and interests over time. In dermatology, studies using Google Trends have been used to elucidate population interest in several conditions including skin cancer, psoriasis, and Botox.^{7,8,9} In addition to patients' using Google to obtain background information and explore health issues on various websites, social media has also evolved from a personal sharing space to a marketplace of information, services, and products. Instagram, a photo-sharing app, has become the most popular social media platform, serving over 110 million users in the United States and over 800

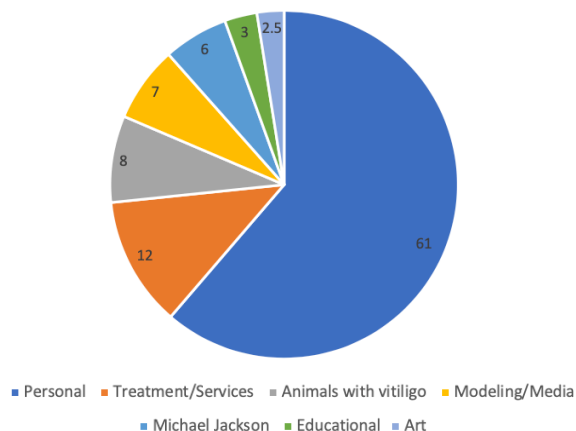
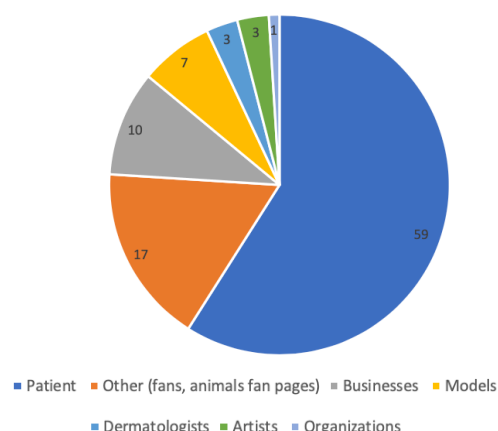
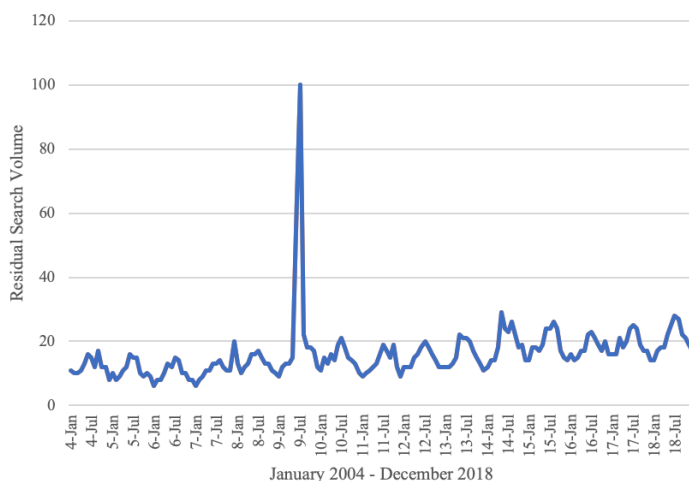
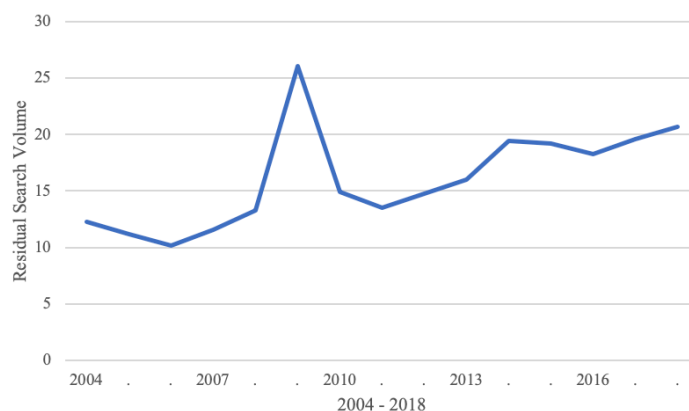
million users worldwide.¹⁰ Indeed in 2018, forty-two percent of Americans reported use of social media platforms, such as Instagram, to search for health-related information.¹¹

Vitiligo has seen a significant increase in attention in mainstream media, ranging from campaigns to 'embrace the skin you are in' to supermodels with vitiligo being featured as the face of major retailers. To date there has been only one peer-reviewed study using Google Trends to examine interest in vitiligo. However, our study is the first to use both Google Trends and a social media platform to elucidate public knowledge patterns about vitiligo and general interest in vitiligo. The goal of this study is to 1) apply Google Trends to track and elucidate the temporal and geographical trends, related interests, and top searches about vitiligo and 2) to summarize the content of vitiligo related treatments and topics on Instagram and document its growing presence.

