

Original Paper

The Rise of “Functional Sunscreens” in Skin of Color Beauty Culture

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Abstract

Conventional public health messaging around sunscreen has emphasized skin cancer prevention in lighter-skinned populations. This approach fails to address the specific dermatologic concerns of individuals with skin of color (SOC), such as pigmentary disorders and photoaging. As a result, sunscreen use in these populations has remained limited, due to dissatisfaction with available products and the perception that sunscreen is not designed for their needs. This review examines the emergence and influence of functional sunscreens on sunscreen behaviors in SOC populations and explores how beauty culture, consumer engagement, and inclusive marketing shape perceptions of SPF products. Functional sunscreens, including tinted SPF formulations, moisturizers with sun protection, and hybrid skincare products, are increasingly popular within SOC communities. Social media and influencer-driven marketing have amplified their appeal by promoting inclusive beauty narratives and repositioning sunscreen as a beauty-enhancing tool. This shift has improved adherence and engagement in populations previously underserved by traditional sun safety campaigns. Functional sunscreens designed for SOC have also expanded the role of photoprotection to include management of pigmentary conditions such as melasma and post-inflammatory hyperpigmentation. Tinted mineral

formulations reduce white cast and improve usability, aligning sunscreen use with the aesthetic and clinical priorities of individuals with skin of color.

Keywords

Skin of color, functional sunscreen, sunscreen adherence, pigmentary disorders, inclusive skincare

Introduction

Conventional public health messaging around photoprotection has traditionally centered on skin cancer prevention, with campaigns predominately targeting lighter-skinned populations. This narrow framing inadvertently reinforces the belief that sunscreen is irrelevant for individuals with darker skin, a misconception reinforced by melanin's protective capacity against ultraviolet B (UVB) radiation (Mun, Lee, & Gupta, 2025). However, melanin also acts as a photosensitizer to ultraviolet A (UVA), contributing to photoaging and hyperpigmentation (Mun, Lee, & Gupta, 2025). The educational disparity is increased by sun protection advisories which suggest that daily sunscreen application is unnecessary for individuals with darker skin due to the relatively low risk for skin cancers (Mun, Lee, & Gupta, 2025). The consequences of this messaging gap in campaigns is significant. Skin of color (SOC) communities report lower sunscreen adherence rates partly because conventional campaigns fail to address their primary concern, pigmentary disorders (PD) and visible signs of photoaging rather than malignancy risk.

The epidemiological reality reflects this disconnect. Pigmentary disorders, such as melasma and post-inflammatory hyperpigmentation (PIH), rank among one of the most common reasons patients with darker skin seek dermatological care (Davis & Callender). The impact of these conditions extends past physical manifestations. SOC patients with PD are more likely to report feelings of self-consciousness in the presence of others, anxiety, and embarrassment (Darji, Varade, West, Armbrrecht, & Guo, 2017). These psychological factors often affect quality of life significantly more than the perceived risk of skin cancer, a perception exacerbated by low sunscreen use. Recognizing these psychosocial and dermatological realities is the first step in creating accurate photoprotection education and products for skin of color communities.

The lack of spreadability and invisibility of sunscreen products has partly influenced the low adherence rates in skin of color communities. Mineral sunscreen containing zinc oxide and titanium dioxide have existed as the photoprotective standard, yet they leave a white residue when applied to darker tones (Maldonado, Gallagher, Curry, Sahloff, & da Silva Souza, 2025). To overcome these obstacles, the cosmetic and dermatologic industries have seen the rise of functional sunscreens which combine photoprotection with cosmetic advantages. Varying formulations and concentrations of iron oxide and pigmentary titanium dioxide in sunscreen and foundation provide protection against visible light while simultaneously catering to a diverse range of skin phototypes (Lyons, Trullas, Kohli, Hamzavi, & Lim, 2021). The absence of white cast in functional sunscreens alongside the moisturizing and antioxidant benefits, encourages consistent use amongst individuals with skin of color.

Although marketing and dermatology are increasingly intersecting, a major gap in literature exists, as current academic literature has not kept pace with the rapid innovation of consumer products and marketing methods. Literature on the direct impact of social media and influence advertising on photoprotection attitudes in diverse populations is limited, highlighting the need for research to bridge clinic guidelines and consumer behaviors. Functional sunscreens are reshaping adherence by aligning photoprotection with aesthetic priorities, driven by three interconnected factors: advances in formulation, inclusive marketing, and the rise of beauty culture influences. Photoprotection now addresses cosmetic challenges, such as the presence of white casts on darker skin tones, through tinted mineral and antioxidant-supported sunscreens. This shift, combined with the rebranding of sunscreen as a required daily skincare step rather than solely a preventative health product, encourages adherence among previously underserved groups.

