

Evaluation of Skin Cancer Screenings in Tucson, Arizona from 2006-2013

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Gianna Romano

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Mentor: Robin Harris, PhD

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ABSTRACT

Background: One out of every three cancer diagnoses is a skin cancer, and the incidence of both melanoma and non-melanoma type skin cancers is increasing. Skin cancers, including melanoma, are typically treatable if detected early. However, there is insufficient evidence to support recommendations to establish population based skin cancer screening programs. The **specific aims** of this study are 1) to evaluate characteristics of participants who attend a community skin cancer screening event and who are referred for follow up due to suspicious lesions, 2) to determine the proportion of participants with suspicious lesions identified at a community skin cancer screening event who complied with a request to visit a dermatologist or primary care physician, and 3) to evaluate attitudes toward sun protection practices, and perceived risk of developing skin cancer among participants who attend a community skin cancer screening and have a suspicious skin lesion. **Methods:** The Skin Cancer Institute sponsored a series of community skin cancer screening events in Tucson, Arizona from 2006 to 2013. Participants completed an American Academy of Dermatology screening form prior to a skin examination by a dermatologist. Participants with suspicious lesions identified at the examination who agreed to be contacted again received questionnaires 4 months after the initial screening to assess compliance with follow-up recommendations, and their sun protection practices and risk perceptions. **Results:** 1979 community members attended the skin cancer screenings. The majority of the participants were Caucasian, females, had blue eyes and brown hair, were college educated, had no prior personal or family history of skin cancer, had health insurance but did not have a regular dermatologist, reported that they had never been to a skin cancer screening before, and stated that without this screening that they would not have their skin examined. 748 (37.8%) of community members were referred and instructed to see a dermatologist for further evaluation of a skin lesion. Of the 441 participants with a suspicious lesion who consented to participate in the follow-up study, 120 returned a questionnaire; 90 (75%) reported that they followed up with a dermatologist or physician, and 30 (25%) did not. Of the 90 participants who followed up, 53% received a skin biopsy. The self-reported diagnoses from the biopsies of the suspicious skin lesions were the following: 1% atypical or dysplastic nevus, 21% actinic keratosis, 16% basal cell carcinoma, 8% squamous cell

carcinoma, 2% melanoma, and 38% did not have skin cancer. **Conclusions/Impact:** This study demonstrated that 38% of community skin cancer screening participants were referred for follow up due to a suspicious skin lesion being identified during a skin cancer screening event. It also appeared that 75% of those who responded to the follow-up questionnaire complied with the request within four months, although the response rate for the follow-up questionnaire was low. Therefore, implementing a formal reminder system following the skin cancer screenings may increase the percentage of participants who follow up with a primary care physician or dermatologist after the screening for further evaluation of their suspicious skin lesion.

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INTRODUCTION/SIGNIFICANCE

Background for the research question: Skin cancer is the most frequently diagnosed cancer throughout the world, with one out of every three cancer diagnoses being skin cancer [4]. Basal cell carcinoma, squamous cell carcinoma, and melanomas account for 99% of all skin cancers [14]. According to the World Health Organization, the incidence rates are increasing for non-melanoma skin cancers including basal cell carcinomas and squamous cell carcinomas, and melanoma skin cancers. Worldwide, approximately 2 to 3 million new cases of non-melanoma skin cancer are diagnosed each year along with 132,000 new cases of melanoma [3]. In the United States, according to the American Cancer society statistics, the estimated total number of new cases of skin cancer in 2015 excluding basal and squamous cell carcinoma in males and females is 80,100, with 73,870 new cases of melanoma and 6,230 new cases of non-epithelial skin cancer [12]. The estimated number of new cases of melanoma is 42,670 in males, and 31,200 in females, with non-epithelial skin cancers accounting for 3,940 new cases in males and 2,290 new cases in females [12]. The estimated number of new cases of melanoma in Arizona in 2015 is 1400 cases, although there is recent evidence that the number of melanoma cases in Arizona are substantially under reported [12].

According to the Centers for Disease Control (CDC), in 2012 Caucasian males had the highest incidence rates of melanoma at 28/100,000 compared with an incidence rate of melanoma of 18/100,000 in Caucasian females [13]. Black males and females in 2012 had the lowest incidence of melanoma with rates of approximately 1/100,000 [13]. In 2015, the age adjusted melanoma incidence rates were 31/100,000 in males, and 22/100,000 in females [14]. The death rates from melanoma in 2012 were highest in Caucasian males at 4.4/100,000, and lowest in black females at 1.5/100,000 [13]. In 2015, the age-adjusted melanoma death rates in males was 3.8/100,000 and 1.6/100,000 in females [14]. The 5-year melanoma survival in 2007 was 60% in black populations compared to 67% in Caucasians [14].

Although the incidence rates of skin cancer are increasing, since the 1980s the mortality rates predominantly associated with cutaneous malignant melanoma have started to stabilize [4]. The recent stabilization in skin cancer mortality rates is being attributed to earlier

detection and diagnosis of cutaneous malignant melanoma leading to a larger amount of early stage, thin lesions being discovered [4]. Overall, both melanoma and non-melanoma types of skin cancer are curable when they are diagnosed at an early stage [4].

