

## **Encouraging Sun Protective Behavior to Reduce Skin Cancer Incidences**

Living in the state of Oregon, it can become easy to discount sun protective behaviors due to the number of days that it is cloudy and raining throughout the year; however, according to the CDC, Oregon has one of the highest incidences of melanoma per 100,000 people in the US for an age adjusted rate of 27.37.<sup>1</sup> Skin cancer is not unique to Oregon, in fact, skin cancer is the most common cancer in the US and according to the CDC in the most recently published data in 2018 there were 83,996 people in the US who were diagnosed with melanoma and 8,199 people who died from melanoma.<sup>1,2</sup> Basal and squamous cell carcinomas are so common there is significant difficulty in tracking the data regarding how many incidences there are a year.<sup>1,2</sup> According to the American Cancer Society, they estimate that in the US each year there will be 3.3 million Americans that are diagnosed with an estimated 5.4 million basal or squamous cell carcinomas (some people are diagnosed with more than one).<sup>2</sup> With evidence demonstrating how lack of sun protection and UV exposure and radiation, especially in childhood, hugely contribute to the incidence of skin cancer development, Healthy People 2030 focuses on risk reduction and implementing behaviors that limit exposure.<sup>3,4</sup> According to the Youth Risk Surveillance System survey that is taken nationally by high school students, in the most recent data from 2017, 57.2% of students reported having at least 1 sunburn in the previous 12 months.<sup>3</sup> With that many high school students nationally reporting a sunburn, there is an opportunity for education and interventions that will hopefully change behaviors and increase the number of people who are actively and intentionally trying to prevent sunburn and limit sun exposure; Healthy People 2030 aims to have the number of students who report a sunburn in the last year reduced to 52.2% by

2030.<sup>3</sup> As a young adult in high school, it is difficult to fully understand the consequence of your choices which makes it imperative to intervene at the high school age in a way that connects to their personal experiences. Further education and personalization of this information needs to be developed and delivered to students in order for them to not only understand the consequences of sun exposure, but also empower them to be prepared and informed on exactly how to best protect their skin.

Considering the necessity of this intervention, a study was performed that took data from Youth Risk Behavior Surveys completed between 1999 and 2009 by students in grades 9-12 attending both public and private schools regarding sunscreen use.<sup>5</sup> In these self-reporting surveys, data showed that during that 10-year span, the percentage of white and Hispanic students who did not wear sunscreen when outside on a sunny day for greater than an hour increased in white students from 57.5% to 69.4% and Hispanic students from 71.6% to 77.9%.<sup>5</sup> While this data is over 10 years old, it still highlights that despite ample information that has been relayed to students about the necessity of sun protection, many high school students aren't reached by traditional means of intervention and new approaches are needed.<sup>5</sup> This study showing this concerning trend further confirms the need for more intentional intervention for high school students. This is further corroborated by a CDC and Youth Risk Behavior Surveys data.<sup>166</sup> They collected data for self-reporting surveys completed by high school students from 2013 to 2019 that showed that the students reporting rarely or never wearing sunscreen with an SPF of 15+ increased from 10.1% to 15.5%.<sup>6</sup> These data points confirm that just because there is more information about the need for sun protection and emphasis on sunscreen use, it does not translate directly to students in grades 9-12 increasing their sun protective behaviors and further substantiates the need for additional and more specific and intentional interventions.<sup>6</sup>

In a 2018 study of 56 young women with moderate to high risk of developing skin cancer, there was an effort to determine what influenced those women to either choose sun protective behaviors or not.<sup>7</sup> Using a daily diary entry they followed these young women for a 14-day study period to determine which factors seem to have the largest influence.<sup>7</sup> The study showed that sun protection was associated with women who did so out of a habit and for prevention against burning, aging, and skin cancer.<sup>7</sup> The two most prevalent reasons for not using sun protection included the belief that it was not needed and that the women were unprepared.<sup>7</sup> While this study was performed over a short period of time, they did note that there was an increase in self-reported sun protection which may speak to how accountability may increase preparedness which increases sun protective behaviors.<sup>7</sup> Another cross-sectional study that enrolled 31,162 US adults to determine the factors associated with increased incidence of sunburn and what the prevalence of sunburn and use of sun protective measures are.<sup>8</sup> One of the highest contributing factors to higher prevalence of sunburn is younger age.<sup>8</sup> There was also an increase prevalence in non-Hispanic white individuals and in those who use sunless tanning, have increased outdoor aerobic activity, and binge drinking.<sup>8</sup> They found that among those who do use sun protective measures, sun avoidance was more effective in reducing sunburn than sunscreen use alone.<sup>8</sup> These studies highlight the importance of developing healthy habits of sun protection, ensuring that students have an understanding of how important it is for prevention of sunburns, aging, and skin cancer, as well as focusing on finding ways to encourage students to be prepared to protect their skin.<sup>7,8</sup> These studies also once again show the importance of trying to intervene in young adults lives and habits as they are more likely to get sunburned due to their age alone, but also many high school students are engaging in outdoor aerobic activity which also increases their risk of sunburn due to increased sun exposure.<sup>7,8</sup>

