

# SUN SMART SCHOOLS PILOT STUDY RESULTS

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## INTRODUCTION

In 2014, the U.S. Surgeon General issued a Call to Action for skin cancer prevention in response to the nearly 5 million people affected by it each year (USDHHS, 2014). The Call to Action suggests that skin cancer prevention needs to be a comprehensive community-wide effort that includes unified support from all levels of the government, community members in business, health care and education sectors, as well as individuals and families. Recommended settings for sun safe interventions include child care centers, elementary and middle schools, and outdoor recreational settings, where children can learn safe habits at an early age and carry those behaviors into adulthood (USDHHS, 2014). The 2016-2020 Nevada Comprehensive Cancer Plan includes skin cancer prevention as a goal, aiming to reduce skin cancer incidence and mortality and increase sun safety education and skin cancer awareness in Nevada (SNDPBH, 2015). To help implement this work, the Nevada Cancer Coalition (NCC) piloted the Sun Smart Schools program in 7 schools across Nevada, adding sun safety education and practices to school curriculum and activities. This report summarizes the methods and results of this pilot program.

## SKIN CANCER

Skin cancer is the most common form of cancer in the United States (CDC, 2014) and is categorized as either melanoma or non-melanoma (Howlader et al., 2015). The most common forms of skin cancer, basal cell and squamous cell carcinomas, are non-melanoma skin cancers, are highly curable, and rarely spread to other parts of the body (Howlader et al., 2015). About 5.4 million cases of basal and squamous cell carcinomas are diagnosed every year. Melanoma is the third most common form of skin cancer and, as it is more likely to spread and metastasize, causes the most deaths (CDC, 2014). Melanoma affects cells in the lower part of the epidermis called melanocytes, which produce melanin and color skin (Howlader et al., 2015). Melanoma occurs when malignant cells form in the melanocytes. Melanoma can develop anywhere on the body, but is most likely to occur on the face, neck, hands, and arms, as these areas of skin are most often exposed to ultraviolet (UV) rays through sun exposure and tanning beds (Howlader et al., 2015). People with fair complexions, light colored-eyes, red or blonde hair, a history of blistering sunburns, or having several large or many small moles are more susceptible to developing melanoma. The Surveillance, Epidemiology, and End Results Program (SEER) estimates that 76,380 new cases of melanoma will be diagnosed, and 10,130 people will die from the disease in 2016. Overall, it is estimated that 1,034,460 people in the US are living with melanoma.

Between the years 1999-2012, a total of 4,342 cases of melanoma were reported in Nevada, with an incidence rate of 15.6 per 100,000 people. Overall, 968 deaths occurred from melanoma, with an age-adjusted death rate of 3.0 per 100,000 (CDC, 2015). Nationally for the same time frame, the age-adjusted incidence rate was reported at 18.6 per 100,000 (USDHHS, 2015), and the age-adjusted death rate was 2.7 per 100,000. So, while Nevada has a lower incidence rate, it does experience a higher death rate than the national level statistics. However, publicly available data for Nevada is limited to 1999-2010, and cancer reporting in Nevada did not meet national reporting standards in 2010 or 2012 (Lensch, 2016), so data on melanoma incidence may be inaccurate, and is likely under-reported.

## SUN SMART SCHOOLS PROGRAM

The goal of the Sun Smart Schools program is to establish healthy sun safety habits in children and teens from a young age to help prevent the incidence of skin cancer during adolescence and adulthood, as the majority of sun exposure in a person's lifetime happens before age 20 (Sun Smart Nevada, 2016).

### PARTICIPATING SCHOOLS

During the 2015-2016 school year, the Nevada Cancer Coalition launched the Sun Smart Schools pilot program in 7 schools representing 4 counties across Nevada.

**Table 1: Participating Sun Smart Schools**

School	County	Grades Participating	Total Enrollment	Expected Reach	Programs implemented
<b>South Reno United Methodist Church</b>	Washoe	Preschool	27	27	Curriculum Sunscreen Policy Clothing Policy
<b>Elizabeth Lenz Elementary School</b>	Washoe	1, 2, 4	462	125	Curriculum Sunscreen Policy Clothing Policy
<b>Gardnerville Elementary School</b>	Douglas	1, 2, 3, 4, 5	461	500	Curriculum Sunscreen Policy Clothing Policy
<b>Lucille S. Rogers Elementary School</b>	Clark	4 & 5	782	740	Curriculum Sunscreen Policy
<b>St. Viator Catholic School</b>	Clark	4, 5, 6, 7, 8	580	400	Curriculum
<b>Hyde Park Middle School</b>	Clark	6, 7, 8	1601	500	Curriculum Sunscreen Policy
<b>Spring Creek High School</b>	Elko	9, 10, 11, 12	864	215	Curriculum Sunscreen Policy

For preschool children, teachers used lessons from MD Anderson and the Coordinated Approach to Child Health (CATCH)'s program for preschool aged children called Ray and the Sunbeatables™. This program provides connections between health education, the school environment, family, and community involvement to support youth in a healthy lifestyle. For elementary school children, Sun Smart Schools uses the free, evidence-based Environmental Protection Agency (EPA) SunWise curriculum designed to facilitate cross-curricular learning about sun safety, UV radiation, and ozone science for K-2<sup>nd</sup> and 3<sup>rd</sup>-5<sup>th</sup> grades. This is the most widely used curriculum for sun safety and has demonstrated success in raising awareness and changing behaviors (Nevada Cancer Coalition, 2016). For middle and high school aged children, Sun Smart Schools uses the Skin Cancer Foundation's free educational program called Sun Smart U. This program includes interactive lesson plans, handouts, and activities, and is consistent with the CDC's National Health Education Standards.

Additionally, the Sun Smart Schools program encouraged all schools to adopt written policy regarding sun safety. Ideally, this policy would make sunscreen available for students to use and apply in schools

and classrooms through installation of public sunscreen pumps around the campus. Policy that promoted the use of sun protective clothing, hats, and sunglasses in school dress codes and uniforms was also recommended.

## SCHOOL ASSESSMENTS AND IMPLEMENTED INTERVENTIONS

For the 2015-2016 school year, school policy assessments were completed by the Nevada Cancer Coalition in the fall of 2015, and sun-safe action plans were developed for each school. These are detailed below for each school.

### **South Reno United Methodist Church (SRUMC) Preschool**

Assessment: The school day runs from 9:00 am – 1:00 pm Monday through Friday, so students do not spend much time outside during peak sun hours, although some improvement can be made for sun safety at school. The school currently doesn't have sun safety policies or curriculum in use. They are interested in increasing shade outside through trees or shade structures. They do not apply sunscreen to students while at school because it takes too long and students end up missing most of their recess time when the teachers do this. They do have sunscreen in the classroom, though, in case a parent forgets to apply it.