Historical Context and Barriers to Sunscreen Use in Skin of Color

Despite increasing awareness of photoprotection needs in skin of color populations, many sunscreen formulations continue to fall short in meeting both cosmetic and functional expectations. For example, 61% of surveyed South Asian individuals experienced a white cast from sunscreen (Toor, Gill, & Ahad, 2025). Tinted “universal” sunscreens attempt to address this issue, yet many formulas do not blend seamlessly across all Fitzpatrick skin types, indicating that shade inclusion requires more than just a single adaptive tint (Bardhi, Mokhtari, Masood et al., 2024). As a result, shade compatibility is identified as the largest barrier to consistent use in individuals with darker skin tones, especially with only 38% of available tinted sunscreens offering multiple shades (He, Chen, Jin, & Zhang, 2025). Texture adds another challenge, as heavy or greasy formulas are hard to tolerate, especially in humid climates or among oily skin, making regular application inconvenient (Wang, Patel, Philip et al., 2024). When products do not meet cosmetic expectations, user adherence drops, reducing their protective benefits. New formulas have emerged to solve these problems, offering tone-adaptable, lightweight, and cosmetically elegant options that meet previously unmet needs. Figure 1 outlines how these newer formulations, such as functional sunscreens, differ from traditional in their composition, function, and inclusivity for skin of color populations.

Past to Present: The Evolution of Sunscreens for SOC

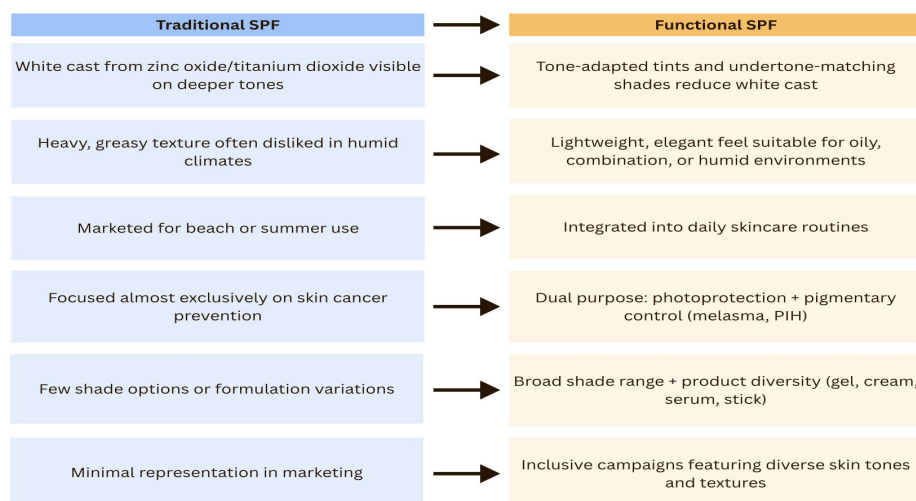


Figure 1. Comparison of Traditional and Functional Sunscreen Formulations and Their Relevance to Skin of Color Populations

Cultural and marketing factors significantly restrict sunscreen use among populations with higher melanin levels by reinforcing the belief that their natural skin color provides sufficient UV protection. This perspective lowers the perceived risk of sunburn or skin cancer in SOC communities. The lowered risk perception is exacerbated as public health campaigns and advertisements traditionally exclude models with Fitzpatrick skin types IV–VI, making products seem less relevant (Geisler, Masub, Toker et al., 2022). These marketing gaps contribute to the impression that sunscreens are not meant for darker skin, reinforcing misconceptions about melanin’s protective function. As a result, motivators in SOC communities for sunscreen use include products that visibly improve skin concerns like pigmentation, acne, or hydration, rather than those focused solely on cancer prevention, which can seem abstract or distant (Krutmann, Piquero-Casals, Morgado-Carrasco et al., 2023). Addressing these challenges requires culturally tailored education and marketing that acknowledge the needs of individuals with skin of color and clarify the limits of melanin.

Beyond these cultural perceptions, sunscreen habits are significantly influenced by accessibility and cost. High-quality sunscreens are often expensive and not widely accessible at community pharmacies, discouraging consistent use among lower socioeconomic or minority groups (Ullman, Nasir-Moin, Hoffman et al., 2024). For example, in Chicago, sunscreens were reported to be twice as scarce in Hispanic neighborhoods compared with non-Hispanic White neighborhoods (Hernandez, Calero, Robinson, Mermelstein, & Robinson, 2012). Therefore, effective strategies must integrate sun protection into daily routines by highlighting immediate benefits such as skin appearance or pigmentation correction, while simultaneously addressing affordability and convenience to achieve higher rates of adherence. Table 1 outlines the multifactorial barriers influencing sunscreen adherence among individuals with skin of color, showing how various barriers interact to shape use patterns.