Non-melanoma skin cancers include basal cell carcinoma and squamous cell carcinomas and are the most common types of skin cancer. They are slow growing tumors that progress to a symptomatic stage within a timeframe from months to years [4,7]. They appear predominately on the face, head, and neck. Due to the extended preclinical phase that is associated with non-melanoma skin cancers, they appear primarily among elderly patient populations [4]. In turn, more than 80% of non-melanoma skin cancer cases occur in individuals who are older than 60 years old [4]. Early detection contributes to a reduction in the morbidity and disfigurement that is associated with non-melanoma skin cancers [9]. Additionally, non-melanoma skin cancers have a greater than 95% cure rate if they are identified and treated early [9]. Basal cell carcinomas are increasing at a rate of approximately 2% per year in the United States, and account for 70-80% of non-melanoma type skin cancers in males and 80-90% of non-melanoma type skin cancers in females [14]. Squamous cell carcinomas arise from precancerous lesions known as actinic keratosis, which present as rough, scaly patches [14]. They account for 20% of non-melanoma type skin cancers [14].

Cutaneous malignant melanoma is a fast growing cancer that can be detected at an early stage of the disease using standardized visual inspection of the skin surface [4]. According to the Surgeon General's Call to Action to prevent Skin Cancer, "consistent and regular screening identifies melanomas that are on average thinner than those found during usual care, and whether detection of these lesions leads to fewer cases of disease or death is unknown" [14, page 70]. One study reported the sensitivity for the total body skin examination with regard to diagnosing cutaneous malignant melanoma is between 40% and 95% [4]. While less than 5% of skin cancer cases are diagnosed as cutaneous malignant melanoma, the majority of deaths related to skin cancer are ascribed to melanoma [8]. The prognosis for cutaneous malignant melanoma declines as the patient progresses to the advanced stages of the disease, which are considered to be stages II through IV [4]. According to Katalinic et al., patients with stage IV

cutaneous malignant melanoma have a 16% 5-year survival rate compared to the 99% 5-year survival rate associated with patients who are diagnosed with stage I melanoma [5]. The National Institute of Health's Surveillance, Epidemiology, and End Results (SEER) program data from 2005-2011 demonstrated that the 5 year survival rate for stage 1 melanoma was 98.3%, the five year survival rate for regional melanoma with spread to the lymph nodes was 63%, and the 5 year survival rate for metastatic melanoma was 16.6% [16]. Therefore, early detection is critical in order to reduce the mortality associated with cutaneous malignant melanoma.

Despite the increasing incidence of skin cancer, organizations such as the United States Preventive Services Task Force (USPSTF) state that there is currently insufficient evidence to recommend population based skin cancer screenings by primary care providers for adults [14]. The task force attributes this to the absence of randomized controlled trials demonstrating improved outcomes in terms of decreased morbidity and mortality rates associated with the implementation of population based skin cancer screening programs, and insufficient research regarding the health and cost benefits of different screening modalities in diverse populations such as those that are found within the United States [14]. However, the USPSTF released the following statement: "Clinicians should remain alert for skin lesions with malignant features noted in the context of physical examinations performed for other purposes. Asymmetry, border irregularity, color variability, diameter greater than 6 mm, or rapidly changing lesions are features associated with an increased risk for cancer. Biopsy of suspicious lesions is warranted" [14, page 70].

In the United States, skin cancer treatment costs approximately 8.1 billion dollars each year, with \$3.3 billion dollars being utilized to treat melanoma, and \$4.8 billion dollars used to treat non-melanoma skin cancers [14]. Decreased productivity costs \$3.5 billion for melanoma related deaths, and \$1.0 billion for non-melanoma skin cancer deaths [14]. Approximately 5 million US adults are treated for skin cancer, with 4.3 million being treated for non-melanoma skin cancers

A research study performed by Koh et al. evaluated the effectiveness of a visual skin examination performed by dermatologists at free skin cancer screening clinics in Massachusetts

[2]. Participants who received a visual skin examination at the screening events and were told that they had a suspicious lesion were asked to see their primary care physicians or dermatologist for further evaluation. Four months later the participants attended a screening event they received a questionnaire in the mail in which they were asked if they had followed up with their doctor after the screening. Additionally, they were asked whether or not they received a biopsy and the result of their biopsy, and if they received treatment for skin cancer. After this information was obtained, the research team contacted the healthcare providers that the participants followed up with in order to confirm the skin cancer diagnoses by speaking to the physicians and obtaining the pathology reports if they were available. The researchers reported that the positive predictive values of the skin cancer screenings were determined to be between 35% and 75% [2]. In turn, they concluded that the benefit of screening for skin cancer was equivalent to the benefit that is associated with cancer screening efforts for other types of cancer [2].

A pilot skin cancer screening program was implemented in the Schleswig-Holstein region of Germany to evaluate the impact of a community wide screening program [5]. Katalinic et al reported a 47% statistically significant decline in the melanoma mortality rates among men in the region as well as a 49% decline among women compared with regional control groups that did not implement the skin cancer screening program [5]. While this decline is impressive, one of the primary limitations of this study was that it was not conducted as a randomized controlled trial due to resistance displayed by healthcare stakeholders in Germany [6]. Additionally, the researchers were unable to enumerate all of the factors that could have contributed to the decline in melanoma mortality rates within the region that implemented the pilot skin cancer screening program [5]. For example, the researchers stated that there was a high rate of participation in the skin cancer screening program in Schleswig-Holstein among individuals with a high risk of developing skin cancer [5]. Overall, randomized controlled trials involving skin cancer screening programs are crucial in order to strengthen the evidence base pertaining to the effectiveness of skin cancer screenings by providing morbidity and mortality data.