Actions:

- Parents will be asked to apply sunscreen to students before they come to school each day.
- Students will be allowed to wear hats and sunglasses while outside during the school day. Teachers will use lessons from MD Anderson and the Coordinated Approach to Child Health (CATCH)'s new program for preschoolers, Ray and the Sunbeatables™.

### **Elizabeth Lenz Elementary School**

Assessment: The school currently does not have any official sun safety policies. The principal does not want students to apply sunscreen during the school day because of allergy and safety concerns (such as a student getting sunscreen in their eyes). Students are allowed to wear hats and sunglasses on the playground. There are a few shade structures and trees on the playground, although shade could be improved. There is currently no sun safety curriculum being used.

Actions:

- 1st, 2nd, and 4th grades will fully participate in Sun Smart Schools.
- Parents will be asked to apply sunscreen to students before they come to school each day.
- The 4th grade marathon club, which meets Fridays after school, will apply sunscreen before they run, and students will be encouraged to wear hats and sunglasses while running.
- The school will announce the UV index as part of morning announcements so students and teachers will know when to take extra sun safety precautions.
- Participating grades will implement lessons from the EPA's SunWise program into their curriculum.

- Guest speakers will be arranged by NCC throughout the school year to visit individual classes and teach students about multiple aspects of sun safety.

### **Gardnerville Elementary School**

Assessment: Gardnerville Elementary lost many of its large old shade trees when the school remodeled a few years ago and now there is very little shade for students on the playground. There is currently no official sun safety policy at the school, although the principal is open to allowing children to apply sunscreen while at school, as well as allowing them to wear hats and sunglasses on the playground. No sun safety curriculum is currently being used at the school.

#### Actions:

- Every student at the school will be given a one-ounce bottle of sunscreen at the beginning of the school year, which they will be allowed to apply to themselves before they go outside.
- A refill gallon-sized sunscreen pump will be available in the office, where students can refill their individual sunscreen bottles.
- Students will be allowed to wear hats and sunglasses while outside during the school day.
- Various grade levels will implement lessons from the EPA's SunWise program into their curriculum.
- Guest speakers will be arranged by NCC throughout the school year to present assembly-style to multiple classes.

### **Rogers Elementary School**

Assessment: The school does not currently have any sun safety policies in place or curriculum in use. There are shade structures over playground equipment to prevent students from burning themselves on the equipment during hotter months, but the field is an open grassy area without shade. The school would like to plant trees to improve shade access on the field. Clark County School District Regulation for Dress and Appearance (R-5131) prohibits students from wearing any sort of "headgear" on school property, including hats and sunglasses. The school is open to having students apply sunscreen while at school.

#### Actions:

- The PE teacher is spearheading the program here, incorporating sun safety as part of physical health and education.
- Every student at the school will be given a one-ounce bottle of sunscreen at the beginning of the school year, which they will be allowed to apply to themselves before they go outside.
- Two refill gallon-sized pumps will be available in the office, where students can refill their individual sunscreen bottles.
- The PE teacher and any other interested teachers will implement lessons from the EPA's SunWise program into their curriculum.
- Guest speakers will be arranged by NCC throughout the school year to present to PE classes at the school.

### **St. Viator Parish School**

Assessment: The school does not currently have any sun safety policies in place or curriculum in use. There is a column in the monthly parent newsletter called the Nurse's Corner where health tips are posted. Sun safety could be incorporated here. The principal does not want to let students wear hats and sunglasses outside for the following reason: "Hats or sunglasses pose an issue on the field. Students would have to carry them to the lunchroom, then outside, and back into the classroom, adding lots of room for loss or breakage as 185 students are at three different recesses." The principal is also worried about having students apply sunscreen at school because of allergies and skin sensitivities. Faculty has solar umbrellas for morning and afternoon drop off and recess. There are sunshades on the field playground equipment and picnic areas. Exposure is 15 minutes at recess and the younger grades have an added recess in the morning as well.

Actions:

- Science and PE teachers will implement lessons from the EPA's SunWise Program and the Skin Cancer Foundation's Sun Smart U into their curriculum.
- Sun Safety tips and suggestions for parents will be added to the Nurse's Corner – a health-centered article in the school's monthly online parent newsletter.
- The UV index will be announced as part of the daily afternoon weather announcements so students and teachers will know when to take extra sun safety precautions.
- Guest speakers will be arranged by NCC throughout the school year to present to science and PE classes at the school.

**Hyde Park Academy of Science and Math**

Assessment: The school does not currently have any sun safety policies in place or curriculum in use. The principal is interested in using curriculum from SunWise and Sun Smart U. The principal is also interested in providing sunscreen for students to use at school before PE and other outdoor activities. There is little shade available on the track and field outside, so that could be improved. Clark County School District Regulation for Dress and Appearance (R-5131) prohibits students from wearing any sort of "headgear" on school property, including hats and sunglasses.

Actions:

- Parents will be asked to have their students apply sunscreen every morning before coming to school.
- Students will be given individual one-ounce bottles of sunscreen that they can apply before going outside.
- Interested teachers will implement lessons from the EPA's SunWise Program and the Skin Cancer Foundation's Sun Smart U into their curriculum.
- Guest speakers will be arranged by NCC throughout the school year to present to classes at the school.

**Spring Creek High School**

Assessment: The school does not currently have sun safety policies in place or curriculum in use. The principal was only interested in implementing curriculum in the 10th grade health class, which all 10th

graders are required to take. The school would like to have speakers accompany the Sun Smart U curriculum. The principal is okay with making sunscreen available in the health class for students to apply as they want.

Actions:

- Sun Smart Schools will be implemented in all 10th grade health classes.
- All 10th grade students will be given an individual one-ounce sized sunscreen that they can apply before going outside.
- A refill gallon-sized sunscreen pump will be located in the health classroom where students can access it before going outside or to refill their sunscreen bottles.
- The health teacher will implement lessons from the Skin Cancer Foundation’s Sun Smart U into her curriculum
- Guest speakers will be arranged by NCC throughout the school year to present to health classes.

**STUDY POPULATION**

The Nevada Cancer Coalition estimates that 2,500 students were reached through the pilot program, and through convenience sampling, a subset of these children and their parents completed a pre-intervention survey in the fall of 2015, and another subset completed a post-intervention survey in May 2016. The surveys were developed for students in 4<sup>th</sup> grade and above, however children in 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> grade responded to the post-intervention survey. These responses were excluded from the analysis, as detailed in Figure 1. The number of responses by grade at each school are tabulated below in Tables 2 and 3 for the student surveys and parent surveys, respectively.

