



## ABSTRACT

**BACKGROUND:** The commercial tanning industry has opposed efforts to educate the public on the risks of tanning as well as attempts to restrict minors' access to tanning services. Despite a paucity of supporting literature, statements from the tanning industry claiming that dermatologists routinely use in-office phototherapy for cosmetic treatments and refer patients to tanning salons have successfully derailed and defeated legislation in many states. **OBJECTIVE:** This study aims to evaluate dermatologist referrals for ultraviolet radiation for cosmetic and medical purposes via tanning beds or phototherapy, as well as their opinions on tanning, legislation, and ultraviolet radiation counseling practices. **DESIGN:** The study was conducted using a 10-question anonymous survey. **SETTING:** The participants were surveyed during meetings of three regional dermatologic societies. **PARTICIPANTS:** One hundred and fifty-two dermatologists attending society meetings participated in the study. **MEASURES:** The authors measured physician referrals, opinions, and recommendations regarding ultraviolet exposure. **RESULTS:** Zero physicians (0/152) recommended tanning salons for cosmetic reasons. These 152 dermatologists referred 458 (417 adult, 41 pediatric) out of an estimated 809,369 patients (0.057%) to tanning salons for medical treatment. Of these physicians, 76 out of 152 and 15 out of 152 reported referring at least one adult or one pediatric patient, respectively, within the last year. All respondents supported ultraviolet tanning legislation and discouraged cosmetic tanning. **CONCLUSION:** These findings directly contradict the assertion that dermatologists use ultraviolet radiation for cosmetic purposes or routinely refer patients to tanning salons. This study underscores the complex nature of ultraviolet radiation, as dermatologists infrequently utilize ultraviolet radiation for medical purposes and unanimously support restrictive legislation. In addition, these dermatologists counsel against cosmetic tanning and list tanning bed use among their highest concerns with regard to the health of pediatric patients.

**KEYWORDS:** Dermatologist referrals, legislation, pediatric dermatology, phototherapy, public health policy, tanning, tanning regimen, tanning salon, tanning bed, ultraviolet radiation, UV, UV counseling practices, UV exposure

## ORIGINAL RESEARCH

# Examining Dermatologist Use and Opinions of Ultraviolet Radiation for Cosmetic and Medical Purposes

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Ultraviolet (UV) radiation has been strongly associated with both melanoma and non-melanoma skin cancer, as well as a variety of other dermatological conditions.<sup>1,2</sup> Despite these dangers, potential benefits exist for photoresponsive skin conditions.<sup>3</sup> Specific beneficial UV wavelengths have been filtered into medical phototherapy devices with narrowed emission spectrums and overall UV exposure has been reduced through standardized protocols and treatment localization.<sup>4–9</sup> In this article, “phototherapy” refers to in-office, physician-directed UV radiation, while any reference to “tanning” refers to broad-spectrum UV radiation via commercial tanning devices.

There is a growing global public health movement to limit UV radiation as a risk factor for skin cancer. Recently, the medical and public health communities have improved education regarding the harmful effects of UV radiation and championed public policy efforts to restrict UV tanning access to minors. Tanning industry lobbyists, officials, and their affiliated publications have argued that these activities are the result of “the cosmetic dermatology industry attacking indoor tanning for strictly financial gain.”<sup>10</sup> They describe dermatologic diseases as “purely cosmetic” and allege that physicians are either dishonest about the dangers of tanning bed use and “violating

their Hippocratic oath” by harming patients for cosmetic benefits.<sup>10–12</sup> Through social media and industry publications, commercial tanning leaders refute peer-reviewed literature and question the integrity of medical and research institutions.<sup>13–15</sup> The industry also provides misleading information to consumers, while simultaneously dismissing the growing body of research substantiating the dangers directly linked to UV exposure.<sup>16–26</sup> Referencing a study by Feldman et al<sup>27</sup> that reviewed the declining usage of phototherapy in the treatment of psoriasis, the tanning industry claims that “dermatology’s anger for the loss of billions of dollars of phototherapy treatment” is the motivation behind legislation to restrict underage tanning.<sup>10</sup> Rather than acknowledge the concurrent advances in the biologic treatment of psoriasis and changes in insurance coverage that have led to increased cost and decreased availability of phototherapy, the tanning industry seeks to equate tanning beds with in-office phototherapy devices, claiming that many patients are treating diseases in commercial tanning beds at the behest of their dermatologists or other physicians.<sup>10,11,27,28</sup>

This study was designed to clarify physician referrals for exposure to UV light. For physicians referring to tanning salons, we sought the reasons for referral, as well as recommended treatment schedules. Additionally, we gathered

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physician opinions on tanning, including legislation, non-UV tanning, counseling practices, and pediatric wellbeing.