Significance and rationale for the research question: In 2006, the Skin Cancer Institute (SCI) at the University of Arizona Cancer Center began a community outreach program within the greater Tucson area. As part of this outreach, approximately two community skin cancer screenings were offered each year between 2006-2013. The screening process followed the annual guidelines and procedures of the American Academy of Dermatology (AAD) which included use of AAD questionnaires and documentation of clinical findings and referral of suspicious lesions. Clinicians and researchers from the SCI then sought to determine if screening attendees complied with the referral recommendations and developed a research protocol to evaluate the screenings. During an exit interview at the end of the screening process, those individuals who had a suspicious lesion identified were asked if they would be willing to participate in a follow-up study. Four months after the screening, these potential participants were sent a questionnaire asking them if they had gone to see their physician about the suspicious lesion and results of the examination and biopsy (if performed) as well as questions about their current sun safety behaviors. All consenting documents and protocols were approved by the University of Arizona Institutional Review Committee (IRB).

Currently the USPSTF does not recommend regular whole body skin examinations by a healthcare provider among adults due to a lack of research studies identifying the relative health benefits and cost benefits. Therefore, the rationale for our research questions was to identify the percentage of individuals who complied with follow up recommendations after attending a skin cancer screening event, and also to identify the percentage of follow up participants that were diagnosed with skin cancer from their self-reported biopsy results in order to elucidate some of the potential benefits of community-based skin cancer screenings.

Research questions: What percentage of participants who consented to participate in the study complied with recommendations to follow up with a physician after they were informed that they had a suspicious skin lesion requiring further evaluation? What percentage of follow up study participants were diagnosed with a precancerous or cancerous skin lesion based upon their self-reported biopsy results?

Objectives for the study: The goals for the study were to utilize the prescreening AAD forms and the follow-up questionnaire data in order to create frequency tables containing the participants' demographic characteristics, skin protection habits, beliefs regarding skin examinations, and their perceived risk of developing skin cancer. Additionally, a goal was to identify the proportion of participants who were compliant with recommendations to follow up with a physician after the skin cancer screening for further evaluation of suspicious skin lesions, and to determine the percentage of follow up study participants who were diagnosed with a precancerous or cancerous skin lesion based upon their self-reported biopsy results.

MATERIALS AND METHODS

The Skin Cancer Institute (SCI) at the University of Arizona Cancer Center sponsored skin cancer screening events at various community events in Tucson, Arizona between 2006 to 2013. These events were designed to increase awareness of the importance of skin cancer prevention and early detection in the community.

Skin Screening Protocol: The skin screenings were set up to follow the requirements of the American Academy of Dermatology (AAD) community screenings and were advertised on their website, in addition to local advertisements. All examinations were conducted by community or SCI dermatologists or residents under the direction of AAD-qualified dermatologists. Participants scheduled an appointment for a skin examination during the event. When the participants arrived, they completed an AAD skin cancer screening form that collected demographic information, data pertaining to whether or not the individual had a personal or family history of skin cancer, and their lifetime sunburn and tanning history. The dermatologist then performed the skin examination and noted on the AAD form the presence and location of skin lesions that they thought were suspicious and warranted further evaluation. The options for the skin examination were a whole body exam, an exam of the face and arms only, or an examination purely above the waist. After the skin exam, participants completed an exit interview. Participants who were informed that they had a suspicious skin lesion were asked for permission to contact them for future research studies.

Follow-up Procedures: If the participant provided written permission and had a recommendation for follow-up, they were sent a letter two months after their skin cancer screening informing them about the IRB approved research study and that they would receive a questionnaire, an informed consent form, and an authorization form for the use and disclosure of protected health information for research purposes in the mail two months later. This letter served as an informal reminder that they had a suspicious skin lesion requiring follow up. They were instructed to complete the consent forms. Then, four months after the screening event, the participants received the tracking suspicious skin lesion questionnaire in the mail with

instructions to return the document to the Skin Cancer Institute in the postage-paid envelope that was provided with the questionnaire.

AAD forms and the follow-up questionnaire: The official AAD form was used for some of the information: gender, age, ethnicity, previous personal history of skin cancer, family history of skin cancer, and health insurance status. However, the AAD forms were not standard throughout the time period included in this study from 2006-2013, and some of the questions varied in the way that they were worded and others were only asked during specific years. The follow-up questionnaire asked the participants questions about whether or not they received a biopsy and the specific skin cancer diagnosis that they were given if the biopsy results were indicative of cancer. The follow-up questionnaire also asked about participants' attitudes about sunscreen and protective clothing, their perceived risk of developing skin cancer, their beliefs regarding self-examinations and healthcare professional provide skin examinations, and how their perceived risk of dying from skin cancer would be affected by self –skin examinations. The follow-up questionnaires were not identical every year that the study was conducted, and modifications were made to the questionnaire over time including the deletion of particular questions. The Tracking Suspicious Skin Lesions study documents and procedures were reviewed and approved by the Institutional Review Board at the University of Arizona in Tucson, Arizona.

Data Management and Analysis Plan: When the questionnaires were mailed back to the Skin Cancer Institute, the questionnaire responses were entered into a password-protected database. The study coordinator, Stephanie Koch, provided an anonymized analytic file for this specific project. Analyses included descriptive statistics pertaining to the characteristics of the individuals who attended the skin cancer screening events, the individuals who were referred for follow up due to suspicious skin lesions being identified during their examination, and the individuals who were referred for follow up who provided consent to be contacted

RESULTS

A total of 1979 individuals attended the skin cancer screenings from 2006-2013. Out of the 1979 participants who attended the community skin cancer screening events, 748 participants (38%) were informed that they had a suspicious lesion on examination and were referred for follow up after the skin cancer screening (Figure 1). Out of the 748 participants who were informed that they had a suspicious skin lesion requiring follow up, 441 (59%) provided consent to be contacted after the screening events to complete a follow-up questionnaire shown in Figure 1.