Table 1. Common Barriers to Sunscreen Use among Individuals with Skin of Color and Their Impact on Adherence

| Barriers to Sunscreen Use in Skin of Color Populations | | | |
|---|---|--|---|
| Barrier Type | Examples | Impact on Use | Reference |
| Formulation | White/gray cast from mineral filters, heavy or greasy texture, lack of undertone adaptation | Cosmetic dissatisfaction reduces daily use | (Lyons, Trullas, Kohli, Hamzavi, & Lim, 2021; Wang, Patel, Philip et al., 2024) |
| Cultural | Belief melanin provides full UV protection, sunscreen seen as for “beach days only” | Low perceived need leads to infrequent application | (Wang, Patel, Philip et al., 2024) |
| Marketing | Few ads featuring deeper skin tones, limited shade ranges | Products not perceived as relevant or inclusive | (Bardhi, Mokhtari, Masood et al., 2024; He, Chen, Jin, & Zhang, 2025; Geisler, Masub, Toker et al., 2022) |
| Access | Higher cost of cosmetically elegant SPF, limited local availability | Reduced trial and purchase | (Ullman, Nasir-Moin, Hoffman et al., 2024; Hernandez, Calero, Robinson, & Mermelstein, Robinson, 2012) |

Barriers to Sunscreen Use in Skin of Color Populations

| | | | |
|------------|--|--|---|
| Behavioral | Preference for products targeting visible concerns (pigment, acne) over prevention | SPF use deprioritized unless multifunctional | (Krutmann, Piquero-Casals, Morgado-Carrasco et al., 2023) |
|------------|--|--|---|

The Emergence of Functional Sunscreens

Functional sunscreens have redefined sunscreen behavior within skin of color communities as their integration of active skincare ingredients extend past photoprotective properties. Many new formulations now include niacinamide, a well-known pigment-evening and anti-inflammatory compound, as well as antioxidant complexes containing vitamins C and E, green tea extract, or resveratrol. These additions shift sunscreen from a single-purpose product into a hybrid product capable of addressing multiple skin concerns. For SOC populations disproportionately affected by dyschromias, niacinamide reduces hyperpigmentation and increases barrier function (Passeron, Brown, Furmanczyk, Foyaca, Trullas, & Piquero-Casals, 2025; Morgado-Carrasco, & Piquero-Casals, 2022). Meanwhile, antioxidants counter oxidative stress generated by environmental insults such as pollution or UV radiation, which are known to accelerate pigmentary disorders (Krutmann, Piquero-Casals, Morgado-Carrasco et al., 2023). By packaging these benefits into a single product, functional SPF's simplify routines while elevating skin outcomes. This multifunctionality appeals especially to younger consumers who prioritize streamlined regimens and visible results, further reinforcing the shift toward daily use.

Unlike traditional sunscreens, these formulations target pigment regulation, visual uniformity, and cosmetic elegance alongside UV and visible light protection. The rising popularity of functional sunscreens reflects both technological innovation and a reframing of sunscreen as a beauty-enhancing tool, not just a cancer-preventive measure. Among the most impactful innovations are tinted mineral sunscreens, which blend seamlessly into deeper skin tones. Tinted mineral sunscreens containing iron oxides were significantly more effective in reducing visible light-induced pigmentation in melasma-prone individuals than their non-tinted counterparts (He, Chen, Jin, & Zhang, 2025). This suggests that tone-adapted sunscreens serve a dual purpose: they shield against pigmentation triggers while also camouflaging existing discoloration. These products are not solely responses to gaps in efficacy, instead they are reflections of changing consumer values, where skincare and identity increasingly intersect.

Cultural and psychological alignment with beauty goals is another key factor driving the success of

functional sunscreens. Marketing narratives have begun positioning sunscreen not merely as a protective barrier but as a complexion enhancer, an essential part of achieving glow, radiance, and even tone. This evolution parallels a broader shift in beauty culture where skincare has become a central mode of self-expression and self-care. For individuals with SOC, whose primary concerns are often aesthetic rather than oncologic, this repositioning is not superficial, instead it is essential. By addressing visible concerns such as hyperpigmentation and uneven texture, functional sunscreens become more than dermatologic tools; they become identity-affirming products that support confidence and routine consistency (Campbell, Sands, McFerran, & Mavrommatis, 2023; Morquette, Waples, & Heath, 2022). As a result, consumers are increasingly adopting SPF products not seasonally, but as year-round staples. This transformation signals a cultural realignment where sun protection is understood within the context of skin tone, not despite it.