## METHODS

A 10-question anonymous survey evaluating physicians referrals by and attitudes toward artificial UV exposure was developed and exempted from International Review Board (IRB) review by the Harvard TH Chan School of Public Health IRB Committee. Data collection was completed from 2012 to 2013, with statistical analysis from 2015 to 2016. Three regional dermatologic organizations participated in the survey: Intermountain Dermatology Society (IDS; members primarily from Idaho, Utah, and neighboring states), Colorado Dermatology Society (CDS, members primarily from Colorado and neighboring states), and Pennsylvania Academy of Dermatology (PAD, members primarily from Pennsylvania and neighboring states). Member dermatologists in attendance at these meetings were offered a paper survey. The surveys were collected in anonymous drop boxes.

The survey queried members on their recommendation of UV tanning devices at a tanning salon and medical phototherapy devices to adults and minors within the past year. Each recommendation was stratified by either cosmetic or medical conditions. The survey included recommendations for non-UV tanning alternatives, opinions on legislation prohibiting minors from using commercial UV tanning, how often UV tanning device usage was included in the social history of patients, which patients receive counseling regarding UV exposure, what counseling is provided, and level of concern for twelve common issues impacting pediatric patients' wellbeing. (Survey included as Appendix 1)

Univariate significance was tested using the Student's *t*-test or the  $\chi^2$  test, as appropriate. Statistical significance was considered using a two-sided  $p < 0.05$ . All analyses were performed using SPSS 22 (IBM, Armonk, New York). Where applicable, standard error was calculated.

The patient population represented in this survey was estimated by multiplying the average number of patients seen per week by 52 weeks, then multiplied by the number of responding providers (average patients per week  $\times$  52 weeks  $\times$  *n* providers).

## RESULTS

**Referrals to tanning salons and phototherapy.** In this study, zero out of the 152 physicians surveyed recommended tanning salons for cosmetic reasons to any patient, adult or pediatric. Phototherapy was recommended to 0.00025 percent of adult patients (2/809,369) by 1.3 percent of physicians (2/152) for non-medical reasons, and was not recommended to any children for non-medical reasons. Regarding tanning salons, the 152 physicians referred approximately 0.051 percent of adults (417/809,369) and 0.005 percent of pediatric patients (41/809,369) for medical treatment, or about three patients (2.74 adults and 0.27 minors) per provider per year. Fifty percent of the responding physicians (76/152) reported having referred at least one adult within the last year; 9.9 percent (15/152) reported having referred at least one pediatric patient. Regarding phototherapy, an estimated 3,147 (0.389%) adult and 353 (0.044%) pediatric patients were referred for medical treatment, with 83.6 percent (127/152) and 43.4 percent (66/152) respondents referring at least one adult or pediatric patient, respectively, within in the past year.

Specific conditions recommended for UV light treatment included psoriasis, atopic dermatitis, vitiligo, pruritus, cutaneous T-cell lymphoma, lichen planus, pityriasis rosea, graft versus host disease, alopecia, granuloma annulare, contact dermatitis, urticaria, prurigo nodularis, polymorphous light eruption, lipodermatosclerosis, lymphomatoid papulosis, pityriasis lichenoides chronica, folliculitis, actinodermatitis, necrobiosis lipoidica diabetorum, and tinea versicolor (Table 1).