**Table 2: Student Population**

School	Survey	Student Survey: Student’s Grade in School (n)													UKN	Total
		1	2	3	4	5	6	7	8	9	10	11	12			
Gardnerville Elementary	Pre			1	65	63									1	130
	Post	37	53	57											6	153
Hyde Park Middle	Pre						51	103	199						2	354
	Post						1	13	95						5	114
Lenz Elementary	Pre				24											24
	Post	20	16		27										5	68
St. Viator Middle	Pre				26		11		23						1	61
	Post				53	62	58	58	50						15	296
Rogers Elementary	Pre				125	121									6	252
	Post															0
Spring Creek High	Pre										88					88
	Post									3	102	5	8	9		128



Sun Smart Schools Pilot Study

Table 3: Parent Population

School	Survey	Parent Survey: Their Child's Grade in School (n)														Total
		PK/K	1	2	3	4	5	6	7	8	9	10	11	12	UKN	
Gardnerville Elementary	Pre	26	9	20	14	22	37								5	133
	Post	3	25	34	27		59			1					6	155
Hyde Park Middle	Pre							20	44	75					27	166
	Post							3	11	59					6	77
Lenz Elementary	Pre		11	13		28									4	56
	Post		12	4		25									4	45
St. Viator Middle	Pre				1	13	24	11	21	12					104	
	Post						44	6	15	32					102	
Spring Creek High	Pre											63				63
	Post										1	66	1	2	2	72
SRUMC Preschool	Pre	20														20
	Post	16														16

Children at Rogers Elementary school were given the Parent Survey instead of the Elementary Survey, so the children answered two additional questions that were disregarded in the analysis.

Each school participating in the Sun Smart Schools pilot program was provided with enough student and parent surveys for all participants of the program and facilitators were instructed to give surveys to students and their parents in the fall of 2015 and again in May 2016. The survey questions were identical at both time points in order to assess increased knowledge gain, and behavioral and attitudinal changes. A total of 910 students and 542 parents responded to the pre-intervention survey. A total of 758 students and 467 parents responded to the post-intervention survey. The only respondent identifier was the child's grade, so pre- and post-intervention surveys were not able to be linked to the same student. Additionally, as evident in Table 2 when looking at respondents by grade, it is clear that many respondents to the pre-intervention survey did not respond to the post-intervention survey. Due to this, only differences in overall score changes by age group were able to be assessed.

Responses were analyzed separately for 4<sup>th</sup> and 5<sup>th</sup> graders, 6<sup>th</sup>, 7<sup>th</sup>, and 8<sup>th</sup> graders, 10<sup>th</sup> graders, and parents, as these were the intended age groups of the surveys and results for other grades had insufficient responses for analysis. Inclusions, exclusions, and final study population for each age group are shown in Figures 1-4 below.