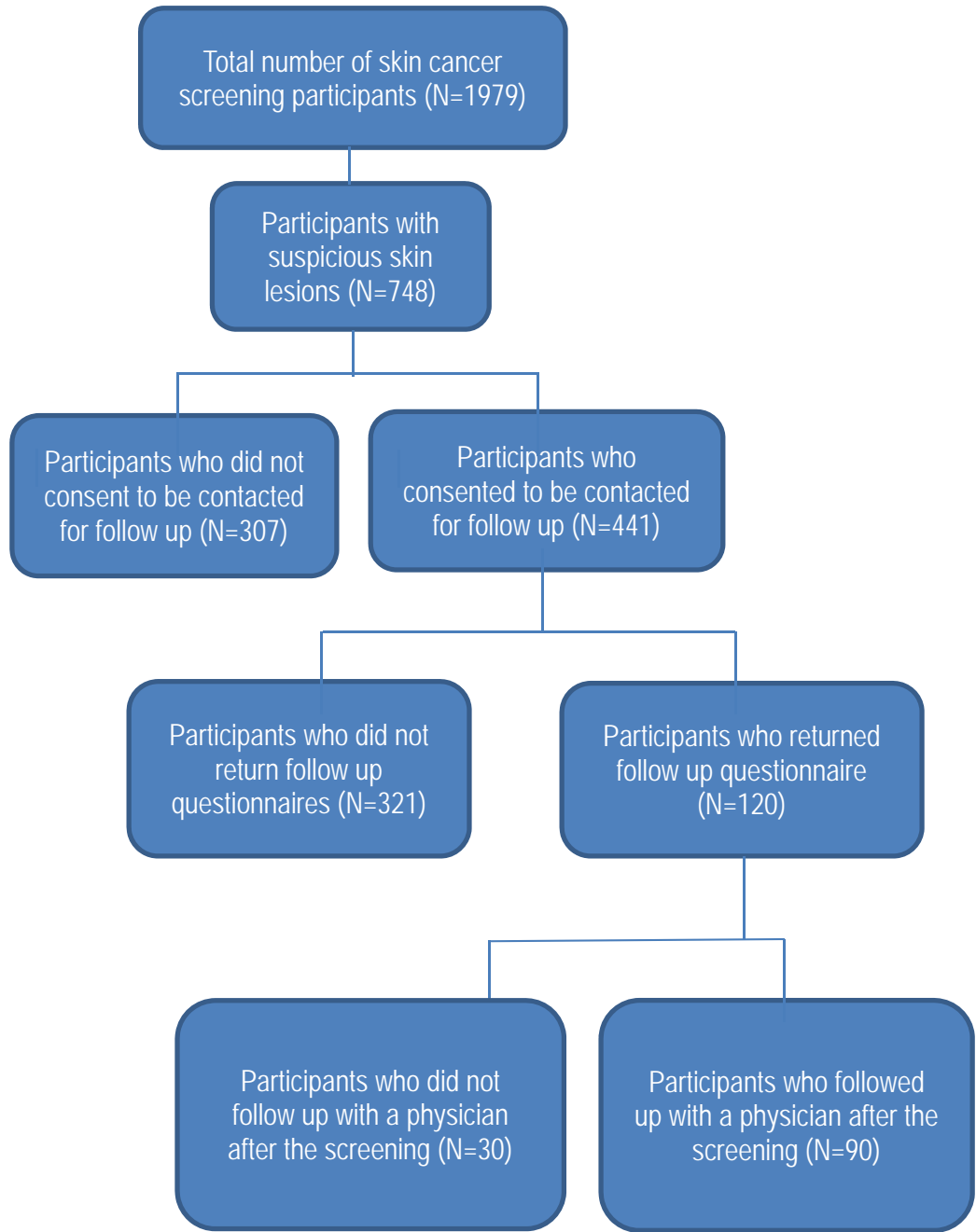


Figure 1: Categories of screening participants

Characteristics of Screening Attendees (Table 1)

The majority of the participants who attended the skin cancer screening events in Tucson, Arizona were female (58%), Caucasian (87%), had blue eyes (37%), brown hair (67%), and 78% were college educated (42% attended college and 36% attended graduate school) as described in Table 1. Forty two percent of the participants were male, 11% had green eyes, 19.6% had blonde hair, and 3.5% had red hair.