Providers who recommended medical treatment in tanning beds were asked to provide the specific regimens they instruct patients to follow. Of these 76 physicians, 41 percent (31/76) reported a complete regimen with instructions for 1) number of sessions per week, 2) duration of each session, and 3) treatment duration. An additional 20 percent (15/76) reported incomplete regimens. Of the 31 complete regimens reported, 90 percent (28/31) were unique from one another. For physicians referring minor patients to tanning salons for medical treatment, 47 percent (7/15) provided complete regimens and an additional 13 percent (2/15) provided incomplete regimens. Of the seven complete regimens, 86 percent (6/7) were unique from one another (Figure 1).

**Non-UV tanning.** Of the 152 responders, 89.5 percent (136/152) and 65.1 percent (99/152) reported recommending non-UV tanning methods, such as spray tanning or self-tanners, as alternatives to UV tanning devices to adult and minor patients, respectively, within the last year.

**Tanning legislation.** Every provider surveyed expressed support for legislation prohibiting minors under age 18 years from using UV tanning devices at commercial tanning salons.

**Patient counseling.** Providers reported actively discussing the use of UV tanning devices with a variety of patients, including minors and their parents/guardians and patients with skin cancer history. For pediatric patients, female patients received counseling more frequently than male patients (82% vs. 37%,  $p < 0.01$ ). Similar discrepancies were seen by patient sex at all age groups ( $p < 0.01$ ). Female providers were significantly less likely to discuss tanning bed use with male patients of all ages compared to their male provider counterparts (Table 2). When counseling patients, 99.3 percent (150/151) opposed cosmetic tanning (92.7 percent strongly discouraged it and 6.6 percent moderately discouraged the practice).

**Concern for pediatric patients' wellbeing.** Physicians rated their level of concern for the wellbeing of pediatric patients related to a variety of health issues using a 1 to 3 scale (1=none, 2=moderate, 3=high) (Figure 2). The highest average levels of concern were for smoking ( $2.92 \pm 0.32$ ), illicit drug use ( $2.87 \pm 0.38$ ), UV tanning ( $2.77 \pm 0.44$ ), texting while driving ( $2.74 \pm 0.54$ ), alcohol ( $2.68 \pm 0.47$ ), and obesity ( $2.66 \pm 0.50$ ).

**Practice setting.** A trend was noted for increased patient referrals to tanning beds for medical reasons from providers located in rural areas compared to providers located in urban areas (64% vs. 35%, respectively,  $p = 0.06$ ). An inverse trend was noted between rural and urban providers recommending adult phototherapy (62% vs. 82%, respectively,  $p = 0.09$ ). Providers with access to an in-office phototherapy unit were significantly more likely to recommend phototherapy than providers without an in-office unit for both adults (92% vs. 69%, respectively,  $p < 0.001$ ) and minors (57% vs. 26%, respectively,  $p < 0.001$ ). However, physicians were no less likely to recommend tanning beds for medical reasons if they had

access to in-office phototherapy (49% vs. 48% for adults and 8% vs. 10% for minors). Having access to in-office phototherapy does not appear to impact whether a dermatologist recommends tanning beds to their patients for medical reasons (49% with access vs. 48% without access for adults and 8% with access vs. 10% without access for minors).

