

## Original Investigation

# Sunscreen Product Performance and Other Determinants of Consumer Preferences

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**IMPORTANCE** Sunscreen use is a modifiable behavior that can help reduce the risk for skin cancer, prevent sunburns, mitigate photoaging, and treat photosensitive dermatoses. A better understanding of consumer sunscreen preferences would inform dermatologists in their own recommendations.

**OBJECTIVE** To determine the characteristics and the most commonly cited positive and negative features of highly rated sunscreens described by consumers.

**DESIGN, SETTING, AND PARTICIPANTS** The top 1 percentile of sunscreen products on Amazon.com as of December 2015 was selected according to average consumer review ( $\geq 4$  stars) and the highest number of consumer reviews. Descriptive data for each product were collected from the product page and manufacturer claims. The top 5 "most helpful" reviews (positive and critical) were analyzed and coded by a consensus qualitative coding scheme, which included positive and negative descriptors in 6 major categories according to consumer comments: affordability, cosmetic elegance, separate ratings, product ingredients, product performance, and skin compatibility.

**MAIN OUTCOMES AND MEASURES** The Kruskal-Wallis test was performed to determine whether characteristics of each product (eg, American Academy of Dermatology [AAD] criteria, sun protection factor [SPF], or vehicle) could be used to predict price per ounce. The number (percentage) of comments categorized by major themes and subthemes was determined. Illustrative consumer comments were also collected.

**RESULTS** There were 6500 products categorized as sunscreens in the Amazon.com, online catalog. Of the 65 products evaluated, the median price per ounce was \$3.32 (range, \$0.68-\$23.47). Of products, 40% (26 of 65) did not adhere to AAD guidelines (broad spectrum, SPF  $\geq 30$ , and water resistant) for sunscreens. Vehicles, AAD, and sunscreen type predicted a higher price per ounce. Cosmetic elegance was the most cited positive feature (198 of 325 [61%] comments) followed by product performance (146 of 325 [45%] comments) and skin type compatibility (78 of 325 [24%] comments).

**CONCLUSIONS AND RELEVANCE** In this cohort of highly rated sunscreen products, a significant proportion did not adhere to AAD guidelines, mostly attributable to a lack of water resistance. The most striking variation in this cohort was price, which varied by more than 3000%. Dermatologists should balance the importance of cosmetic elegance, cost, and AAD guidelines for sun protection in making their recommendations to consumers.

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Sunscreen use is a modifiable behavior proven to reduce the risk for skin cancers, prevent photoaging, reduce sunburns, and control photosensitive dermatoses. Despite these results, sunscreen use remains persistently low for adolescents and adults.<sup>1</sup> Insufficient sunscreen use is likely a multifactorial problem. Consumer preferences and recommendations likely drive sunscreen use but have not been well investigated previously. Understanding these factors will help health care professionals learn about meaningful patient considerations regarding sunscreens to increase their sustained use for preventive health.

In 2012, the market for sunscreens was expected to become a \$1 billion industry by 2016 with an expansive range of marketed sunscreen products.<sup>2</sup> Of consumers, 73% buy beauty and personal care products through Amazon.com, which totals an estimated 9% of all sunscreen sales occurring with this online retailer.<sup>3</sup> Previous work showed that online customer-reported reviews of consumer products have a powerful effect on purchasing decisions.<sup>4</sup> Understanding the characteristics of consumer reviews for highly consumer-rated sunscreens would provide useful information for dermatologists to help inform their recommendations to patients.

## Methods

The keyword *sunscreens* was searched in the broader category of “Beauty and Skin Care” products on the US internet retailer Amazon.com. From the results, we determined the top 1 percentile of sunscreen products according to the average consumer review ( $\geq 4$  stars) and the number of consumer reviews ( $>150$  reviews) (eTable in the Supplement). Descriptive data for each product, including SPF strength, price, and active ingredients, were also collected. Sunscreen products marketed for the face, body, and children were included. Tanning lotions and oral sun protection capsules were excluded. For products with multiple-size options, the product with the highest number of reviews was included in the analysis and coded as 1 entry. The Kruskal-Wallis test was used to associate a product’s descriptive characteristics with price per ounce.