Sun Smart Schools Pilot Study

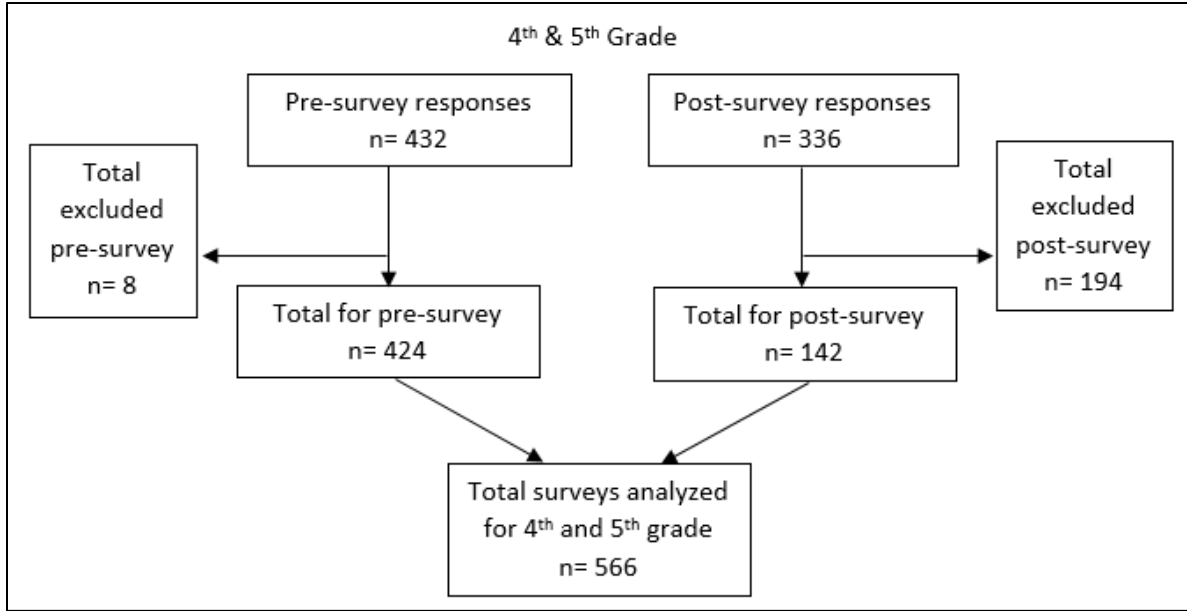


Figure 1: Elementary School Survey Population

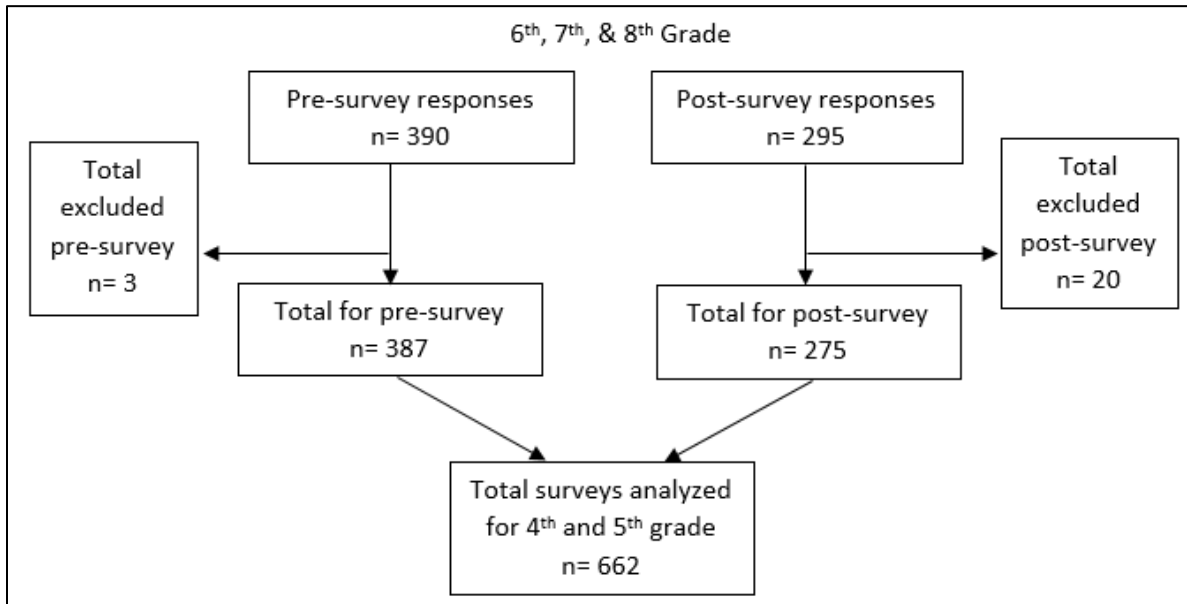


Figure 2: Middle School Survey Population

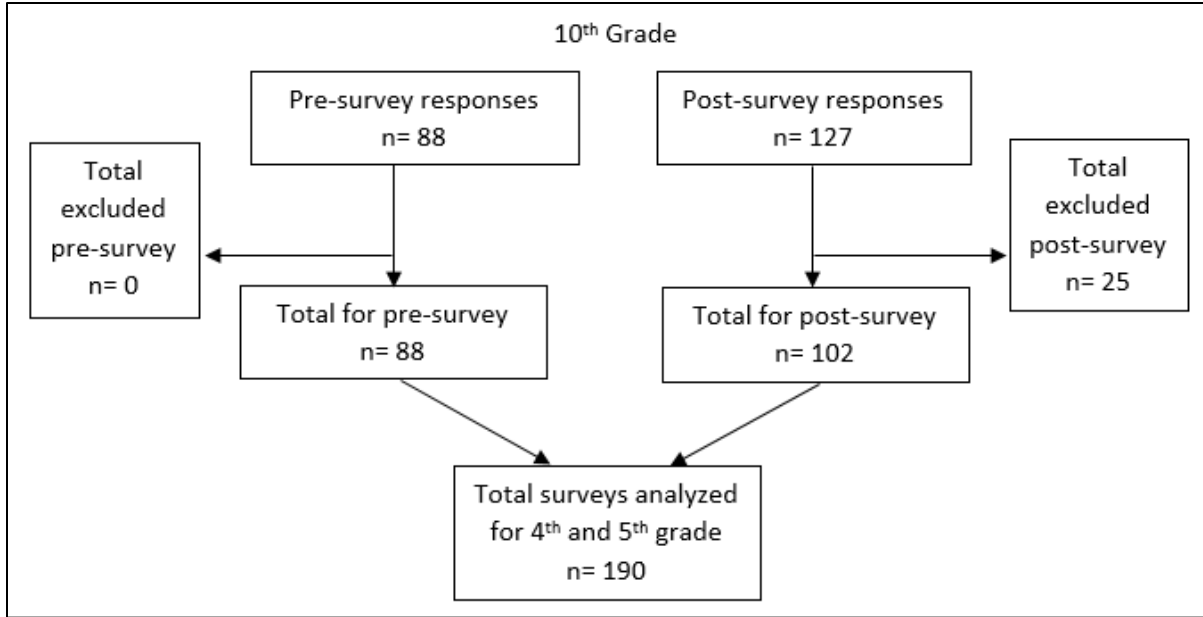


Figure 3: High School Survey Population

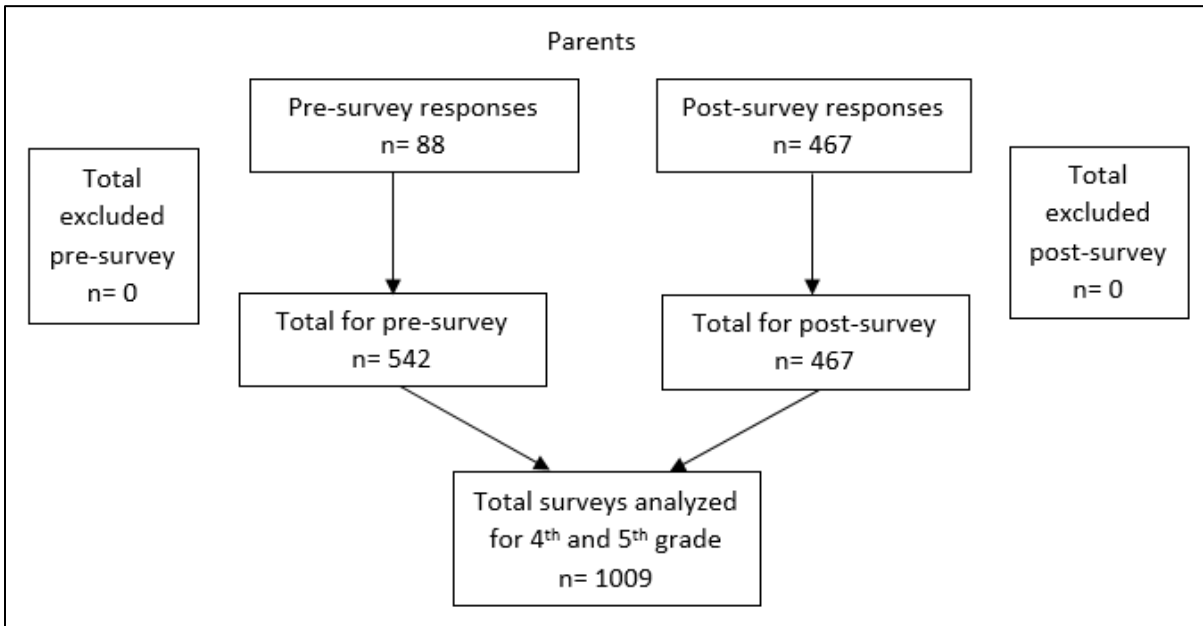


Figure 4: Parent Survey Population

**METHODS**

Results from the pre-intervention surveys were manually entered into SPSS and exported into Excel. Results from the post-intervention surveys were manually entered into Excel. Responses were combined for analysis using SAS 9.4 software.

Results for the student surveys were weighted by dividing the total number of children enrolled in each grade at each school by the number of responses for that grade, providing a representative response

distribution for each grade at each school. Total enrollment for each grade was determined by either contacting each school administration directly (Lenz Elementary School, St. Viator Parish School, and Spring Creek High School), or using the 2015-2016 total enrollment count provided by the Nevada State Department of Education (SNDOE, 2015). Parent surveys were weighted by dividing the total number of students enrolled at each school by the number of parent responses for each school. These weighted responses were used to calculate overall percentages of change among question responses and t-tests and chi-square testing was done to determine if results were statistically significant, meaning the result was not likely to occur randomly and was likely attributable to a specific cause. A 95% confidence level ( $p$ -value < 0.05) was used to interpret the statistical significance of each result and all significant values are bolded in the tables below.