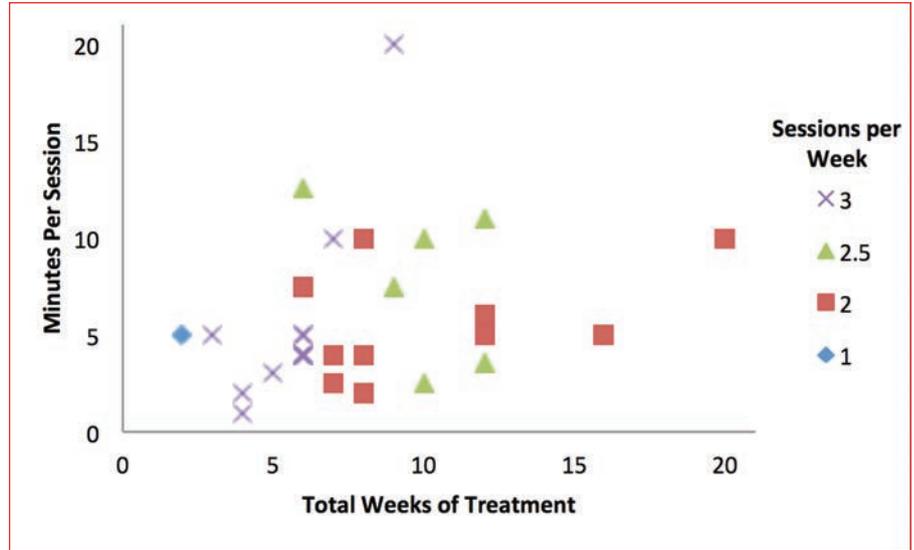
**DISCUSSION**

As with most medical treatments, UV radiation has both harmful and therapeutic properties. Contrary to tanning industry claims, dermatologic diseases are far from purely cosmetic, and, in some cases, the benefit of UV treatment might outweigh the risk. Psoriasis, for example, has major systemic health implications, including erosive inflammatory arthritis and increased risk of cardiovascular disease, metabolic syndrome, diabetes, and obesity.<sup>29–34</sup>

While commercial tanning beds and in-office phototherapy units have a similar appearance, they utilize different equipment and emit a vastly different spectrum of UV radiation. For example, narrowband UVB phototherapy devices emit a concentrated dose of 311 to 313nm UVB, while tanning beds emit an average of five-percent broad spectrum UVB (290–320nm) with the remaining 95 percent composed of UVA light (320–400nm). Therefore, tanning beds might be an inefficient source of UV exposure in the treatment of dermatological disease when more ideal options like phototherapy are unavailable due to cost or proximity.<sup>35</sup>

**Interpretation of results.** By our estimation, these results represent approximately 809,369 patient visits per year. Only an estimated 0.057 percent, or 458 (417 adult, 41 pediatric) out of the 809,369 patients were referred to tanning salons for medical treatment. We estimate the rates of dermatologist referral to tanning salons for medical treatment to be extremely low; only one adult out of every 1,940 patients and one child out of every 19,450 patients. In other words, the average dermatologist in our study saw 4,000 to 6,500 patients per year and referred approximately three of them (2.74 adults and 0.27 minors) for medical treatment in tanning salons.

Our findings, albeit limited to responses from only 152 physicians, strongly contradict



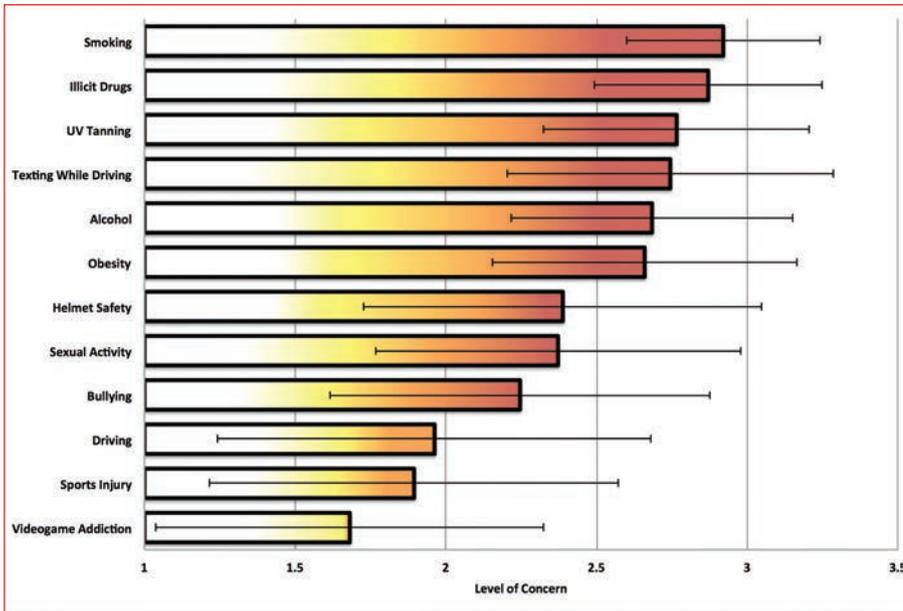
**FIGURE 1.** Recommended tanning regimens. Complete regimens recommended to either adults or minors for medical treatment in tanning beds, including: 1) minutes per session (y-axis), 2) sessions per week (x=3, Δ=2.5, □=2, ◆=1), and 3) weeks of treatment (x-axis)