The Role of Inclusive Marketing and Beauty Influencers

The rebranding of sunscreen from a health precaution to a beauty essential represents one of the most consequential shifts in consumer adoption patterns. Beauty influencers across platforms like Instagram and TikTok have placed emphasis on sunscreens' role in anti-aging, skin radiance, and self-care, positioning it alongside moisturizers or serums rather than a separate preventative category (Shanbhag, Nayak, Narayan, & Nayak, 2010; Surber, & Osterwalder, 2021). Endorsements from trusted influencers significantly impact both purchasing behavior and brand perception, particularly among demographics historically underrepresented in dermatological research. Peer-generated content, such as documentation of the before-and-after hyperpigmentation improvement following consistent tinted sunscreen use, develops trust and reliability that traditional advertisements struggle to achieve. This perspective produced by social media serves to make sun protection personally relevant and aesthetically rewarding rather than distant and obligatory.

Inclusive marketing that features a diverse range of skin tones builds trust amongst consumers and encourages greater engagement with sun protection products. When individuals see models who resemble themselves, they are more likely to trust that products were designed with their needs in mind, an effect explained by the homophily principle which refers to how perceived similarity increases acceptance (Wahyuni, & Ayomi, 2024; Buller Andersen, Bettinghaus et al., 2018; Buller, Bettinghaus, Fluharty et al., 2019). Fenty Beauty is an example of how an extensive shade range and a diversity within models revolutionized consumer expectations across the beauty industry (Prayudawardani, Hadiati, & Muttaqin, 2023). This demonstrates the power of authentic inclusivity to redefine industry standards, providing a model for sunscreen marketing. When visibility is extended to sunscreen products in the same manner, it simultaneously communicates that photoprotection products exist for diverse skin tones and that manufacturers recognize the distinct dermatological needs of SOC populations. This shift addresses the gap in advertising where models with Fitzpatrick skin types IV-VI were absent, creating the impression that sun protection was irrelevant to individuals with darker skin.

Behavioral research highlights the mechanisms through which identity-based framing enhances adoption. When sunscreen use is framed as part of a self-affirming or identity-based practice, individuals are more receptive to the message. By integrating sunscreen into identity-affirming routines, public health campaigns and brands can foster sustainable habits, leading to greater acceptance and long-term adherence across diverse populations. Positioning sunscreen as a form of self-care makes the behavior intrinsically rewarding and consistent with one's self-image. This psychological principle explains why messaging emphasizing even skin tone, radiance, and protection against visible light-induced pigmentary disorders influences SOC communities more than abstract cancer prevention narratives. Addressing previous barriers through authentic representation, inclusive shade ranges, and targeted campaigns, particularly on social media, can strengthen trust and drive product adoption.

Clinical Implications and Counseling Opportunities

The rise of functional sunscreens offers dermatologists an opportunity to translate beauty culture trends into practical clinical advice. Traditional sunscreens offer partial protection against hyperpigmentation by blocking UVA and UVB radiation; however, they do not provide adequate protection against visible light (Moyal, 20224). This distinction is important, as visible light is recognized as a significant factor in hyperpigmentation, especially in patients with SOC (Zhou, Lee, Salas & Luke, 2024). Tinted mineral sunscreens containing iron oxides extend protection into the visible light spectrum, providing comprehensive coverage (Figure 2). This specific product is the most effective option for reducing visible light-induced pigmentation, significantly decreasing melasma relapse, and lowering MASI scores compared to UV-only sunscreens (He, Chen, Jin, & Zhang, 2025). Clinical evidence from a 12-week trial of a tinted mineral SPF 50 demonstrated that more than 80% of participants demonstrated measurable improvement in photoaging features such as tone uniformity and radiance (Kern, Wood, Almkhtar, Angra, Lipp, & Goldman, 2022). These findings establish tinted mineral formulations should be recommended over non-tinted sunscreens in patients prone to disorders of hyperpigmentation.