With all the above studies and data, the need for tailored intervention to high school students seems more pertinent and necessary than ever. However, traditional methods of disseminating information have not been successful in preventing high school students from still continuing to report sunburn and not diligently practice sun protective behaviors. The United States Preventive Services Task Force outlines the most current recommendations regarding counseling patients on sun exposure which focuses on minimizing patient exposure to UV radiation by avoiding sun exposure between the hours of 10 AM and 4 PM and wearing hats, sunglasses, and sun-protective clothing.<sup>9</sup> The recommendation for sun protection counseling is highest for people under the age of 24 in part because many people accumulate lots of sun damage as a younger adult.<sup>9</sup> In a journal article by Li H et al., a literature review from Medline, highlighted that best protection is use of physical barriers and sun avoidance, but also highlighted the need for broad-spectrum SPF of 15+ as well as lip protection.<sup>10</sup> Both of these source also highly discourage people from using indoor tanning bed as use even once has been shown to increase the risk for melanoma skin cancer by up to 60%.<sup>1,9,10</sup> Current FDA sunscreen guidelines highlight necessities for adequate sunscreen use.<sup>11</sup> These recommendations note that an adult or child needs at least one full ounce of sunscreen to cover their entire body from head to toe and discussed the need to reapply at least every 2 hours and more frequently when swimming or sweating since no sunscreen is fully waterproof.<sup>11</sup> When storing sunscreen, they discuss the need to avoid leaving sunscreen containers in the direct sunlight and excessive heat to ensure the sunscreen retains the full efficacy.<sup>11</sup>

As it is evident that the way that sun protective information has been provided to young adults has not been effective, there have been studies attempting to measure response and effect of interventions in young adults. In a feasibility wait-list controlled trial performed in the UK

with 487 students aged 13-15 years old, the effect of preventative interventions of sun exposure was evaluated.<sup>12</sup> 385 students from 5 different schools were in the intervention groups and attended a presentation, action planning, and received SMS messages and measured results spanning a school holiday.<sup>12</sup> While they did find a slight decrease in sunburn occurrence, there was not a significant increase in sunscreen use or in sun avoidance behaviors.<sup>12</sup> Data collected did reveal that the students in the intervention groups responded best to the story of a young adult skin cancer survivor who talked about his treatment and diagnosis which they thought made his message more powerful and the students reported being more likely to change their behavior because they heard his testimony.<sup>12</sup> They also noted that students did like receiving follow up texts, especially when they were funny, but did not note that they were not as inclined to change their behavior with this facet of the intervention.<sup>12</sup> While this study was performed in the UK and was done with a small number of students, it does emphasize the importance of having the information relate directly to students' lives in order to get buy-in and incite real behavioral change.<sup>12</sup>

Another study which focused on even younger children in kindergarten through 8<sup>th</sup> grade examined different interventions to promote sun-protective behaviors and discusses the efficacy of the interventions used.<sup>13</sup> The interventions included lesion monitoring and role-playing but also increasing availability of sun-protective items and shade structures.<sup>13</sup> After intervention they report an increase in use of sunscreen, hats, use of protective clothing, use of shade, and use of sunglasses.<sup>13</sup> They also report fewer new nevi, decreased sunburn incidence, and decreased UV exposure as measure by changes in skin pigmentation.<sup>13</sup> While this study was performed in younger students, it reveals a key foundational piece of interventions that really equate to change.<sup>13</sup> The institution providing increased sun-protective item availability including sunscreen