TABLE 1: Demographic and personal characteristics of all attendees of the community skin cancer screenings

	FREQUENCY	PERCENTAGE
Gender		
Female	1148	58.00
Male	815	42.00
Eye Color*		
Brown Eyes	348	35.58
Blue Eyes	357	36.50
Green Eyes	110	11.25
Hazel Eyes	163	16.67
Hair Color*		
Black Hair	92	10.17
Brown Hair	604	66.74
Red Hair	32	3.54
Blonde Hair	177	19.56
Race/Ethnicity**		
Caucasian	1295	87.09
Black	14	0.94
Hispanic	104	6.99
Asian	31	2.08
Other	43	2.89
Education Level***		
Elementary school education	9	1.24
High school	146	20.05
College	308	42.31
Graduate school	265	36.40

*Question asked only on 2007-2010 AAD forms; **Asked only on the 2007-2010, 2012, and 2013 AAD forms ***Asked only on the 2006-2008 AAD forms; In 2006 there was no Asian category and Asians were included in the other category for ethnicity

Comparison of Demographic Characteristics among Referred and Consented to be Contacted Participants

The majority of the individuals who had a suspicious lesion and were referred for follow up were also female (53%), Caucasian (92%), blue eyed (41%), had brown hair (71%), and 79% were college educated (44% attended college and 35% attended graduate school) shown in Table 2. The majority of the participants who provided consent to be contacted were female (57%), Caucasian (92%), blue eyed (39%), brown haired (66%), and 77% were college educated (45% attended college and 32% attended graduate school) shown in Table 2.

TABLE 2: Demographic and personal characteristics for participants who were referred for follow up and participants who were referred for follow up and provided consent to be contacted after attending the community skin cancer screenings

	DATA FOR ALL PARTICIPANTS REFERRED FOR FOLLOW UP		DATA FOR ALL PARTICIPANTS REFERRED FOR FOLLOW UP WHO PROVIDED CONSENT TO BE CONTACTED	
	Frequency (N=720)	Percentage	Frequency (N=428)	Percentage
Gender				
Female	380	53.00	242	57.00
Male	340	47.00	186	43.00
Eye Color*				
Brown Eyes	101	30.00	52	31.30
Blue Eyes	138	41.00	65	39.20
Green Eyes	37	11.00	22	13.20
Hazel Eyes	60	18.00	27	16.30
Hair Color*				
Black Hair	17	5.60	8	5.00
Brown Hair	214	70.90	103	66.00
Red Hair	14	4.60	12	8.00
Blonde Hair	57	18.90	32	21.00
Race/Ethnicity**				
Caucasian	485	91.5	265	91.70
Black	2	0.38	0	0.00
Hispanic	29	5.47	19	6.57
Asian	6	1.13	1	0.35
Other	8	1.51	4	1.38
Education Level***				
Elementary school education	1	0.40	0	0.00
High school	49	20.90	36	22.40
College	103	43.80	73	45.30
Graduate school	82	34.90	52	32.30

*Question asked only on 2007-2010 AAD forms; **Asked only on the 2007-2010, 2012, and 2013 AAD forms ***Asked only on the 2006-2008 AAD forms; In 2006 there was no Asian category and Asians were included in the other category for ethnicity; the referred participants in this table were those individuals with the referred box checked on their AAD form regardless of their biopsy recommendation status.

Sunburn History and Family History of Skin Cancer (Tables 3 and 4)

Table 3 summarizes sunburn history and personal and family history of skin cancer for all screening attendees. The majority of participants who attended the community skin cancer screenings reported that they sometimes burned in the sun (53%), had no family history of skin cancer (62%), had no family history of melanoma (72%), had no family history of basal cell carcinoma (72%), and had no family history of squamous cell carcinoma (75%) shown in Table 3. Additionally, the majority of all participants who attended the screenings stated that they had no personal history of skin cancer (89%), no personal history of melanoma (82%), no personal history of basal cell carcinoma (75%), and no personal history of squamous cell carcinoma (78%) shown in Table 3.

TABLE 3: Reported frequency of burning when in the sun, family history of skin cancer, and personal history of skin cancer for all attendees of the community skin cancer screenings

	FREQUENCY (N=1871)	PERCENTAGE
Sunburn Frequency*		
Always burn in sun	25	9.09
Usually burn in sun	42	15.27
Sometimes burn in sun	147	53.45
Rarely Burn in sun	61	22.18
Family History of Skin Cancer**		
Yes	692	37.59
No	1149	62.41
Family History of Melanoma**		
Yes	455	28.46
No	1144	71.54
Family history of BCC ***		
Yes	349	28.17
No	890	71.83
Family history of SCC***		
Yes	306	24.70
No	933	75.30
Family history of skin cancer unsure of type***		
Yes	439	35.43
No	800	64.57
Personal history of skin cancer**		
Yes	208	11.12
No	1663	88.88
Personal history of melanoma**		
Yes	279	18.36
No	1241	81.64
Personal history of BCC***		
Yes	310	25.02
No	929	74.98
Personal history of SCC***		
Yes	272	21.95
No	967	78.05

*Asked only on the 2006 AAD form. **Asked on all AAD forms beginning in 2006.

***Asked only on the AAD forms beginning in 2008.

Sunburn History and Family History of Skin Cancer among the Referred and Consented to be Contacted Attendees

A total of 725 individuals had a suspicious skin lesion identified at the screening and were referred for follow up (they had a check box indicating that they were referred for follow up on their AAD forms). Of these, 51% reported that they sometimes burn in the sun, 20.5% usually burn in the sun, 17% reported that they rarely burn in the sun, and 11% reported that they always burn in the sun. Furthermore, the majority had no family history of skin cancer (57%), no family history of melanoma (71%), no family history of basal cell carcinoma (69%), and no family history of skin squamous cell carcinoma (75%) shown in Table 4. They also stated that they had no personal history of skin cancer (82%), no personal history of melanoma (81%), no personal history of basal cell carcinoma (71%), and no personal history of squamous cell carcinoma (77%) shown in Table 4.