The t-test was used to evaluate Likert-scale questions only (questions 1-3 of elementary/middle school survey and questions 1-2 of parent and high school surveys). This test used the equivalent Likert-scale number (1-5, where 5 was “Most of the time” or “Very important”, 2 was “Never” or “Not important at all”, and 1 was for miscoded or non-responses) to compare sample means of each question from pre- to post- intervention to determine if there was a statistically significant increase or decrease between response means.

The chi-square test was conducted to assess the relationship between pre- and post- survey responses for each survey question and evaluate the statistical significance of the magnitude of difference. Survey questions with a Likert-scale responses were grouped together so “Most of the time” and “Sometimes” equated to a positive response and “Rarely” and “Never” equated to a negative response.

All analysis was conducted using SAS 9.4 software. Surveys are attached in Appendix 1.

**RESULTS**

Tables 4-15: Tabulated Results by Survey Question

**Do you put sunscreen on when you go outside for a long time?**

Survey Group	Pre-Survey (%)	Post-Survey (%)	Change in “Yes” from pre- to post-survey (%)	Pr > ChiSquare	t-test difference of means	Pr >  t
<b>4<sup>th</sup> &amp; 5<sup>th</sup> grade</b>	Yes: 79.64 No: 20.36	Yes: 87.65 No: 12.35	<b>+8.01</b>	<b>0.0474</b>	+0.1341	0.1816
<b>6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup> grade</b>	Yes: 63.35 No: 36.65	Yes: 61.73 No: 38.27	-1.62	0.8066	-0.0074	0.9230
<b>10<sup>th</sup> grade</b>	Yes: 49.43 No: 50.57	Yes: 64.29 No: 35.71	<b>+14.86</b>	<b>0.0414</b>	<b>+0.3576</b>	<b>0.0095</b>
<b>Parents</b>	Yes: 76.76 No: 23.24	Yes: 79.44 No: 20.56	+2.68	0.4211	+0.0726	0.2488

Note: “Yes”= “Always” or “Sometimes”; “No”= “Rarely” or “Never”

Does your family put sunscreen on when they go outside for a long time? Note: Children at Rogers Elementary did not answer this question and were excluded from analysis of this question.

Survey Group	Pre-Survey (%)	Post-Survey (%)	Change in "Yes" from pre- to post-survey (%)	Pr > ChiSquare	t-test difference of means	Pr >  t
4 <sup>th</sup> & 5 <sup>th</sup> grade	Yes: 81.46 No: 18.54	Yes: 87.59 No: 12.41	+6.13	0.1580	+0.1002	0.2976
6 <sup>th</sup> , 7 <sup>th</sup> , 8 <sup>th</sup> grade	Yes: 71.73 No: 28.27	Yes: 69.46 No: 30.54	-2.27	0.7262	-0.1128	0.1296

Note: "Yes"= "Always" or "Sometimes"; "No"= "Rarely" or "Never"

What do you think about protecting yourself from the sun?

Survey Group	Pre-Survey (%)	Post-Survey (%)	Change in "Yes" from pre- to post-survey (%)	Pr > ChiSquare	t-test difference of means	Pr >  t
4 <sup>th</sup> & 5 <sup>th</sup> grade	Yes: 87.07 No: 12.93	Yes: 90.66 No: 9.34	+3.59	0.3731	-0.0828	0.3558
6 <sup>th</sup> , 7 <sup>th</sup> , 8 <sup>th</sup> grade	Yes: 75.58 No: 24.42	Yes: 72.61 No: 27.39	-2.97	0.6210	-0.0732	0.2496
10 <sup>th</sup> grade	Yes: 65.52 No: 34.48	Yes: 66.33 No: 33.67	+0.81	0.9077	+0.1963	0.0939
Parents	Yes: 89.25 No: 10.75	Yes: 83.14 No: 16.53	<b>-6.11</b>	<b>0.0259</b>	-0.0260	0.6146

Note: "Yes"= "Very important" or "important"; "No"= "Kind of important" or "Not important at all"

When you are outside in the middle of the day, do you wear a hat?

Survey Group	Pre-Survey		Post-Survey		Change in "Yes" from pre- to post-survey (%)	Pr > ChiSquare
	Yes (%)	No (%)	Yes (%)	No (%)		
4 <sup>th</sup> & 5 <sup>th</sup> grade	42.05	57.95	49.24	50.76	+7.19	0.2429
6 <sup>th</sup> , 7 <sup>th</sup> , 8 <sup>th</sup> grade	30.14	69.86	49.17	50.83	<b>+19.03</b>	<b>0.0030</b>
10 <sup>th</sup> grade	44.83	55.17	58.16	41.84	+13.33	0.0700
Parents	48.71	51.29	54.35	45.65	+5.64	0.1382

When you are outside in the middle of the day, do you wear sunglasses?

Survey Group	Pre-Survey		Post-Survey		Change in "Yes" from pre- to post-survey (%)	Pr > ChiSquare
	Yes (%)	No (%)	Yes (%)	No (%)		
4 <sup>th</sup> & 5 <sup>th</sup> grade	33.79	66.21	52.29	47.71	<b>+18.5</b>	<b>0.0027</b>
6 <sup>th</sup> , 7 <sup>th</sup> , 8 <sup>th</sup> grade	36.90	63.10	39.21	60.78	+2.31	0.7226
10 <sup>th</sup> grade	45.98	54.02	55.10	44.90	+9.12	0.2153
Parents	67.46	32.54	71.31	28.69	+3.85	0.2788

When you are outside in the middle of the day, do you wear a long sleeve shirt?