TABLE 1. Conditions treated			
ADULTS		MINORS	
TANNING BEDS	PHOTOTHERAPY	TANNING BEDS	PHOTOTHERAPY
<ul style="list-style-type: none"> <li>• Psoriasis (67)</li> <li>• Atopic Derm (21)</li> <li>• PR (8)</li> <li>• Pruritus (6)</li> <li>• Vitiligo (3)</li> <li>• GA (2)</li> <li>• Urticaria (2)</li> <li>• CTCL (1)</li> <li>• PMLE (1)</li> <li>• TV (1)</li> </ul>	<ul style="list-style-type: none"> <li>• Psoriasis (119)</li> <li>• Atopic Derm (71)</li> <li>• Vitiligo (45)</li> <li>• Pruritus (34)</li> <li>• CTCL (22)</li> <li>• LP (8)</li> </ul>	<ul style="list-style-type: none"> <li>• Psoriasis (11)</li> <li>• Atopic Derm (6)</li> <li>• PR (2)</li> </ul>	<ul style="list-style-type: none"> <li>• Psoriasis (38)</li> <li>• Vitiligo (30)</li> <li>• Atopic Derm (22)</li> <li>• Morphea (3)</li> <li>• Pruritus (2)</li> <li>• CTCL (2)</li> <li>• PR (2)</li> <li>• LP (1)</li> <li>• GVHD (1)</li> <li>• Urticaria (1)</li> <li>• PN (1)</li> <li>• LDS (1)</li> <li>• LyP (1)</li> </ul>

Dermatologic conditions recommended for treatment with UV light (number of providers out of 152 who recommended treatment to at least one patient for specified condition within the past year). CD: contact dermatitis; CTCL: cutaneous T cell lymphoma; GA: granuloma annulare; GVHD: graft versus host disease; LDS: lipodermatosclerosis; LP: lichen planus; LyP: lymphomatoid papulosis; NLD: necrobiosis lipidica diabetorum; PLC: pityriasis lichenoides chronica; PMLE: polymorphous light eruption; PN: prurigo nodularis; PR: pityriasis rosea; TV: tinea versicolor

the idea that dermatologists use UV radiation therapy for cosmetic purposes. In our study, none of the 152 physicians who participated in the survey recommended tanning salons for cosmetic reasons to any patient, adult or pediatric. Phototherapy was recommended for cosmetic reasons to two adults, accounting for 0.00025 percent of patients, and zero minors. We suspect the two providers reporting these two patients might have been describing referrals for phototherapy to treat

conditions they considered to be cosmetic (e.g., some consider vitiligo treatment to be cosmetic). Additionally, it is important to recognize that the recommendations to use tanning beds for medical reasons were not based on whether the physicians had access to an in-office phototherapy unit. (49% vs. 48% for adults and 8% vs. 10% for minors). This further suggests that referrals by dermatologists are driven by individual patient factors (e.g., insurance coverage, proximity



**FIGURE 2.** Physician concern for pediatric patients: Comparison of the average level of concern providers have for pediatric patients' wellbeing with regards several health-related issues. Data presented as mean with error bars representing standard error

**TABLE 2.** Counseling of specific patient populations on the risks of UV tanning.

COUNSELING ON UV TANNING DEVICES	TOTAL	PROVIDER SEX		P-VALUE
		MALE	FEMALE	
Girls younger than 18 years of age	82.1 (124)	82.2 (60)	82.1 (64)	0.98
Women aged 18–40	88.1 (133)	83.6 (61)	92.3 (72)	0.1
Women older than 40	58.3 (88)	58.9 (43)	57.7 (45)	0.06
Boys younger than 18 years of age	37.1 (56)	47.9 (35)	26.9 (21)	0.008
Men aged 18–40	42.4 (64)	52.1 (38)	33.3 (26)	0.02
Men older than 40	37.7 (57)	46.6 (34)	29.5 (23)	0.03
Parents of minors	55.6 (84)	54.8 (40)	56.4 (44)	0.84
Patients with skin cancer history	59.6 (90)	60.3 (44)	59.0 (46)	0.87
Patients with obvious UV damage	64.2 (97)	61.6 (45)	66.7 (52)	0.52
Cosmetic patients	46.4 (70)	45.2 (33)	47.4 (37)	0.78

to phototherapy, cost to patient), rather than financial gain.