METHODS

The keyword of vitiligo was entered (August 15, 2019) in Google search and we recorded the number of results and the content of the top page of results. Next, Google Trends was used to explore temporal and geographical population interest related to vitiligo. Searches were limited to those performed in the United States from January 1, 2004, the earliest year with recorded Google Trends data, through December 31, 2018. Google Trends presents temporal and geographical trends as relative search volumes (RSV) on a scale of 1-100, which allows for normalization of geographic and population sizes. Interest over time (temporal) was recorded as RSV per month, and subsequently, annual RSV was estimated by calculating the mean of each monthly RSV per year. Interest by subregion was also recorded as RSV for each state. The subcategory of "Related Queries" was then explored. This subcategory is also provided in the Google Trends analysis and identifies the most frequent subsequent searches by users who initially searched for vitiligo.

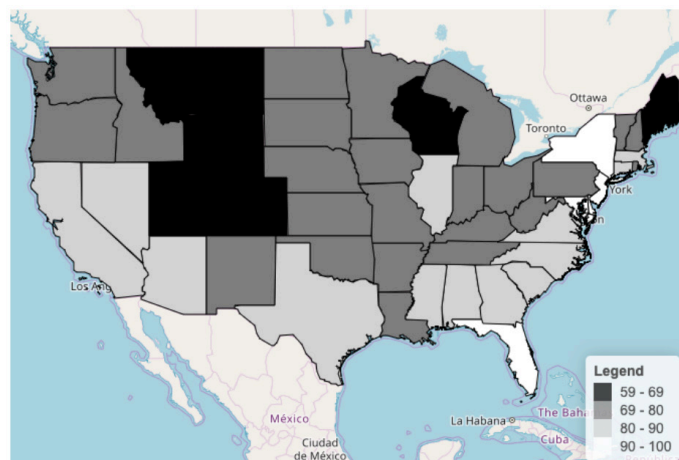
We also searched the keyword of vitiligo as a hashtag on Instagram and recorded the number of total posts, with Instagram providing a "Top Posts" page with a continuous list of images. A sample of 300 top posts were recorded and categorized based on content and source (Figure 1a and 1b).

FIGURE 1A. Image content of top related posts on Instagram in 2019.**FIGURE 1B.** Image sources of top related posts on Instagram in 2019.**FIGURE 2A.** Monthly residual search volume in vitiligo.**FIGURE 2B.** Annual residual search volume in vitiligo.

RESULTS

The initial Google search using the term vitiligo yielded over 20,000,000 results. The top page of results included information pages from Mayo Clinic, American Academy of Dermatology (AAD), Web MD, Medline Plus, and NIH. Links to top news stories, top images, and top alternative searches were also included.

The RSVs for the term vitiligo for each month from January 1, 2004 through December 31, 2018 ranged from 6 to 100, while estimated annual RSVs ranged from 10 to 20. Both monthly and annual RSVs are trended and presented in Figures 2a and 2b. In 2009, the annual RSV increased to 26 from 13, equating to a 100% increase in searches, before returning to the low teens for the following three years. This increase in annual estimated RSV is significantly impacted by the monthly RSVs for May and June in 2009, recorded at 64 and 100, respectively. Geographic distribution of searches for the keyword vitiligo revealed high-

FIGURE 3. Heat Map of Continental United States. This heat map displays the relative search volume by state, controlled for population size. A relative search volume of 100 is assigned to states with the highest proportions of searches.

Top Queries and Rising Related Queries on Google Trends. Top queries and rising related top queries are searches with the biggest increase in search frequency in the defined time-period (i.e. over 1 year). Search frequency is measured by growth percent. "Breakout" is defined as more than 5000% growth compared to previous year.