Survey Group	Pre-Survey		Post-Survey		Change in "Yes" from pre- to post-survey (%)	Pr > ChiSquare
	Yes (%)	No (%)	Yes (%)	No (%)		
4 <sup>th</sup> & 5 <sup>th</sup> grade	6.82	93.18	8.52	91.48	+1.7	0.6547
6 <sup>th</sup> , 7 <sup>th</sup> , 8 <sup>th</sup> grade	14.87	85.13	44.44	55.56	<b>+29.57</b>	<b>&lt;0.0001</b>
10 <sup>th</sup> grade	5.75	94.25	8.16	91.84	+2.41	0.5211
Parents	14.71	85.29	25.57	74.43	<b>+10.86</b>	<b>0.0005</b>

**When you are outside in the middle of the day, do you stay in the shade most of the time?**

Survey Group	Pre-Survey		Post-Survey		Change in "Yes" from pre- to post-survey (%)	Pr > ChiSquare
	Yes (%)	No (%)	Yes (%)	No (%)		
4 <sup>th</sup> & 5 <sup>th</sup> grade	51.19	48.81	54.98	45.02	+3.79	0.5439
6 <sup>th</sup> , 7 <sup>th</sup> , 8 <sup>th</sup> grade	71.86	28.14	65.93	34.07	-5.93	0.3642
10 <sup>th</sup> grade	49.43	50.57	38.76	61.22	-10.67	0.1451
Parents	57.77	42.23	54.63	45.37	-3.14	0.4088

**Can you get a sunburn on a cloudy day?**

Survey Group	Pre-Survey			Post-Survey			Pr > ChiSquare
	Yes (%)	No (%)	Don't know (%)	Yes (%)	No (%)	Don't know (%)	
4 <sup>th</sup> & 5 <sup>th</sup> grade	32.67	40.98	26.36	42.81	37.70	19.49	0.1969
6 <sup>th</sup> , 7 <sup>th</sup> , 8 <sup>th</sup> grade	36.53	41.58	21.90	56.60	33.94	9.46	<b>0.011</b>
10 <sup>th</sup> grade	86.21	6.90	6.90	77.55	6.12	16.33	0.1374
Parents	74.24	15.78	9.98	68.80	14.70	16.50	0.0553

Note: Responses with a significant p-value indicate a statistically significant change between all three response variables from pre- to post-intervention surveys, and not necessarily a significant change in correct answers.

**Do you think you and your friends look better with a suntan?**

Survey Group	Pre-Survey			Post-Survey			Pr > ChiSquare
	Yes (%)	No (%)	Don't know (%)	Yes (%)	No (%)	Don't know (%)	
4 <sup>th</sup> & 5 <sup>th</sup> grade	24.01	38.70	37.29	17.81	50.93	31.26	0.1265
6 <sup>th</sup> , 7 <sup>th</sup> , 8 <sup>th</sup> grade	19.03	47.88	33.09	11.90	61.77	26.33	<b>0.0305</b>
10 <sup>th</sup> grade	57.47	16.09	26.44	60.20	18.37	21.43	0.7118
Parents	27.72	44.39	27.88	34.63	35.91	29.46	0.0548

Note: Responses with a significant p-value indicate a statistically significant change between all three response variables from pre- to post-intervention surveys, and not necessarily a significant change in correct answers.

**Do you think spending a lot of time in the sun is healthy?**

Survey Group	Pre-Survey			Post-Survey			Pr > ChiSquare
	Yes (%)	No (%)	Don't know (%)	Yes (%)	No (%)	Don't know (%)	
4 <sup>th</sup> & 5 <sup>th</sup> grade	18.26	64.30	17.44	18.36	67.32	14.31	0.7621
6 <sup>th</sup> , 7 <sup>th</sup> , 8 <sup>th</sup> grade	20.97	60.87	18.16	20.36	57.56	22.08	0.7602
10 <sup>th</sup> grade	28.74	62.07	9.20	29.59	51.02	19.39	0.1149
Parents	14.49	77.15	8.36	16.91	68.75	14.33	<b>0.0254</b>

Note: Responses with a significant p-value indicate a statistically significant change between all three response variables from pre- to post-intervention surveys, and not necessarily a significant change in correct answers.

**Do you think spending a lot of time in the sun in childhood can lead to skin cancer when you're older?**

Survey Group	Pre-Survey			Post-Survey			Pr > ChiSquare
	Yes (%)	No (%)	Don't know (%)	Yes (%)	No (%)	Don't know (%)	
<b>10<sup>th</sup> grade</b>	77.01	10.34	12.64	81.63	9.18	9.18	0.7058
<b>Parents</b>	73.93	9.22	16.85	60.93	10.61	28.46	<b>0.0009</b>

Note: Responses with a significant p-value indicate a statistically significant change between all three response variables from pre- to post-intervention surveys, and not necessarily a significant change in correct answers.

**Have you ever used an indoor tanning bed?**

Survey Group	Pre-Survey		Post-Survey		Change in "Yes" from pre- to post-survey (%)	Pr > ChiSquare
	Yes (%)	No (%)	Yes (%)	No (%)		
<b>10<sup>th</sup> grade</b>	5.75	94.25	8.16	91.84	+2.41	0.5211
<b>Parents</b>	20.22	79.78	24.79	75.21	+4.57	0.1312

**Do you think a base tan helps protect your skin from sun damage?**

Survey Group	Pre-Survey			Post-Survey			Pr > ChiSquare
	Yes (%)	No (%)	Don't know (%)	Yes (%)	No (%)	Don't know (%)	
<b>10<sup>th</sup> grade</b>	32.18	26.44	41.38	29.59	35.71	34.69	0.3831
<b>Parents</b>	13.99	51.04	34.97	15.49	50.86	33.65	0.8442

Note: Responses with a significant p-value indicate a statistically significant change between all three response variables from pre- to post-intervention surveys, and not necessarily a significant change in correct answers.

**DISCUSSION**

**FOURTH AND FIFTH GRADE RESULTS**

Overall, the 4<sup>th</sup> and 5<sup>th</sup> graders expressed an increase in importance from pre- to post-intervention when asked about sun safety practice. This group showed a statistically significant increase of 8.01% ( $p < 0.05$ ) from pre- to post-intervention of those reporting they always or sometimes wear sunscreen when going outside for a long time. Additionally, there was a statistically significant increase of 18.5% ( $p < 0.05$ ) of fourth and fifth graders who reported wearing sunglasses post-intervention.

Most other results suggest positive attitude and behavioral change but were not statistically significant. There was an increase in the percentage of children who reported using hats (7.19%), long sleeve shirts (1.7%), and seeking shade when outside (3.79%). Overall, there was a slight 3.59% increase in the percentage of children reporting that protecting themselves from the sun was very important or important. Additionally, there was a 12.23% increase in children reporting that they felt they and their friends did not look better with a suntan.

The elementary aged students were asked one knowledge based question: Can you get a sunburn on a cloudy day? There was a 10.14% increase in "Yes" responses from pre- to post- intervention, and a

decrease of 6.87% “I don’t know” responses. This positive knowledge change, increase in sun safe behaviors such as sunscreen use, hat, sunglasses, and shade seeking, and attitude change about sun tanning suggest fourth and fifth graders are receptive to the curriculum and policy changes presented in the Sun Smart Schools program, and this program can provide a positive influence to change their behaviors and attitudes about sun safety.