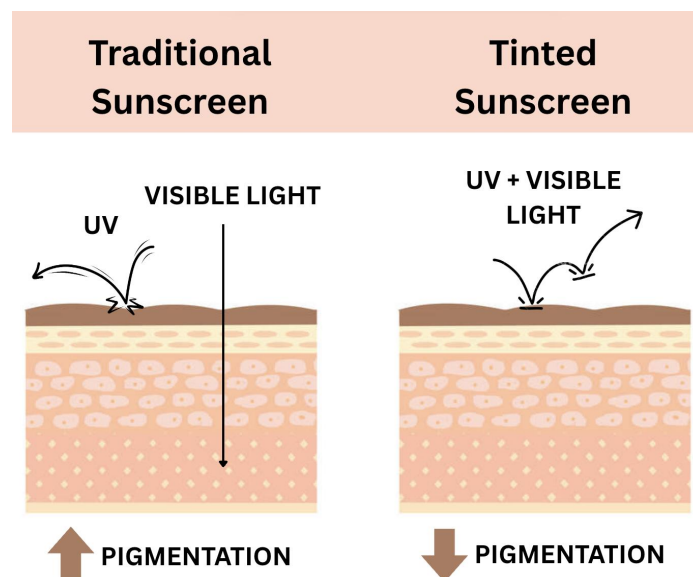


Figure 2. Comparative Schematic Illustrating That Tinted Sunscreens Protect against both UV and Visible Light-induced Pigmentation, while Traditional Sunscreens Primarily Address UV Radiation Alone

For clinical implementation, tailoring recommendations to individual patient needs ensures consistent use. Formulation choice should account for skin type and climate as patients with oily skin or those in humid environments benefit from lightweight, matte options. While those with dry skin or in colder conditions require richer, emollient bases. Given that white cast and shade mismatch are key barriers, it is reasonable to assume that tinted sunscreens designed to match undertones more effectively may help improve adherence in individuals with SOC. By aligning sunscreen recommendations with cosmetic preferences, lifestyle factors, and environmental context, clinicians can make daily photoprotection both effective and acceptable.

Patients with skin of color face unique barriers to sunscreen use. Many patients prefer providers of similar racial or ethnic backgrounds, who may better understand the cultural and cosmetic considerations relevant to their care (Wang, Patel, Philip et al., 2024). This highlights the importance of workforce diversity in dermatology, as race-concordant providers can foster trust, improve communication, and encourage preventive behaviors. Partnerships with dermatologists and estheticians specializing in SOC can help address these gaps by recommending sunscreens that protect against both UV and visible light, minimize white cast, and provide shade diversity (Krutmann, Piquero-Casals, Morgado-Carrasco et al., 2023; Zhou, Lee, Salas, & Luke, 2024; Kern, Wood, Almkhatar, Angra, Lipp, & Goldman, 2022). Such collaborations ensure that product recommendations are both clinically effective and cosmetically acceptable, reducing barriers that often discourage sunscreen use in melanin-rich skin. These experts also play a critical role in educating patients about the importance of photoprotection for conditions such as pigmentary disorders and in dispelling the misconception that

darker skin does not require sunscreen (Wang, Patel, Philip et al., 2024). By correcting these misconceptions, trusted providers can shift cultural narratives around sun safety and promote adherence in populations that have been underserved.

A common misconception is that the use of sunscreen invariably causes vitamin D deficiency; however, population-based evidence shows mixed results, with only modest reductions in serum 25(OH)D levels observed and no clear evidence of clinically significant deficiency (Gatta & Cappelli, 2025). Supplementation and a balanced diet remain the most reliable ways to maintain adequate vitamin D levels (Kannan & Lim, 2014). Finally, patients should be reminded that UVA and visible light penetrate clouds and glass, making sunscreen a year-round necessity across all skin tones (Marionnet, Tricaud, & Bernerd, 2014; Geisler, Austin, Nguyen, Hamzavi, Jagdeo, & Lim, 2021). By directly addressing these myths, dermatologists can shift patient perceptions of sunscreen from optional to essential, reinforcing its role in both skin health and aesthetics.

Dermatologists can further enhance adoption by partnering with the beauty industry to expand shade diversity and improve formulation accessibility for skin of color patients. EltaMD's launch of Deep Tint variants, tested specifically on Fitzpatrick V-VI skin tones, was supported by dermatologist influencers of color who educated communities both online and in their clinics (Pile, 2025). This approach shows how clinical expertise can guide inclusive product development. This collaborative approach redefines sunscreen as both a health necessity and a beauty tool, strengthening credibility and cultural relevance. When combined with social media engagement and community-based efforts, such partnerships make photoprotection more inclusive and accessible.