For each sunscreen product, the content of the top 5 most helpful positive and critical comments as voted by consumers (325 total comments) was analyzed. Reviewer characteristics, such as skin type, age, and prior dermatological conditions, were not consistently available on the Amazon.com platform. Three of us (S.X., M.K., and A.A.) developed, compared, and reconciled a single, standard qualitative coding scheme. Two of us (M.K. and A.A.) coded consumer-reported comments for positive and negative descriptors with major categories, including affordability, cosmetic elegance, separate ratings, product ingredients, product performance, and skin compatibility. For each major category, subthemes were also coded. Cosmetic elegance was defined as any feature associated with skin sensation on application, color, or scent. Product performance included SPF and real-world effectiveness in preventing sunburn, and product ingredients focused on the sunscreen’s active and inactive ingredients. Skin compatibility reflected how the product performed in association with

## Key Points

**Question** What are the characteristics and features of sunscreens that consumers rate favorably?

**Findings** In this analysis of the top 1 percentile of sunscreen products on an online retailer, consumers preferred sunscreen products predominately for their cosmetic elegance followed by product performance. The cohort had a wide range of prices (\$0.68-\$23.47 per ounce), with 40% (26 of 65) of highly rated products not adhering to the American Academy of Dermatology’s recommended criteria for sunscreens, mostly owing to a lack of water and/or sweat resistance.

**Meaning** Dermatologists should balance the importance of cosmetic elegance, cost, and adequate sun protection in making their recommendations to consumers.

skin conditions cited by reviewers. Comments may have multiple subcodes for a given major category (eg, a product was noted to be nongreasy and have a pleasant scent). Of entries, 20% (65 comments) were coded by one of us (S.X.) to ensure internal validity as previously reported.<sup>5,6</sup> This study was deemed exempt by the institutional review board at Northwestern University.

## Results

There were 6500 products categorized as sunscreens in the Amazon.com, online catalog. The top 65 products were selected first by ratings ( $\geq 4$  stars). This group was then ranked by the number of consumer reviews (a surrogate for popularity) to finalize the cohort. Our calculations revealed that the top 1 percentile of Amazon.com sunscreen products acquired more than 24 400 customer reviews as of December 2015. The median review rating was 4.5 of 5 stars with a median of 288 customer reviews (range, 178-1792 reviews) per product. Price per ounce was highly variable. The median price per ounce was \$3.32 (range, \$0.68-\$23.47). The median SPF was 35 (range, 4-110), with 89% (58 of 65) of products being 30 or higher. Sunscreens with an active chemical ingredient were most common (40%; 26 of 65) followed by physical sunscreens (32%; 21 of 65) and a combination of chemical and physical sunscreens (25%; 16 of 65). Of products, 92% (60 of 65) had a broad-spectrum claim and 62% (40 of 65) were labeled as water or sweat resistant. For vehicles, creams were the most common (49%; 32 of 65) followed by lotions (29%; 19 of 65) and sprays (11%; 7 of 65). Nearly all products (88%; 57 of 65) had additional claims associated with being sensitive skin compatible, preservative-free, natural and/or organic, noncomedogenic, or animal safe. Of the highest rated sunscreen products on Amazon.com, 40% (26 of 65) did not adhere to AAD criteria (SPF  $\geq 30$ , broad-spectrum claim, and water and/or sweat resistance). Sunscreens that adhered to AAD criteria or had water resistance were associated with higher cost ( $P < .001$ , Kruskal-Wallis test). Physical sunscreens were more expensive than chemical sunscreens ( $P = .001$ ). From highest to lowest cost, creams were more expensive than lotions ( $P < .001$ ), whereas

Table 1. Top 10 Most-Reviewed, Highly Rated Sunscreens According to Amazon.com<sup>a</sup>