#### SIXTH, SEVENTH, AND EIGHTH GRADE RESULTS

Middle schoolers (6<sup>th</sup>, 7<sup>th</sup>, and 8<sup>th</sup> grades) expressed an overall decrease in importance from pre- to post-intervention when asked about sun safety practice. This group showed a non-statistically significant decrease of 1.62% reporting they always or sometimes wore sunscreen, a 5.39% decrease in those reporting they seek shade when outside in the middle of the day, and a 2.97% decrease in importance of protecting themselves from the sun. However, middle schoolers showed a statistically significant increase of 19.03% ( $p < 0.05$ ) in those who reported wearing a hat and a 29.57% ( $p < 0.0001$ ) increase in those who reported wearing a long sleeve shirt when outside in the middle of the day. There was a non-statistically significant increase of 2.31% who reported using sunglasses when outside. Despite some negatively changed behaviors surrounding sun safety, there was a statistically significant 13.89% increase in children reporting that they felt they and their friends did not look better with a suntan.

The middle school aged students were asked one knowledge based question: Can you get a sunburn on a cloudy day? There was a statistically significant increase of 20.07% in “Yes” responses from pre- to post- intervention, and a decrease of 12.44% “I don’t know” responses. Similarly to the elementary aged students, this positive knowledge change, increase in hat and long sleeve shirt use, and attitude change about sun tanning suggest middle school aged children are receptive to some areas of the sun safety curriculum presented in the Sun Smart Schools program, but more focus may be needed on addressing the importance and improving practice of sun-safety behaviors.

#### 10<sup>TH</sup> GRADE RESULTS

The 10<sup>th</sup> graders who participated in the Sun Smart program showed an overall increase in practicing sun-safety behaviors. There was a statistically significant 14.86% ( $p < 0.05$ ) increase in sunscreen use when outside for a long time from pre- to post- intervention, and non-statistically significant increases in hat use (13.33%), sunglasses use (9.12%), and long sleeve shirt use (2.41%) when outside in the middle of the day.

In terms of sun tanning, there was a non-statistically significant increase of 2.73% of 10<sup>th</sup> graders who felt they and their friends looked better with a tan, and an increase of 2.41% of respondents who reported ever using a tanning bed. Additionally, there was a 10.67% decrease in respondents who reported seeking shade when outside in the middle of the day. Despite this, attitudes surrounding the importance of protecting themselves from the sun did not change dramatically from pre- to post-intervention, with only a 0.81% increase in respondents saying it was very important or important.

The high school aged students were asked three knowledge based questions. Responses to the question “Can you get a sunburn on a cloudy day?” were surprising, as 86.21% of pre-intervention respondents



said “Yes”, however this decreased to 77.55% in the post-survey, and responses of “I don’t know” increased by 9.43% from pre- to post-surveys, though results were not statistically significant. The second knowledge based question asked if they think spending a lot of time in the sun in childhood can lead to skin cancer when they are older. There was a non-statistically significant increase in “Yes” responses by 4.62% and a slight decrease in both “No” and “I don’t know” responses. Lastly, students were asked if they thought a base tan helps protect their skin from sun damage. There was a non-statistically significant increase of 9.27% in correct “No” responses in the post-intervention survey, and a decrease of 6.69% “I don’t know” responses.

While there was an increase in protecting themselves from the sun by using clothing and sunscreen barriers, high school students expressed an increased desire to have tanned skin, shown by the nearly 11% decrease in shade-seeking and increase in both tanning bed use and attitude toward having tanned skin. Based on this information, high schoolers may benefit from additional appearance-based interventions incorporated into the existing curriculum that shows the detrimental effects of sun tanning on skin over time. Results of the knowledge-based questions were also indicative that the curriculum presented may not be comprehensive enough for this age group, or was not presented in a beneficial way.

## PARENT RESULTS

Parents expressed a statistically significant decrease of 6.11% ( $p < 0.05$ ) from pre- to post- intervention when asked how important protecting themselves from the sun is. Despite this, there was a statistically significant increase of 10.86% in those who reported wearing a long sleeve shirt when outside in the middle of the day, and non-statistically significant increases in respondents who reported wearing sunscreen when outside for a long time (2.68%), wearing a hat (5.64%) and wearing sunglasses (3.85%) when outside in the middle of the day. There was a decrease in shade use of 3.14%, an increase of those reporting ever using a tanning bed (4.57%), and an increase of 6.91% who think they and their friends look better with a suntan.

The parents were asked three knowledge based questions. Responses to the question “Can you get a sunburn on a cloudy day?” showed a similar trend to the 10<sup>th</sup> graders. In the pre-survey, 74.24% of respondents said “Yes”, however this decreased to 68.80% in the post-survey, and responses of “I don’t know” increased by 6.52% from pre to post, though results were not statistically significant. The second knowledge based question asked if they think spending a lot of time in the sun in childhood can lead to skin cancer when they are older. There was a statistically significant ( $p < 0.001$ ) 13.0% decrease in “Yes” responses and 11.61% increase in “I don’t know” responses, showing a knowledge deficit among those who took the post-intervention survey. Lastly, responses to the question “Do you think a base tan helps protect your skin from sun damage?” had almost no change in response distribution from pre- to post-survey.

Similar to the student surveys, it was not possible to match pre-intervention and post-intervention surveys to the same parent, and it cannot be assumed that the same parents took both surveys. This may contribute to some of the discrepancies between pre- and post- intervention surveys, for example,

the decrease in correct answers for both of the knowledge-based questions and increase in those who reported using tanning beds between pre- and post- intervention.

Based on the available analysis, it may be beneficial to provide appearance-based information to parents through newsletters that supplement the information provided on skin cancer risks. Since parents are so influential in their children's lives, especially as they get older, ensuring that they act as positive role models who discourage tanning and promote sun-safe behaviors will be crucial to making positive changes in both their behaviors and their children's.

## CONCLUSION

There are promising results from the pilot study of Sun Smart Schools program in Nevada. All groups analyzed showed an increase in sun-protective use of hats, sunglasses, and long sleeve shirts when outside in the middle of the day, and both the elementary and high school groups showed statistically significant increases in sunscreen use when going outside for a long time. Additionally, the elementary and middle school participants showed knowledge gains from the curriculum, with an increase of over 10% of elementary students and over 20% of middle school students answering their knowledge-based question correctly in the post-intervention survey. Both elementary and middle school children also showed a sun-smart change in attitude surrounding tanning. Elementary schoolers showed a 12.23% increase, and middle schoolers showed a statistically significant increase of 13.89% of respondents reporting that they did not think they and their friends looked better with a tan.