The majority of the participants who were referred for follow up and consented to be contacted for follow up stated that they sometimes burn in the sun (55%), have no family history of skin cancer (56%), no family history of melanoma (62%), no family history of basal cell carcinoma (54%), and no family history of squamous cell carcinoma (60%) shown in Table 4. Additionally, the majority reported no personal history of skin cancer (80%), no personal history of melanoma (71%), no personal history of basal cell carcinoma (58%), and no personal history of squamous cell carcinoma (62%) shown in Table 4.

TABLE 4: Self-reported sunburn frequency and family history of skin cancer for attendees referred for follow up and those who provided consent

	DATA FOR ALL PARTICIPANTS REFERRED FOR FOLLOW UP FOR A SUSPICIOUS LESION		DATA FOR ALL PARTICIPANTS REFERRED FOR FOLLOW UP WHO CONSENTED TO BE CONTACTED	
	FREQUENCY (N=684)	PERCENTAGE	FREQUENCY (N=408)	PERCENTAGE
Sunburn Frequency*				
Always burn in sun	13	11.10	10	11.90
Usually burn in sun	24	20.50	14	16.70
Sometimes burn in sun	60	51.30	46	54.70
Rarely Burn in sun	20	17.10	14	16.70
Family history of skin cancer**				
Yes	297	43.40	178	44.00
No	387	56.60	230	56.00
Family history of melanoma**				
Yes	184	29.00	142	38.00
No	451	71.00	234	62.00
Family history of BCC***				
Yes	149	31.00	121	46.00
No	337	69.00	144	54.00
Family history of SCC***				
Yes	123	25.00	107	40.00
No	363	75.00	158	60.00
Family history of skin cancer of unsure type***				
Yes	169	35.00	129	49.00
No	317	65.00	136	51.00
Personal history of skin cancer**				
Yes	126	18.00	81	20.00
No	558	82.00	325	80.00
Personal history of melanoma**				
Yes	116	19.00	106	29.00
No	503	81.00	259	71.00
Personal history of BCC***				
Yes	141	29.00	112	42.00
No	345	71.00	153	58.00
Personal history of SCC***				
Yes	111	23.00	100	38.00
No	375	77.00	165	62.00

*Asked only on the 2006 AAD form. **Asked on all AAD forms beginning in 2006. ***Asked only on the AAD forms beginning in 2008.

Mole History and History of Prior Skin Examinations (Tables 5 and 6)

The prescreening data obtained from the AAD forms demonstrated that 24% of attendees reported that they had a mole that had changed and 37% reported 9 or fewer moles (Table 5). Almost 34% reported that they had attended a prior skin cancer screening and 55% had a past skin check by a dermatologist or other doctor, although 80% did not have a regular dermatologist. Approximately 56% of participants reported that without this screening that they would not see a doctor for their skin and 92% had health insurance.

TABLE 5: Reported mole history and number of moles, and prior attendance at a skin cancer screening or skin examination for all attendees of the community skin cancer screenings

	FREQUENCY (N=1826)	PERCENTAGE
Have moles that changed*		
Yes	431	23.60
No	1,395	76.40
Current number of moles on the body**		
0-9 moles	360	36.70
10-25 moles	176	17.94
26-50 moles	88	8.97
50+ moles	54	5.50
Unsure of # of moles	303	30.89
Been to a skin cancer screening before***		
Yes	437	33.80
No	856	66.20
Past skin check by a dermatologist or other doctor****		
Yes	714	55.26
No	538	41.64
Unsure	40	3.10
Have a regular dermatologist*****		
Yes	249	19.65
No	1,018	80.35
Without this screening would see a doctor for their skin*		
Yes	799	44.39
No	1,001	55.61
Have health insurance***		
Yes	1,185	91.65
No	108	8.35

*Asked on all AAD forms beginning in 2006, **Asked on the AAD forms from 2007-2011, ***Asked on the 2006-2010 AAD forms, ****Asked on the 2007-2010 AAD forms, *****Asked on the 2006-2011 AAD forms

Table 6 reports mole history and previous skin examination histories for those attendees who were referred for a suspicious lesion and those who consented to participate in the follow-up study. The majority of participants who were referred for follow up, and who were referred for follow up and provided consent to be contacted to complete the follow-up questionnaire reported that they do not have moles that have changed, and that they are unsure of the # of moles that they have. Additionally, the majority of individuals in both of these groups reported that they had never been to a skin cancer screening before and stated that they have had a prior skin check by a dermatologist or other doctor. Also, the majority of the referred participants and the referred participants who provided consent to be contacted stated that they do not have a regular dermatologist, but they reported that they do have health insurance and that they would see a doctor for their skin without this screening.

TABLE 6: Reported mole history and prior experience with skin cancer screening for attendees referred for follow-up and those who consented to be contacted to complete the questionnaire

	DATA FOR ALL PARTICIPANTS REFERRED FOR FOLLOW UP		DATA FOR ALL PARTICIPANTS REFERRED FOR FOLLOWUP WHO CONSENTED TO BE CONTACTED	
	FREQUENCY (N=657)	PERCENTAGE	FREQUENCY (N=393)	PERCENTAGE
Have moles that have changed*				
Yes	188	29.00	123	32.00
No	466	71.00	265	68.00
Number of moles**				
0-9 moles	105	32.00	49	29.52
10-25 moles	57	17.00	32	19.28
26-50 moles	36	11.00	15	9.04
50+ moles	21	6.00	10	6.02
Unsure of # of moles	112	34.00	60	36.14
Been to a skin cancer screening before***				
Yes	167	36.00	90	35.00
No	295	64.00	170	65.00
Past skin check by a dermatologist or other doctor****				
Yes	301	65.60	168	65.37
No	146	31.80	84	32.68
Unsure	12	2.60	5	1.95
Have a regular dermatologist*****				
Yes	110	24.00	64	25.00
No	342	76.00	189	75.00
Without this screening would see a doctor for their skin*				
Yes	355	54.00	217	55.00
No	302	46.00	176	45.00
Have health insurance***				
Yes	413	90.00	226	87.00
No	48	10.00	33	13.00