No.	Product	Reviews, No.	Rating (1-5)	Price per Ounce, \$	Type <sup>b</sup>	SPF	Broad Spectrum	Water Resistance <sup>b</sup>	Vehicle	Additional Claims <sup>c</sup>	AAD Criteria <sup>b</sup>
1	EltaMD UV Clear SPF 46	1792	4.4	13.38	Combination	46	Yes	No	Cream	Yes	No
2	Hawaiian Tropic Sunscreen Silk Hydration SPF 30	1078	4.6	1.33	Chemical	30	Yes	80min	Lotion	Yes	Yes
3	Blue Lizard Australian Sunscreen, Sensitive SPF 30+	812	4.5	3.41	Physical	30	Yes	No	Cream	Yes	No
4	SPF 30 daily oil-free face moisturizer	786	4.7	5.98	Chemical	30	Yes	No	Cream	Yes	No
5	Neutrogena Age Shield Face Lotion Sunscreen SPF 110	740	4.4	3.73	Chemical	110	Yes	80min	Lotion	Yes	Yes
6	EltaMD UV Physical SPF 41	715	4.7	6.57	Physical	41	Yes	40min	Lotion	Yes	Yes
7	Neutrogena Ultra Sheer Dry-Touch Sunscreen, SPF 55	693	4.6	2.26	Chemical	55	Yes	80min	Cream	Yes	Yes
8	Neutrogena Sunscreen Ultra Sheer Stick SPF 70	647	4.6	5.91	Chemical	70	Yes	80min	Roll-on	Yes	Yes
9	Neutrogena Oil Free Moisture SPF 35	635	4.5	2.76	Chemical	35	Yes	No	Roll-on	Yes	No
10	Eucerin Daily Protection Moisturizing Face Lotion	631	4.3	1.76	Physical	30	Yes	No	Lotion	Yes	No

Abbreviations: AAD, American Academy of Dermatology; SPF, sun protection factor.

<sup>a</sup> Data adapted from number of reviews ranked by number of ratings and lowest price per ounce.

<sup>b</sup> Statistically significant at  $P = .05$ .

<sup>c</sup> Nearly all products (88%; 57 of 65) had additional claims associated with being sensitive skin compatible, preservative-free, noncomedogenic, or animal safe. In total, the top 1 percentile of sunscreens categorized by

Amazon.com have received more than 24 400 customer reviews. The AAD criteria for preferred sunscreens were adhered to if the product had an SPF rating of 30 or greater, a broad-spectrum protection claim, and water resistance. Of the highest-rated sunscreen products on Amazon.com, 40% (26 of 65) did not adhere to AAD recommendations, the primary reason being a lack of water or sweat resistance (73%; 19 of 26). The median customer rating was 4.5, with a median of 288 customer reviews. The median price per ounce was \$3.32 with a wide range (\$0.68-\$23.47).

Table 2. Top 10 Lowest-Cost, Highly Rated Sunscreens According to Amazon.com<sup>a</sup>

No.	Product	Price per Ounce, \$	Reviews, No.	Rating (1-5)	Type <sup>b</sup>	SPF	Broad Spectrum	Water Resistance <sup>b</sup>	Vehicle	Additional Claims <sup>c</sup>	AAD Criteria <sup>b</sup>
1	NO-AD Sunscreen Lotion SPF 45	0.68	193	4.3	Chemical	45	Yes	80min	Lotion	No	Yes
2	NO-AD Sport Sunscreen Lotion SPF 50	0.72	179	4.6	Chemical	50	Yes	80min	Lotion	Yes	Yes
3	Banana Boat Sunscreen Sport Family Size Broad Spectrum Sun Care Sunscreen Lotion, SPF 50	0.83	259	4.5	Chemical	50+	Yes	80min	Lotion	Yes	Yes
4	Australian Gold SPF 30 Spray Gel with Bronzer	0.90	254	4.6	Chemical	30	Yes	80min	Spray	Yes	Yes
5	Banana Boat Sunscreen Sport Performance Quik Dri Broad Spectrum Sun Care Sunscreen Spray	1.02	178	4.2	Chemical	30	Yes	80min	Spray	Yes	Yes
6	Banana Boat Sunscreen Sport Performance Coolzone Broad Spectrum Sun Care Sunscreen Spray	1.23	474	4.3	Chemical	50+	Yes	Yes	Spray	No	Yes
7	Hawaiian Tropic Sunscreen Silk Hydration SPF 30	1.33	1078	4.6	Chemical	30	Yes	80min	Lotion	Yes	Yes
8	Babyganics Mineral-Based Baby Sunscreen Lotion, SPF 50	1.33	407	4.3	Combination	50+	Yes	80min	Lotion	Yes	Yes
9	Zinc oxide powder	1.35	182	4.9	Physical	NL	NL	No	Powder	No	No
10	L'Oreal Paris Sublime Sun Advanced Sunscreen SPF 30 Crystal Clear Mist	1.41	279	4.4	Chemical	45	Yes	Yes	Spray	Yes	Yes