and hats as well as installing increased shade structures was instrumental in allowing for change.<sup>13</sup> This study in conjunction with the study performed by Auerbach et al., reinforces that ill-preparedness significantly contributes to people not using sun protective measures.<sup>7,13</sup> This study also highlights the necessity of increased availability of shade structures. While sun protection is vital, sun avoidance is preferred and increased structures providing shade was shown to help reduce UV radiation and exposure.<sup>13</sup> While increasing the shade available is not always feasible with permanent structures, there are many options and opportunities to increase available shade with temporary structures including large beach umbrellas and pop up canopies or E-Z UP instant shelters. This intervention seems particularly pertinent for high school students participating in outdoor sports; if there was sunscreen available or if there were more opportunities for shade seeking even during water breaks or throughout practice, this may help reduce the number of sunburns received.

Another cluster-randomized clinical trial followed 1573 Brazilian students in 52 different school classes grades 9-12 to determine the effect of a single intervention presentation 3 and 6 months later.<sup>14</sup> The intervention included using the phone application Sunface to alter students' selfies to show how UV will affect their future faces and were shown in front of the class.<sup>14</sup> This is used to show students the effects of UV radiation including skin cancer, but also with a focus on photoaging.<sup>4,14</sup> The study found that even at 6 months there was still a significant increase in daily sunscreen use and decrease in tanning bed use; daily sunscreen use increased in the experimental group from 15% or 110 out of 734 to 25.1% of students and use of indoor tanning decreased from 18.8% to 15.2% of students at 6 months while there was no significant change in the control group.<sup>14</sup> They did also note that this intervention<sup>14</sup> was more effective for female students than it was more male students with a number to treat was as low as 8 for the female

students and 31 for the male students.<sup>14</sup> This was a reminder that they are multiple different angles of consequences to discuss with students and this is just another way to encourage students to be proactive about their sun protection. While the main reason sun protection is so important from a medical standpoint is to avoid the development of skin cancer, this study shows that we often, as patients, have a variety of priorities. If we can achieve more buy-in with discussion surrounding the avoidance of photoaging, since that will also necessitate sun protective behaviors, then it seems like such an important piece to incorporate into intervention tactics when addressing young adults.

For my intervention in particular, I will be creating an interactive presentation for health students at Jesuit High School who are between 14-18 years old. Incorporating all of the statistics discussed above about types of intervention, I really want to emphasize and focus on making the education relevant and personal for these high school students. While I will be unable to have an actual adolescent melanoma survivor come speak to the students, I will instead show these students a video of a survivor sharing their story and how they wished they knew to protect their skin before they were diagnosed. In order to keep the presentation engaging, I will create a quiz with prizes that students will be able to engage in electronically alone or in pairs as, according to the teacher, that should allow everyone to have access to a phone or other device. This will also allow me to discuss the education points regarding sun avoidance and sun protected behaviors that are essential to helping these high school students avoid developing skin cancer in the future including proper application and reapplication of sunscreen and avoiding tanning beds. I also have downloaded the phone application Sunface as discussed earlier which will allow me to change my face or the face of a student and share how differing levels of protection affect photoaging. With these different aspects to an intervention, I believe research shows that this will

allow me to connect personally with students and help them related to the education in a meaningful way which will hopefully be reflected in changed, more sun-protective, behaviors.

In conclusion, skin cancer rates are increasing and with the development of many skin cancers being greatly influenced by UV radiation, intervention encouraging and reiterating the importance of sun protection and avoidance is of the utmost necessity. However, previous data show that many of the traditional methods for providing education to younger adults is not effective and rates of youth not using any sun protection is increasing.<sup>6</sup> Incorporating data regarding why sun protective measures are not used with studies discussing which intervention tactics have been successful or not provides a framework from to create a hopefully better technique for future interventions. Interventions need to be personalized to the students and young adults with whom the education is being provided to. This can be done by using a phone application that shows the personal effects of UV radiation and from personal stories from young adults who experienced having and treating skin cancer.<sup>12,14</sup> In the absence of a personal testimony, stories and photos of the experience can be used to simulate that experience. This personalization of information will allow students to relate to the information and consider how this may truly impact their lives in the future. Additionally, providing information about how to be better prepared and ways to create more shade would help overcome some of the barriers preventing sun protective behaviors. Skin cancer rates are astronomically high and will remain that way without further specialized intervention into the behaviors and habits of high school students.



## Resources

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