Year	Top Queries	RSV	Top Rising Related Queries	Growth %
2005	vitiligo treatment	100	vitiligo treatment	90% ↑
	vitiligo support	37		
2006	vitiligo treatment	100	vitiligo cure	300% ↑
	vitiligo cure	79	vitaligo	80% ↑
	vitiligo support	50		
	vitaligo	36		
2007	vitiligo treatment	100	National Vitiligo Foundation	Breakout
	vitiligo pictures	72	Lee Thomas	Breakout
	white spots on skin	39	skin discoloration	100% ↑
	vitiligo support	39	vitiligo treatment	70% ↑
	tinea versicolor	36	vitiligo pictures	50% ↑
2008	vitiligo Michael Jackson	100	vitiligo Michael Jackson	250% ↑
	Michael Jackson	92	vitiligo symptoms	180% ↑
	vitiligo treatment	89	what is vitiligo	170% ↑
	what is vitiligo	52	Michael Jackson	140% ↑
	vitiligo symptoms	41	Protopic	80% ↑
2009	Michael Jackson	100	Michael Jackson vitiligo pictures	Breakout
	vitiligo Michael Jackson	98	did Michael Jackson have vitiligo	Breakout
	vitiligo skin	68	vitiligo symptoms	Breakout
	vitiligo pictures	41	vitiligo more condition symptoms	Breakout
	vitiligo treatment	36	que es vitiligo	Breakout
2010	vitiligo treatment	100	Prince Jackson vitiligo	130% ↑
	vitiligo pictures	67	vitiligo treatment	90% ↑
	Michael Jackson	65	vitiligo cure	90% ↑
	vitiligo Michael Jackson	57	Prince Michael Jackson vitiligo	80% ↑
	vitiligo disease	47	causes of vitiligo	80% ↑
2011	vitiligo treatment	100	vitiligo treatment 2011	Breakout
	vitiligo pictures	67	vital	Breakout
	vitiligo Michael Jackson	58	hypothyroidism	Breakout
	Michael Jackson	53	is vitiligo hereditary	Breakout
	vitiligo disease	40	Vitality	Breakout
2012	vitiligo treatment	100	cura para el vitiligo	Breakout
	vitiligo Michael Jackson	60	Tempestt Bledsoe	Breakout
	Michael Jackson	60	is vitiligo hereditary	170% ↑
	vitiligo cure	57	que es vitiligo	160% ↑
	vitiligo disease	55	vitiligo photos	140% ↑
2013	vitiligo treatment	100	Katherine Webb	Breakout
	vitiligo cure	91	Joe Rogan vitiligo	Breakout
	vitiligo Michael Jackson	90	vitiligo treatment 2013	Breakout
	Michael Jackson	78	vitiligo meaning	Breakout
	vitiligo disease	64	AJ McCarron	Breakout
2014	vitiligo skin	100	Chantelle Brown-Young	Breakout
	vitiligo Michael Jackson	48	Winnie Harlow	Breakout
	Michael Jackson	47	ANTM vitiligo	Breakout
	vitiligo cure	45	vitiligo cure 2014	Breakout
	vitiligo treatment	43	Top Model vitiligo	Breakout
2015	vitiligo skin	100	vitiligo treatment 2015	Breakout
	vitiligo Michael Jackson	40	vitiligo cure 2015	Breakout
	Michael Jackson	39	Michael Jackson vitiligo 1986	Breakout
	vitiligo treatment	37	Tacrolimus ointment	Breakout
	vitiligo model	34	Modelo con vitiligo	4,550% ↑
2016	vitiligo skin	100	vitiligo treatment 2016	Breakout
	vitiligo model	40	is vitiligo genetic	Breakout
	vitiligo Michael Jackson	40	Michael Jackson vitiligo Oprah	Breakout
	Michael Jackson	36	Autoimmune disorder	Breakout
	vitiligo cure	35	vitiligo cure 2016	Breakout
2017	vitiligo skin	100	vitiligo treatment 2017	Breakout
	Michael Jackson	39	vitiligo cure 2017	Breakout
	vitiligo Michael Jackson	38	Michael Jackson vitiligo	Breakout
	what is vitiligo	30	Michael Jackson vitiligo no makeup	Breakout
	vitiligo disease	30	Michael Jackson skin disease youtube	Breakout
2018	vitiligo skin	100	vitiligo treatment 2018	breakout
	Michael Jackson	42	vitiligo cure 2018	breakout
	vitiligo Michael Jackson	41	does vitiligo hurt	breakout

supplemented with analysis of social media – in this case Instagram – we were able to perform a more complete evaluation of population trends as well as how interest in and knowledge of vitiligo is being shared. The content of the top 300 Instagram posts consisted of 61% personal images posted by patients with vitiligo, many of which included captions encouraging others to embrace diversity. Almost all the consistent top posters referred to themselves in their account bios as vitiligo ambassadors or advocates, dedicated to spreading awareness about the condition and increasing representation in the media. A mere 3% of posts were posted by dermatologists, only one of whom was a board-certified dermatologist in the United States. Considering that forty-two percent of Americans report using social media to search for health-related information, there is significant opportunity for dermatologists to take advantage of this market to raise awareness and provide educational information about vitiligo.

Despite the seemingly unified movement in mainstream media and on social media to educate and increase representation of vitiligo positivity, it is important to remember that though many patients have embraced their skin and are proud of their uniqueness, there are many who are still searching for new treatment options, struggling with self- and peer-acceptance, and experiencing discrimination. As the impact of the internet and social media continue to grow in scope, it is imperative that physicians learn to actively engage in the technology and consider inclusive approaches to using these larger platforms to encourage self-acceptance while also continuing to educate and promote emerging treatment options. With the entirety of the internet and social media at their fingertips, patients are taking a more active role in their health, but most do so without sufficient backgrounds to understand the complexities of issues involved. Understanding how patients are using these platforms and acquiring information will allow physicians to better understand and serve their patients. Thus, it is imperative that health professionals recognize the growing role of the internet and social media and actively engage in the technology to help guide their patients as they navigate online health-related information. Additionally, the ability of physicians to provide relevant, reliable online and social media sources is an opportunity to strengthen the patient-physician relationship.

DISCLOSURE

The authors have no conflicts.

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AUTHOR CORRESPONDENCE

Simone Nicole Boeckmann Montgomery

E-mail:..... snmontgo@usc.edu