Abbreviations: AAD, American Academy of Dermatology; NL, not listed; SPF, Sun Protection Factor.

<sup>a</sup> Data adapted from number of reviews ranked by number of ratings and lowest price per ounce.

<sup>b</sup> Statistically significant at  $P = .05$ .

<sup>c</sup> Nearly all products (88%; 57 of 65) had additional claims associated with being sensitive skin compatible, preservative-free, noncomedogenic, or animal safe.

lotions, as a category, were more expensive than sprays ( $P = .005$ ). We provide a list of highly rated consumer sunscreens by the top 10 lowest-cost products and the top 10 most-reviewed products (Table 1 and Table 2); the full cohort is described in the eTable in the Supplement.

In analyzing the top-voted comments for each product, several consonant themes emerged. First, cosmetic elegance was

the most cited positive feature associated with sunscreen products (61%; 198 of 325) followed by product performance (45%; 146 of 325). Skin compatibility (24%; 78 of 325) and product ingredients (17%; 55 of 325) were cited less commonly as positive features. A few consumer reviews cite separate ratings (12%; 39 of 325) and price (9%; 29 of 325) as positive features. Second, when negative features were cited, patients mostly

noted cosmetic elegance concerns (22%; 72 of 325). Product performance (11%; 36 of 325), product ingredients (10%; 33 of 325), and expense (9%; 29 of 325) were comparable as negatively cited features. Only a few reviewers cited skin compatibility concerns, formulation changes, and separate ratings as negative features.

An analysis of the subthemes confirmed more specific determinants of consumer preferences with sunscreens. Categorized in cosmetic elegance, the subthemes of “rubs in well” and “positive tactile skin feel” were most commonly cited. Third, product residue and thickness were the most common negative cosmetic features. Regarding product performance, consumers frequently cited “effectiveness” and “did not sunburn” as positive features. For skin compatibility, sunscreens that did not cause acne were most commonly cited as a positive feature (13%; 42 of 325), and for ingredients, zinc oxide and natural and/or organic ingredients were cited specifically as positive features (10%; 33 of 325). Separate rankings were cited by 12% (39 of 325) of top comments. Of those rankings, the Environmental Working Group’s ranking was the most cited followed by “dermatologist recommended” and *Consumer Reports*. Finally, affordability and high cost were not commonly cited as positive or negative concerns (9%; 29 of 325) (Table 3).