Future Directions

Skin of color communities have been underrepresented in research, leaving a gap in literature about how various dermatological diseases present and are treated in darker skin. It is predicted that there will be an increase in cutaneous cancers, with the majority occurring in low and middle income areas (Gupta, Bharadwaj, & Mehrotra, 2016). Current research provides limited insights on evaluating individuals with darker skin tones, posing diagnostic challenges in the identification of characteristics such as color variation within the lesions (Geller, Jablonski, Pagoto et al., 2018). This research deficit is interconnected with previous product development, resulting in sunscreens that were cosmetically unacceptable for darker skin tones. Future trials must abandon the "one-size-fits-all" approach and instead should incorporate diverse populations by refining skin physiology categories, use of nuanced messaging to target at-risk populations, and sun safety interventions that are scalable (Geller, Jablonski, Pagoto et al., 2018). Sunscreen application is a behavioral barrier most populations face. Improper application is a major cause for the lack of protective benefits of sunscreen, most often not enough is applied to achieve the claimed SPF and it is not regularly reapplied (Silva, Tavares, Paulitsch, & Zhang, 2018). Future research must address the long-term adherence patterns and real-world efficacy of functional sunscreens in preventing and treating common pigmentary disorders, including melasma and

PIH. Most importantly, this research must move beyond simple SPF testing to include patient-centred outcomes such as reduction in white cast and improvement in quality of life measures related to pigmentary disorders.

Current trends point toward expanded shade range stratification beyond the current “light/medium/dark” categorization. A common misunderstanding is viewing SOC as a monolithic category, however, most racial groups include individuals on both sides of the Fitzpatrick phototype system (Karampinis, Toli, Georgopoulou et al., 2024). The move for greater inclusiveness in the beauty and dermatological market directly acknowledges the heterogeneity within SOC populations. Multi-active sunscreen addressing simultaneous concerns, broad-spectrum sun protection alongside acne and pigmentation, have emerged partly from consumer demand for streamlined skincare routines that simplify daily adherence. Cost, however, remains as a significant barrier. The expense of clinically effective functional sunscreens frequently deters consistent use, particularly among lower-income individuals and marginalized communities. Future research must address the impact of economic factors in achieving equitable access, and dermatological strategies should focus on marketing photoprotection as essential. Reframing photoprotection as an essential health intervention rather than a luxury beauty product may create pathways toward insurance coverage or public health subsidies, thereby reducing the financial burden to adherence.

To bridge the gaps among clinical research and consumer adoption, interdisciplinary collaborations are required. Interactions between the beauty community, public health, and dermatology are essential to the development of effective photoprotection strategies. Efforts across multiple disciplines are needed to take the diversity in culture and beliefs across various communities into account to ensure preventative methods for skin cancer reach the intended population (Geller, Jablonski, Pagoto et al., 2018). The combination of scientific rigor, population-level education, product formulation expertise, and cultural influence can create photoprotective strategies that target skin of color communities effectively.

Conclusion

Functional sunscreens are reshaping the landscape of photoprotection by aligning clinical efficacy with the aesthetic and cultural priorities of individuals with skin of color. Advances in formulation, such as tinted mineral products with iron oxides, directly address barriers of white cast and shade mismatch while offering visible light protection critical for pigmentary disorders. At the same time, inclusive marketing and the influence of beauty culture have reframed sunscreen as a beauty-enhancing tool rather than solely a cancer-preventive measure, fostering broader acceptance and daily use. Dermatologists have an opportunity to integrate these cultural and technological shifts into patient counseling, emphasizing sunscreen’s role in preventing dyspigmentation, photoaging, and hyperpigmentation alongside traditional UV protection. Ensuring equitable access, expanding shade diversity, and strengthening interdisciplinary collaborations between dermatology, public health, and

the beauty industry are essential to improving adherence and outcomes. By bridging clinical priorities with consumer values, functional sunscreens provide a pathway toward inclusive, effective, and sustainable photoprotection.