*Asked on all AAD forms beginning in 2006, **Asked on the AAD forms from 2007-2011, ***Asked on the 2006-2010 AAD forms, ****Asked on the 2007-2010 AAD forms, *****Asked on the 2006-2011 AAD forms. Missing data was excluded from the frequency and percentage calculations in this table.

Sun Protection Behaviors among the Attendees (Tables 7 and 8)

Table 7 shows self-reported use of sun protection for all screening attendees. Over 55% of the attendees stated that they sometimes use sunscreen (55%), seek shade always (53%), wear protective clothing sometimes (57%), had 0-3 sunburns prior to age 20 (50%), and spend 4-10 hours per week in the sun (35%) shown in Table 7. Thirty percent reported that they spend 1-3 hours per week in the sun, and 16% reported that they spend 11-20 hours per week in the sun.

Table 7 shows self-reported use of sun protection for all screening attendees. Over 55% of attendees stated that they sometimes use sunscreen, and 28% always use sunscreen. Almost 53% report they always seek shade and 57% sometimes wear protective clothing. Approximately 50% of these attendees reported experiencing 0-3 sunburns prior to age 20, 16.7% reported more than 10 burns prior to age 20, and 35% reported that they spend 4-10 hours per week in the sun shown in Table 7. Thirty percent reported that they spend 1-3 hours per week in the sun

TABLE 7: Sun behavior characteristics of attendees at the community skin cancer screenings

	FREQUENCY (N=1672)	PERCENTAGE
Sunscreen use frequency*		
Always	473	28.29
Sometimes	924	55.26
Rarely	206	12.32
Never	69	4.13
Seek shade**		
Always	639	52.85
Sometimes	510	42.18
Rarely	50	4.14
Never	10	0.83
Wear protective clothing**		
Always	158	13.00
Sometimes	698	57.45
Rarely	216	17.78
Never	143	11.77
# of sunburns prior to age 20*		
0-3	713	49.86
4-6	326	22.80
7-10	152	10.63
10+	239	16.71
Hours spent per week in the sun***		
Less than one hour	51	9.12
1-3 hours	169	30.23
4-10 hours	193	34.53
11-20 hours	92	16.46
21-30 hours	19	3.40
30+ hours	35	6.26

*Asked on the AAD forms beginning in 2007, **Asked on all AAD forms beginning in 2009, ***Asked on the 2008-2010 AAD forms. Missing data was excluded from the frequency and percentage calculations in this table

Table 8 contrasts responses on sun protection use for those who were referred and those who consented to follow-up study. The majority of the participants who were referred for follow up due to a suspicious lesion reported that they sometimes use sunscreen (55%), seek shade always (55%), wear protective clothing sometimes (58%), had 0-3 sunburns prior to age 20 (44%), and spend 4-10 hours per week in the sun (32%) shown in Table 8. There were few differences for those who consented to follow-up.

TABLE 8: Sun protection behaviors for participants who were referred for follow-up and participants who provided consent to be contacted

	DATA FOR ALL PARTICIPANTS REFERRED FOR FOLLOW UP		DATA FOR ALL PARTICIPANTS REFERRED FOR FOLLOWUP WHO CONSENTED TO BE CONTACTED	
	FREQUENCY (N=594)	PERCENTAGE	FREQUENCY (N=336)	PERCENTAGE
Sunscreen use frequency*				
Always	161	27.0	91	27.1
Sometimes	326	55.0	188	56.0
Rarely	85	14.0	45	13.4
Never	22	4.0	12	3.6
Seek shade**				
Always	260	54.6	143	55.0
Sometimes	193	40.6	104	40.0
Rarely	20	4.2	11	4.2
Never	3	0.6	2	0.8
Wear protective clothing**				
Always	62	13.0	36	14.0
Sometimes	276	58.0	152	58.9
Rarely	91	19.0	51	19.8
Never	47	10.0	19	7.4
# of sunburns prior to age 20*				
0-3	230	43.6	132	44.8
4-6	137	26.0	73	24.8
7-10	61	11.5	32	10.9
10+	100	18.9	58	19.7
Hours per week spent in the sun***				
Less than one hour	3	3.1	3	3.1
1-3 hours	30	30.9	30	30.9
4-10 hours	31	32.0	31	32.0
11-20 hours	18	18.6	18	18.6
21-30 hours	4	4.1	4	4.1
30+ hours	11	11.3	11	11.3

*Asked on the AAD forms beginning in 2007, **Asked on all AAD forms beginning in 2009, ***Asked on the 2008-2010 AAD forms. Missing data was excluded from the frequency and percentage calculations in this table

Preliminary Diagnoses for Referred Participants (Table 9)

The dermatologist recorded on the AAD form their preliminary diagnosis for all suspicious lesions. The primary diagnoses were summarized. Out of the 1979 attendees, 39% were referred for follow up (N=725). The preliminary diagnoses that were made by the dermatologists after they performed the skin exams were the following: seborrheic keratosis (33%), actinic keratosis (16%), dysplastic nevus (8%), complex nevus (2%), basal cell carcinoma (7%), squamous cell carcinoma (1%), melanoma (0.4%), and other diagnosis (28%) shown in Table 9. Twenty-one percent of the participants (387 people) were recommended for biopsy, and 79% (1,464 people) were not recommended to have a biopsy of their suspicious skin lesion.