## Discussion

For our cohort, cosmetic elegance was the most commonly cited positive feature. Qualitative research with consumers provides insight into the consumer attitude when it comes to sunscreens. Prior research has shown that people apply more product when it spreads easily. Increased use means producing photoprotection that more closely reflects the expected photoprotection or SPF.<sup>7,8</sup> Our qualitative analysis provides empirical evidence of this as well. In cosmetic elegance, consumers frequently cited the subtheme of rubs in well. Our results clarify features identified by previously published studies indicating consumer preference for sunscreens that specifically did not leave residues and were not greasy.<sup>9</sup>

For product effectiveness, the sunscreen SPF was not frequently cited as a positive feature, which may be associated with a lack of consumer understanding of SPF<sup>10</sup> or preselection of high SPF products. Real-world product performance, such as “effective” and “did not sunburn,” were how consumers described product effectiveness, which makes the results difficult to interpret because variables such as UV index, exposure time, amount of sunscreen applied, and consumer skin type are not clearly specified. However, most of our cohort include sunscreens with an SPF of 30 or greater (89%; 58 of 65), which should have provided adequate protection with proper use. The emphasis on effectiveness, even among this high SPF cohort, could reflect patient misunderstanding of the difference between expected and produced photoprotection.

For skin compatibility, most products claimed additional product features in addition to sun protection, including safe for sensitive skin, preservative-free, or noncomedogenic. Patients should be counseled that these labels are marketing

mechanisms instead of performance standards such as SPF regulated by the US Food and Drug Administration, although these factors may have equal importance to patients and should be discussed to promote products that satisfy both areas. Product ingredients and separate ratings were less commonly cited features. Physical sunscreen ingredients (zinc and titanium oxide) were more likely to be cited as positive features, whereas nanoparticles (6 comments) were the most commonly cited negative feature regarding product ingredients. Active ingredients zinc oxide and titanium dioxide, particularly micronized versions, offer superior UV-A protection and photostability.<sup>11</sup>

A small, noticeable amount of detailed comments cited the Environmental Working Group ratings (22 comments) for purchasing decisions surrounding product safety. Environmental Working Group was cited more often than dermatologist recommended (18 comments) regarding positive product features. This group describes itself as a nonpartisan, nonprofit organization and determines its sunscreen rankings according to manufacturer and toxicology databases without secondary verification of product performance.<sup>12</sup> Negative cosmetic elegance was the most frequently cited feature followed by product performance and skin compatibility. This study is limited to highly rated products, making interpretation of the negative comments more difficult to generalize.

Analogous to *Consumer Reports’* review of sunscreens,<sup>13</sup> our cohort also had a wide range of prices with a difference between the least and most expensive products (\$0.68-\$23.47 per ounce). Cost is an important consideration, especially for those with an increased risk of developing skin cancer, such as patients who underwent an organ transplant for whom regular photoprotection is recommended. For these patients, the cost of daily sunscreen use can range from \$249 to \$292 per year. If used daily for 1 week, sunscreen cost for a family of 4 can range from \$178 to \$238.<sup>14</sup> Although expense was not frequently cited as a negative feature, previous studies showed that expensive sunscreens may compel patients to use less.<sup>15,16</sup> Dermatologists are often asked by patients to recommend sunscreen products.<sup>17</sup> Health care professionals should incorporate cost-conscious recommendations of sunscreens for patients, particularly in skin cancer prevention.

The AAD has published guidelines recommending sunscreen products that have an SPF of 30 or higher, broad-spectrum coverage, and water and sweat resistance.<sup>16</sup> A significant proportion (29%; 19 of 65) in our cohort of highly rated sunscreens did not adhere to AAD guidelines solely owing to a lack of water or sweat resistance claims. Because many products in our cohort were comarketed as moisturizers or daily beauty products, water-resistant products would not be a critical feature. Consumers may choose a non-water-resistant sunscreen product with more favorable cosmetic elegance. Because water exposure reduces the efficacy of sunscreens when a person is sweating or immersed in water, water-resistant products are often reserved for use in water-related activities or sports with profuse sweating. Previous studies showed that two-thirds of sunscreen products are advertised as cosmetics (38%; 25 of 65) or moisturizers (26%; 17 of 65), whereas a minority were advertised as a stand-alone sunscreen (19%; 12 of

Table 3. Positive and Negative Themes Identified by Consumer Comments for Highly Rated Sunscreens<sup>a,b</sup>