Declaration of Conflicting Interests

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

- Bardhi, R., Mokhtari, M., Masood, M et al. (2024). Subjective and objective assessment of color match of universal tinted sunscreens in Fitzpatrick skin phototypes I-VI. *Photodermatol Photoimmunol Photomed*, 40(5), e12992. <https://doi.org/10.1111/phpp.12992>
- Buller, M. K., Andersen, P. A., Bettinghaus, E. P. et al. (2018). Randomized Trial Evaluating Targeted Photographic Health Communication Messages in Three Stigmatized Populations: Physically-Disabled, Senior, and Overweight/Obese Individuals. *J Health Commun*, 23(10-11), 886-898. <https://doi.org/10.1080/10810730.2018.1536731>
- Buller, M. K., Bettinghaus, E. P., Fluharty, L. et al. (2019). Improving health communication with photographic images that increase identification in three minority populations. *Health Educ Res*, 34(2), 145-158. <https://doi.org/10.1093/her/cyy054>
- Campbell, C., Sands, S., McFerran, B., & Mavrommatis, A. (2023). Diversity representation in advertising. *Journal of the Academy of Marketing Science*. <https://doi.org/10.1007/s11747-023-00994-8>.
- Darji, K., Varade, R., West, D., Armbrecht, E. S., & Guo, M. A. (2017). Psychosocial Impact of Postinflammatory Hyperpigmentation in Patients with Acne Vulgaris. *J Clin Aesthet Dermatol*, 10(5), 18-23.
- Davis, E. C., & Callender, V. D. (2010). Postinflammatory hyperpigmentation: A review of the epidemiology, clinical features, and treatment options in skin of color. *J Clin Aesthet Dermatol*, 3(7), 20-31.
- Gatta, E., & Cappelli, C. (2025). Sunscreen and 25-Hydroxyvitamin D Levels: Friends or Foes? A Systematic Review and Meta-Analysis. *Endocr Pract*, 31(6), 839-848. <https://doi.org/10.1016/j.eprac.2025.03.014>
- Geisler, A. N., Austin, E., Nguyen, J., Hamzavi, I., Jagdeo, J., & Lim, H. W. (2021). Visible light. Part II: Photoprotection against visible and ultraviolet light. *J Am Acad Dermatol*, 84(5), 1233-1244. <https://doi.org/10.1016/j.jaad.2020.11.074>
- Geisler, A., Masub, N., Toker, M. et al. (2022). Skin of Color Skin Care Needs: Results of a Multi-Center-Based Survey. *J Drugs Dermatol*, 21(7), 709-711. <https://doi.org/10.36849/JDD.6557>

- Geller, A. C., Jablonski, N. G., Pagoto, S. L. et al. (2018). Interdisciplinary Perspectives on Sun Safety. *JAMA Dermatol*, 154(1), 88-92. <https://doi.org/10.1001/jamadermatol.2017.4201>
- Gupta, A. K., Bharadwaj, M., & Mehrotra, R. (2016). Skin Cancer Concerns in People of Color: Risk Factors and Prevention. *Asian Pac J Cancer Prev*, 17(12), 5257-5264. <https://doi.org/10.22034/APJCP.2016.17.12.5257>
- He, M., Chen, X., Jin, S., & Zhang, C. (2025). Visible Light Protection: An Updated Review of Tinted Sunscreens. *Photodermatol Photoimmunol Photomed*, 41(4), e70033. <https://doi.org/10.1111/phpp.70033>
- Hernandez, C., Calero, D., Robinson, G., Mermelstein, R., & Robinson, J. K. (2012). Comparison of sunscreen availability in Chicago Hispanic and non-Hispanic neighborhoods. *Photodermatol Photoimmunol Photomed*, 28(5), 244-249. <https://doi.org/10.1111/j.1600-0781.2012.00688.x>
- Kannan, S., & Lim, H. W. (2014). Photoprotection and vitamin D: A review. *Photodermatol Photoimmunol Photomed*, 30(2-3), 137-145. <https://doi.org/10.1111/phpp.12096>
- Karampinis, E., Toli, O., Georgopoulou, K. E. et al. (2024). Exploring Pediatric Dermatology in Skin of Color: Focus on Dermoscopy. *Life (Basel)*, 14(12), 1604. <https://doi.org/10.3390/life14121604>
- Kern, J., Wood, E., Almukhtar, R., Angra, K., Lipp, M., & Goldman, M. (2022). Evaluation of an SPF50 Sunscreen Containing Photolyase and Antioxidants for its Anti-Photoaging Properties and Photoprotection.. *Journal of drugs in dermatology: JDD*, 21(5). <https://doi.org/10.36849/JDD.6503>.
- Krutmann, J., Piquero-Casals, J., Morgado-Carrasco, D. et al. (2023). Photoprotection for people with skin of colour: needs and strategies. *Br J Dermatol*, 188(2), 168-175. <https://doi.org/10.1093/bjd/ljac046>
- Lyons, A. B., Trullas, C., Kohli, I., Hamzavi, I. H., & Lim, H. W. (2021). Photoprotection beyond ultraviolet radiation: A review of tinted sunscreens. *J Am Acad Dermatol*, 84(5), 1393-1397. <https://doi.org/10.1016/j.jaad.2020.04.079>
- Maldonado, L. A. M., Gallagher, E. A., Curry, A., Sahloff, K. Q., & da Silva, S. I. D. (2025). A standardized scoring method for measuring white cast of mineral sunscreens and improving user compliance across diverse skin tones. *PLoS One*, 20(8), e0319891. <https://doi.org/10.1371/journal.pone.0319891>
- Marionnet, C., Tricaud, C., & Bernerd, F. (2014). Exposure to non-extreme solar UV daylight: spectral characterization, effects on skin and photoprotection. *Int J Mol Sci*, 16(1), 68-90. <https://doi.org/10.3390/ijms16010068>
- Morgado-Carrasco, D., & Piquero-Casals, J. (2022). Melasma: The need for tailored photoprotection to improve clinical outcomes. *Photodermatology, Photoimmunology & Photomedicine*, 38(4), 345–353. <https://onlinelibrary.wiley.com/doi/abs/10.1111/phpp.12783>
- Morquette, A., Waples, E., & Heath, C. (2022). The importance of cosmetically elegant sunscreen in skin of color populations. *Journal of Cosmetic Dermatology*, 21.