While the interventions implemented among the elementary and middle schools seemed to impact attitude, knowledge, and behavior, the high schoolers and parents did not appear to benefit as much from the interventions. Parents showed a statistically significant decrease in attitude surrounding the importance of protecting themselves from the sun. In both groups, there was an increase in both tanning bed use and attitude that tanning made them and their friends look better. Additionally, there was a decrease in knowledge in both groups when asked if they could get a sunburn on a cloudy day, and a statistically significant decrease in knowledge among parents when asked about the correlation between sun exposure and skin cancer. This provides valuable feedback on areas of improvement within the Sun Smart Schools program, and shows that while protective behaviors may have changed among the older groups, attitudes and knowledge were not significantly impacted by the piloted interventions. Moving forward, appearance-based interventions may be more successful in changing attitudes among these populations. Additionally, added support from the Nevada Cancer Coalition to follow up with schools periodically throughout the school year to provide reminders or new educational materials may help improve the consistency and reach of the Sun Smart Schools program.

Lastly, all respondents except the elementary school students reported a decrease in shade usage when outside in the middle of the day from pre- to post- intervention. While this could be indicative of a desire to tan among older children and adults, this could also be due to a lack of shade structures available at schools during recess or around the community. Clark County has added shade structures to all elementary playgrounds in their school district (CCSD, 2012), so this may explain in part why the

elementary school children were the only group who did not report a decrease in seeking shade in the middle of the day.

There were several limitations in this study. First, in many cases, the pre- and post-intervention surveys were not given to the same students, so true pre- to post-intervention change was not able to be assessed, only overall changes among each age group. Second, the phrasing of the survey questions was unclear in several places, and this may have caused confusion on how to respond. Phrases such as “a long time” or “a lot of time” may mean different things to different people and cause responses to be biased. Lastly, there was no control group for this study, so there isn’t a true baseline of responses with which to compare the responses of those exposed to the intervention. For example, the time of year each survey was taken may have affected responses on its own, since the post-survey was taken during an unseasonably cold May in Nevada, so chances of covering up with clothing when outside during that time would have been higher than at the end of summer when the pre-intervention surveys were taken. Additionally, those children who participated in the intervention might express participation bias since they have an understanding of the program, and be more apt to select the answer they believe their teacher wanted them to select.

Overall, the results of this pilot study are positive and consistent with existing research. The Centers for Disease Control and Prevention have developed research-based recommendations for interventions in skin cancer prevention (CDC, 2014). They found that education and policy approaches in primary school settings (kindergarten through eighth grade) are effective in changing behaviors, and the Sun Smart Schools pilot program showed consistency with this. The elementary and middle schoolers in this study showed positive changes in attitude, behavior, and knowledge. The CDC (2014) has found insufficient evidence in the available research that educational approaches or activities designed to influence behaviors or attitudes are effective for high school students and their parents. This is relatively consistent with the Sun Smart Schools pilot program, as high school students and parents showed positive behavioral changes, however attitudes and knowledge gains did not appear to be impacted by the implemented interventions. As this study shows consistent results with national research, the Sun Smart Schools pilot study a great starting point for developing and expanding the curriculum and focus within schools, and for improving the data collection methods moving forward.

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## APPENDIX 1: SURVEYS

### ELEMENTARY AND MIDDLE SCHOOL SURVEY

Grade: \_\_\_\_\_

1. Do you put sunscreen on when you go outside for a long time?
  - a. Most of the time
  - b. Sometimes
  - c. Rarely
  - d. Never
2. Does your family put on sunscreen when they go outside for a long time?
  - a. Most of the time
  - b. Sometimes
  - c. Rarely
  - d. Never
3. What do you think about protecting yourself from the sun?
  - a. Very important
  - b. Important
  - c. Kind of important
  - d. Not important at all
4. When you are outside in the middle of the day, do you: \_\_\_\_\_ (circle all that apply).
  - a. Wear a hat
  - b. Wear sunglasses
  - c. Wear a long sleeve shirt
  - d. Stay in the shade most of the time
5. Can you get a sunburn on a cloudy day?
  - a. Yes
  - b. No
  - c. I don't know
6. Suntan is a browning of the skin that is caused by the sun rays. Do you think you and your friends look better with a suntan?
  - a. Yes
  - b. No
  - c. I don't know
7. Do you think spending a lot of time in the sun is healthy?

- a. Yes
- b. No
- c. I don't know

HIGH SCHOOL SURVEY

Grade: \_\_\_\_\_

1. Do you put sunscreen on when you go outside for a long time?
  - a. Most of the time
  - b. Sometimes
  - c. Rarely
  - d. Never
2. What do you think about protecting yourself from the sun?
  - a. Very important
  - b. Important
  - c. Kind of important
  - d. Not important at all
3. When you are outside in the middle of the day, do you: \_\_\_\_\_ (circle all that apply).
  - a. Wear a hat
  - b. Wear sunglasses
  - c. Wear a long sleeve shirt
  - d. Stay in the shade most of the time
4. Have you ever used an indoor tanning bed?
  - a. Yes – about how many times? \_\_\_\_\_
  - b. No
5. Do you think you and your friends look better with a tan?
  - a. Yes
  - b. No
  - c. I don't know
6. Do you think a base tan helps protect your skin from sun damage?
  - a. Yes
  - b. No
  - c. I don't know
7. Do you think spending a lot of time in the sun is healthy?
  - a. Yes
  - b. No
  - c. I don't know
8. Do you think spending a lot of time in the sun as a teenager can lead to skin cancer when you're older?
  - a. Yes
  - b. No
  - c. I don't know

9. Can you get a sunburn on a cloudy day?
- a. Yes
  - b. No
  - c. I don't know

PARENT SURVEY

Student's Grade: \_\_\_\_\_

1. Do you put sunscreen on when you go outside for a long time?
- a. Most of the time
  - b. Sometimes
  - c. Rarely
  - d. Never
2. What do you think about protecting yourself from the sun?
- a. Very important
  - b. Important
  - c. Kind of important
  - d. Not important at all
3. When you are outside in the middle of the day, do you: \_\_\_\_\_ (circle all that apply).
- a. Wear a hat
  - b. Wear sunglasses
  - c. Wear a long sleeve shirt
  - d. Stay in the shade most of the time
4. Have you ever used an indoor tanning bed?
- a. Yes – about how many times? \_\_\_\_\_
  - b. No
5. Do you think you and your friends look better with a tan?
- a. Yes
  - b. No
  - c. I don't know
6. Do you think a base tan helps protect your skin from sun damage?
- a. Yes
  - b. No
  - c. I don't know
7. Do you think spending a lot of time in the sun is healthy?
- a. Yes
  - b. No
  - c. I don't know
8. Do you think spending a lot of time in the sun in childhood can lead to skin cancer when you're older?
- a. Yes
  - b. No
  - c. I don't know
9. Can you get a sunburn on a cloudy day?
- a. Yes
  - b. No
  - c. I don't know