Positive Coding Themes				Negative Coding Themes			
Major Theme	Subtheme	Exemplary Quote	No. (%) of Comments	Major Theme	Subtheme	Exemplary Quote	No. (%) of Comments
Cosmetic elegance			198 (61)	Cosmetic elegance			72 (22)
	Absorbs well	"You feel it there for about 5 min and then it absorbs very well"	124 (38)		Skin residue	"It left a white residue all over my face"	26 (8)
	Tactile skin feel	"Doesn't leave my skin feeling oily, just smooth"	107 (33)		Too thick	"This cream was way too thick and impossible to rub in"	23 (7)
	Not greasy	"Goes on easily with no greasiness"	75 (23)		Greasy	"The biggest drawback with the American formula is GREASE"	20 (6)
	Moisturizing	"It leaves my skin feeling moisturized and protected"	46 (14)		Bad smell	"It absolutely reeks"	20 (6)
	Nice smell	"Love the barely-there fragrance"	42 (13)		Bad skin feel		13 (4)
	Tint or matte finish	"This went on very smoothly and easily and left my skin with a gently matte finish"	23 (7)		Too white		7 (2)
	Makeup compatible	"It is moisturizing, so I can use it as a base for my makeup"	23 (7)		Staining		3 (1)
	No smell		13 (4)		Bad color		3 (1)
	Exfoliative		7 (2)		Drying		3 (1)
	Antiaging		3 (1)		Too dark		1 (0.3)
Performance			146 (45)		Makeup incompatible		1 (0.3)
	Effective	"Thin yet highly potent even with such a small amount"	117 (36)	Performance			36 (11)
	Did not sunburn	"I was able to stay out at my children's soccer games for the entire afternoon with no sunburn"	49 (15)		Not effective		13 (4)
	Water and/or sweat proof	"I was pleased to find it remained on for around 90 min worth of direct sunlight and sweating"	29 (9)		Sunburned		13 (4)
	High SPF	"I'm absolutely obsessed with this SPF"	23 (7)		Packaging problem		10 (3)
	Broad spectrum	"It has the broad-spectrum rating from the FDA that means it protects from the UVA and UVB"	16 (5)		Not water and/or sweat proof		10 (3)
	Obtainability of tan		13 (4)		Low SPF		3 (1)
Skin compatibility			78 (24)	Product ingredients			33 (10)
	Acne prone	"Works great with my acne prone skin"	42 (13)		Unsafe ingredients		10 (3)
	Sensitive skin		13 (4)		Nanoparticles		7 (2)
	Safe for kids		10 (3)		Retinyl palmitate		3 (1)
	No eye stinging		7 (2)		Avobenzone		3 (1)
	Oily skin		7 (2)		Parabens		3 (1)
	Darker skin		7 (2)		Oxybenzone		3 (1)
	Rosacea		3 (1)		Homosalate		3 (1)
	No skin reaction		3 (1)		Octinoxate		1 (0.3)
	Melasma		3 (1)	Expensive		"At nearly \$20 a tube, it isn't cheap"	29 (9)

(continued)

Table 3. Positive and Negative Themes Identified by Consumer Comments for Highly Rated Sunscreens<sup>a,b</sup> (continued)

Positive Coding Themes				Negative Coding Themes			
Major Theme	Subtheme	Exemplary Quote	No. (%) of Comments	Major Theme	Subtheme	Exemplary Quote	No. (%) of Comments
	Eczema		3 (1)	Skin tolerance			26 (8)
Product ingredients			55 (17)		Skin reaction	"Like another reviewer, I, too, had an allergic reaction with itching"	20 (6)
	Natural and/or organic ingredients	"Made [ . . . ] with [ . . . ] certified 'organic' ingredients"	33 (10)		Burning on application		10 (3)
	Zinc oxide	"The active ingredients are Zinc Oxide and Titanium Dioxide, which are high quality minerals for broad spectrum UVA and UVB skin protection"	33 (10)		Burns eyes		7 (2)
	Safe for children		10 (3)	Formulation change		"I was disappointed when I tried their new facial sunscreen formulation"	7 (2)
	Avobenzone		3 (1)	Separate ratings			3 (1)
	Titanium dioxide		3 (1)		EWG		3 (1)
	Physical sunscreen		3 (1)				
Separate ratings			39 (12)				
	EWG	"I ordered this product after doing some research on the EWG's online database of the least harmful sunblocks"	23 (7)				
	Dermatologist recommended	"Was recommended to me by my dermatologist who is a specialist in skin cancer"	20 (6)				
	Consumer Reports		3 (1)				
Affordable		"It's the best sunblock product on the market at a reasonable price"	29 (9)				