- <https://doi.org/10.1111/jocd.14409>
- Moyal, D. (2004). Prevention of ultraviolet-induced skin pigmentation. *Photodermatol Photoimmunol Photomed*, 20(5), 243-247. <https://doi.org/10.1111/j.1600-0781.2004.00111.x>
- Mun, S. J., Lee, V., & Gupta, M. (2025). Sunscreens in pigmentary disorders: time to revise the message. *Photochem Photobiol Sci*, 24(2), 215-225. <https://doi.org/10.1007/s43630-025-00688-w>
- Passeron, T., Brown, A., Furmanczyk, M., Foyaca, M., Trullas, C., & Piquero-Casals, J. (2025). An Investigator-Blinded, Randomized Trial of a Broad-Spectrum Sunscreen Containing Sclareolide and Niacinamide for the Prevention of Post-inflammatory Hyperpigmentation in Skin of Color. *Dermatol Ther (Heidelb)*, 5. <https://doi.org/10.1007/s13555-025-01586-w>
- Pile, T. (2024). *EltamD Launches Deep Tint, Sunscreen Protection for Darker Skin*. <http://www.glossy.co/beauty/eltamd-launches-deep-tint-sunscreen-protection-for-darker-skin/>
- Prayudawardani, A., Hadiati, C., & Muttaqin, U. (2023). SEMIOTIC ANALYSIS ON FENTY BEAUTY'S FOUNDATION ADVERTISING POSTER AS A REPRESENTATIVE OF BEAUTY DIVERSITY. *LUNAR*. <https://doi.org/10.36526/ln.v7i2.3053>
- Shanbhag, S., Nayak, A., Narayan, R., & Nayak, U. (2019). Anti-aging and Sunscreens: Paradigm Shift in Cosmetics. *Advanced Pharmaceutical Bulletin*, 9. <https://doi.org/10.15171/apb.2019.042>
- Silva, ESD., Tavares, R., Paulitsch, FDS, & Zhang L. (2018). Use of sunscreen and risk of melanoma and non-melanoma skin cancer: A systematic review and meta-analysis. *Eur J Dermatol*, 28(2), 186-201. <https://doi.org/10.1684/ejd.2018.3251>
- Song, H., Beckles, A., Salian, P., & Porter, M. (2020). Sunscreen recommendations for patients with skin of color in the popular press and in the dermatology clinic. *International Journal of Women's Dermatology*, 7. <https://doi.org/10.1016/j.ijwd.2020.10.008>
- Surber, C., & Osterwalder, U. (2021). Challenges in Sun Protection.. *Current problems in dermatology*, 55. <https://doi.org/10.1159/000517590>
- Toor, H., Gill, M. S., & Ahad, T. (2025). Beliefs and Attitudes Towards Sunscreen and Sun Protection Practices Among South Asians in British Columbia: A Survey Study. *Photodermatol Photoimmunol Photomed*, 41(4), e70029. <https://doi.org/10.1111/phpp.70029>
- Ullman, L. E., Nasir-Moin, M., Hoffman, V. et al. (2024). Sunscreen use and affordability attitudes based on ethnicity, socioeconomic status, and Fitzpatrick skin type. *Arch Dermatol Res*, 316(6), 266. <https://doi.org/10.1007/s00403-024-02997-z>
- Wahyuni, N., & Ayomi, P. (2024). Being Flawless: Beauty Representation in L'Oréal Paris Skincare Advertisements. *Innovations in Language Education and Literature*. <https://doi.org/10.31605/ilere.v1i2.4118>
- Wang, J. Y., Patel, P., Philip, R. et al. (2024). Sunscreen Practices and Preferences of Skin of Color Patients. *J Drugs Dermatol*, 23(6), 456-462. <https://doi.org/10.36849/JDD.8268>
- Zhou, C., Lee, C., Salas, J., & Luke, J. (2024). Guide to tinted sunscreens in skin of color. *Int J Dermatol*, 63(3), 272-276. <https://doi.org/10.1111/ijd.16954>