**Recommended treatment regimen.**

Interestingly, we observed an unexpected level of variability among the treatment regimens recommended to patients for medical treatment in tanning salons (Figure 3). Of the 38 complete treatment regimens, 90 percent of treatments for adults and 86 percent of treatments for minors were unique between providers. Consistent with these findings, there are few published recommendations and no widely accepted standardized treatment protocols for medical use of

tanning beds. Future studies to investigate optimal treatment regimens are needed, but the movement toward standardization of dermatologic disease treatment presents several challenges. In addition to physiologic differences between disease conditions, treatment with tanning beds is complicated by individual variability in skin type, dose-response, and exposure history. Perhaps more importantly, inter- and intra-device variability in UV emission, imprecise spectral targeting, and administration by the patient or non-medical staff all have potential to lead to unpredictable variations in dosing.

The composite average of the recommended treatment regimens in this study was 2.5 sessions per week for 6.1 minutes per session for 8.3 weeks. Other publications have suggested 3 to 7 sessions per week starting at a low dose of 2 to 3 minutes per session, with small incremental increases ranging from 15 seconds to one minute per session until the desired effect is achieved, and subsequent clinical follow up 4 to 6 weeks after initiation of treatment.<sup>34,36,37</sup> It is suggested that a combination of these techniques in conjunction with patient education to monitor for signs of treatment efficacy (e.g., mild erythema, disease improvement) or overdose (e.g., pain, sunburn, blistering) is the most prudent approach to minimize damage to the skin while optimizing treatment. Additionally, patients should be encouraged to have explicit conversations with tanning salon employees regarding goals (e.g., disease treatment rather than tanning) and methods to minimize dosing variability (e.g., using a specific tanning bed, requesting notification of any bulb or equipment changes).

**Limitations.** Potential limitations are those inherent to survey studies, including nonresponse bias, sampling bias, and recall bias. Further limitations include the small sample size and regionalized, but limited, distribution of this survey. Due to an inability to discern the specific number of dermatologists who accepted the survey or were in attendance at the surveyed sessions from the total number of registered attendees, which included some non-physician staff and students who were not invited to complete the survey, we were forced to use the entire meeting registry, 350 (IDS=60, CDS=185, PAD=105) in calculating response rate. By assuming all 350 registrants were dermatologists who received the survey, we were able to calculate the minimum possible response rate. However, this method almost certainly resulted in an artificially deflated overall response rate of 43.4 percent. Additionally, time constraints at PAD limited verbal introduction to only the CDS and IDS meetings, where minimum response rates were 52 percent and 53 percent, respectively. We suspect that the brevity and anonymity of the survey, as well as distribution and collection methods, might have limited nonresponse bias despite moderate response rates.

## CONCLUSION

Skin cancer is a rapidly growing and potentially preventable worldwide health concern, and reducing unnecessary UV exposure might prove to be a critical component in reducing the global burden of disease. Our findings underscore the complex nature of UV radiation. While many dermatologists appear to recognize the therapeutic utility of UV radiation, they unanimously support restrictive legislation, counsel against cosmetic tanning, and list tanning bed use among their highest concerns with regard to the health of pediatric patients. Indeed, for some patients experiencing special circumstances (inability to obtain a home-phototherapy unit, limited proximity to office-based phototherapy, difficulty with insurance coverage and/or cost), there might be a role for tanning salons in the treatment of dermatologic disease. However, the acknowledgment of the potential beneficial effects of UV therapy does not mean UV radiation is free of harmful effects; rather it highlights the importance of education, risk-benefit analysis, and the pivotal role clinicians play in the longitudinal management of disease.

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In this survey, 'UV tanning device' refers to UV devices (e.g., tanning beds) commonly found in commercial tanning salons. 'Medical phototherapy devices' refers to medical phototherapy devices located in physicians' offices.