Abbreviations: EWG, Environmental Working Group; FDA, US Food and Drug Administration.

<sup>a</sup> There were 65 sunscreen products in the cohort.

<sup>b</sup> The qualitative coding of the top 5 most helpful comments (positive and critical) voted by consumers for each product in the entire cohort is summarized. As expected, positive features were much more likely to be cited than negative features. The features were similar in themes but opposite in

valence. Cosmetic elegance was the most cited positive and negative feature followed by product performance, skin compatibility, and product ingredients. When investigating specific subthemes, consumers most commonly cited how the product absorbed as a positive and negative feature. Exemplary quotes were only included for all features cited with more than 5% (<3) of the total comments assessed.

65).<sup>18</sup> These findings may cause consumer confusion regarding what makes up an adequate sunscreen product. A small but significant proportion (11%; 7 of 65) of the cohort had an SPF of less than 30. Physicians should educate consumers on these key considerations. Nine of 10 of the least costly sunscreen products in the cohort did adhere to AAD guidelines.

There are several important limitations in this study. Although these data sources represent 9% of all sunscreen sales, the generalizability may be limited because of the lack of reviewer demographic information. Another limitation of this study was the use of higher-rated product reviews as a surrogate for product popularity. Research in product marketing suggests that online review measurements, specifically volume and valence, directly influence product sales.<sup>19-21</sup> Of our cohort, 46% (30 of 65) was also in Amazon.com's top 100 best sellers list in the sun protection category. We believe that our cohort mitigates the volatility that exists with best seller lists,

which are updated hourly. This frequent updating may change the exact product name and review number of sunscreens. Further work comparing our cohort's representation with the catalog of other major online retailers would provide further insight. Finally, a limitation of using the AAD guidelines is that consumers who use sunscreen daily and do not engage in sweat-producing activities or water sports may appropriately choose not to use water-resistant sunscreens.

Although our data showed that dermatologist recommendations were not a significantly cited positive feature, dermatologists are the most likely physicians (86%) to recommend sunscreen use in all outpatient visits where sunscreen use is mentioned.<sup>22</sup> Frequently, patients with skin concerns ask for nonprescription product recommendations from dermatologists. Dermatologists should be aware of the implications of their recommendations, particularly regarding cost and consumer preferences. With recent legislation allowing the US Food

and Drug Administration to rapidly advance the approval of additional sunscreens, consumers and dermatologists will have more product options to consider soon.<sup>23</sup> Although sunscreen products available in Europe have better UV absorption performance, there is limited empirical evidence that this leads to lower skin carcinogenesis in clinical practice.<sup>24</sup> Ultimately, dermatologists must remain informed of the continued evolution of sunscreen products and consumer preferences to improve use.

## Conclusions

There is wide variability in price, SPF protection, and product claims among commercially available sunscreens. Con-

sumer comments show that cosmetic elegance is the most important positive feature, followed by product performance. Dermatologists should counsel patients that sunscreen products come with numerous marketing claims and varying cosmetic applicability, all of which must be balanced with adequate photoprotection. In addition, consumers should be advised to select a product with broad-spectrum coverage, an SPF of 30 or higher, and water and/or sweat resistance in the setting of water activities or high ambient temperatures. Our list provides dermatologists, other health care professionals, and patients with a cohort of sunscreen products organized by consumer preference, ranked by price or rating, and detailed information regarding how those products adhered to sunscreen performance standards together with their consumer reviews.

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