**D Survey #** \_\_\_\_\_

Considering **only adult patients** you have seen within the past 1 year...

1) ...how many times have you recommended the use of a UV tanning device at a tanning salon (If none, enter 0):

1<sup>a</sup>) For non-medical cosmetic reasons: \_\_\_\_\_

1<sup>b</sup>) For medical condition(s): \_\_\_\_\_ Please specify condition(s): \_\_\_\_\_

1<sup>c</sup>) Recommended schedule for medical use: \_\_\_\_\_ minutes per session for \_\_\_\_\_ sessions per week for \_\_\_\_\_ weeks total

2) ...how many times have you recommended or used medical phototherapy devices (if none, enter 0):

2<sup>a</sup>) For non-medical cosmetic reasons: \_\_\_\_\_

2<sup>b</sup>) For medical condition(s): \_\_\_\_\_ Please specify condition(s): \_\_\_\_\_

Considering **only patients under the age of 18** you have seen within the past 1 year...

3) ...how many times have you recommended the use of a UV tanning device at a tanning salon (If none, enter 0):

3<sup>a</sup>) For non-medical cosmetic reasons: \_\_\_\_\_

3<sup>b</sup>) For medical condition(s): \_\_\_\_\_ Please specify condition(s): \_\_\_\_\_

3<sup>c</sup>) Recommended schedule for medical use: \_\_\_\_\_ minutes per session for \_\_\_\_\_ sessions per week for \_\_\_\_\_ weeks total

4) ...how many times have you recommended or used medical phototherapy devices (if none, enter 0):

4<sup>a</sup>) For non-medical cosmetic reasons: \_\_\_\_\_

4<sup>b</sup>) For medical condition(s): \_\_\_\_\_ Please specify condition(s): \_\_\_\_\_

5) In the past 1 year, have you recommended non-UV tanning (e.g., spray tans, self-tanners) as alternatives to UV tanning devices? (Check all that apply)  YES, to **adult patients**  YES, to **patients under the age of 18**  NO

6) Do you support laws prohibiting minors (under 18) from using UV tanning devices at commercial tanning salons?  YES  NO

7) How often do you include questions about past or present use of UV tanning devices when collecting a patient's history?

Never  Rarely  Sometimes  Always

8) With which patients do you actively discuss the use of UV tanning devices? (Check all that apply)

None  Girls <18  Women 18-40  Women >40  Cosmetic  **Parents** of kids <18  
 All  Boys <18  Men 18-40  Men >40  History of cancer  Obvious UV damage

9) When discussing UV tanning device use with patients, do you:

Strongly discourage it  Moderately discourage it  Mildly discourage it  Encourage  Neither

10) Using 1-3 (1=none, 2=moderate, 3=high), please rate each topic below regarding your concern for pediatric patients' wellbeing:

\_\_\_ Smoking \_\_\_ Alcohol \_\_\_ Obesity \_\_\_ Helmet safety \_\_\_ Sexual activity \_\_\_ Videogame addiction  
 \_\_\_ Illicit drugs \_\_\_ UV Tanning \_\_\_ Bullying \_\_\_ Sports injury \_\_\_ Driving in general \_\_\_ Texting while driving

Age: \_\_\_\_\_ Sex: \_\_\_\_\_ City: \_\_\_\_\_ State: \_\_\_\_\_ Years in practice: \_\_\_\_\_

Is your practice:  Urban  Suburban  Rural

Average number of patients you see per week?  <50  50-99  100-149  150-199  200+

Number of pediatric patients you see per week: \_\_\_\_\_

Practice Focus:  General  Procedural  Pediatric  Cosmetic  Academic  Other: \_\_\_\_\_

Approximate percentage of cosmetic patients: \_\_\_\_\_%

Do you have a medical phototherapy device in your office?  YES  NO

If NO, approximately how far in miles is your office from the nearest medical phototherapy device? \_\_\_\_\_  I don't know

Do you have any UV tanning devices associated with your office (e.g., tanning bed; do not include Wood's Lamps)?  YES  NO

APPENDIX 1. Survey used for study