TABLE 9: Skin findings and the associated preliminary diagnosis and biopsy recommendation status recorded on the AAD forms among all of the skin cancer screening attendees

	FREQUENCY (N=1851)	PERCENTAGE
Diagnosis		
Seborrheic keratosis	442	32.57
Actinic keratosis	213	15.70
Dysplastic nevus	114	8.40
Complex nevus	32	2.36
Basal cell carcinoma	98	7.22
Squamous cell carcinoma	16	1.18
Melanoma	5	0.37
Other	382	28.15
Biopsy recommended		
Yes	387	20.91
No	1,464	79.09

Missing data was excluded from the frequency and percentage calculations in this table.

The majority of the participants who were referred for follow up after the skin cancer screening to evaluate their lesion and participants who were referred for follow up and consented to be contacted after the screening had a diagnosis listed as actinic keratosis (30%) shown in Table 10. Fifty-five percent of the participants (n=223) who were referred for follow up were also recommended to have a biopsy.

TABLE 10: Preliminary diagnosis and recommendation for biopsy among participants who were referred for follow-up and participants who provided consent to be contacted

	DATA FOR ALL PARTICIPANTS REFERRED FOR FOLLOW UP		DATA FOR ALL PARTICIPANTS REFERRED FOR FOLLOW UP WHO CONSENTED TO BE CONTACTED	
	FREQUENCY (N=725)	PERCENTAGE	FREQUENCY (N=429)	PERCENTAGE
Diagnosis				
Seborrheic keratosis	90	23.40	90	23.49
Actinic keratosis	116	30.20	116	30.29
Dysplastic nevus	56	14.60	56	14.62
Complex nevus	4	1.00	4	1.04
Basal cell carcinoma	53	13.80	53	13.84
Squamous cell carcinoma	5	1.30	5	1.31
Melanoma	2	0.52	2	0.52
Other	57	14.80	57	14.88
Biopsy recommended				
Yes	223	55.00	223	55.00
No	179	45.00	179	45.00
Referred for follow up				
Yes	725	100	429	100

Missing data was excluded from the frequency and percentage calculations in this table.

Follow-up Study Responses (Tables 11-20)

A total of 429 individuals were sent a follow-up questionnaire. However, only 120 responses were received. Of these 120 individuals, 75% (n=90) reported that they had seen a dermatologist after being referred following a skin cancer screening (Table 11). The participants who did not follow up were asked questions in order to elucidate possible reasons why they did not follow up. Eighty-eight percent (n=22) responded no when asked if they did not have time to see a dermatologist and 100% (n=25) responded no to the question did not have transportation. Sixty-eight percent (17 people) responded no when asked if they were not concerned about the suspicious skin spot, and 96% (n=23) responded no when asked if they forgot to schedule an appointment. Eighty percent (n=20) responded no to the question I could not cover the costs of a treatment. Ninety-six percent (n=24) responded no to the question asking if they were not interested in knowing anything more about the suspicious spot.

Table 11 demonstrates that 120 participants out of the 429 participants who consented to be contacted following the skin cancer screenings submitted follow up questionnaires. Of the 120 participants who submitted the questionnaires, 75% saw a dermatologist after the screening and 25% did not see a dermatologist after the screening. Out of the participants who did not comply with follow up recommendations to have their suspicious skin lesions evaluated, 88% or 22 participants responded no when asked if they did not have time to see a dermatologist, and 100% responded no when asked if they did not have transportation as a reason for not following up. 68% of participants who did not follow up responded no when asked if they were not concerned about the suspicious skin spot, 96% responded no when asked if they forgot to schedule an appointment, and 80% responded no when asked if they could not cover the costs of a visit or treatment. 96% of participants who did not follow up responded no when asked if they were not interested in knowing anything more about the suspicious spot and 88% responded no when asked if they have not had their appointment yet but that it is scheduled. 80% of participants who did not follow up responded no when asked if they didn't know who to see, and 86% responded no when asked if they had no opinion about following up with another provider.

TABLE 11: Compliance with follow-up recommendations and reasons for non-compliance among individuals responding to the follow-up questionnaire

	FREQUENCY (N=120)	PERCENTAGE
Participants who saw a dermatologist		
Yes	90	75
No	30	25
Reasons for Non-Compliance		
Did not have time to see a dermatologist?		
Yes	3	12
No	22	88
Did not have transportation?		
No	25	100
Was not concerned about the suspicious skin spot		
Yes	8	32
No	17	68
Forgot to schedule an appointment		
Yes	1	4
No	23	96
Could not cover the costs of a visit or treatment		
Yes	5	20
No	20	80
Was not interested in knowing anything more about the suspicious spot		
Yes	1	4
No	24	96
Have not had my appointment yet but it is scheduled		
Yes	3	12
No	22	88
Didn't know who to see		
Yes	5	20
No	20	80
Didn't want to follow up with another provider*		
Yes	0	0
No	12	48

*Asked only on the 2006-2008 AAD forms follow-up questionnaires. Missing data was excluded from the frequency and percentage calculations in this table.

Table 12 summarizes the participants' responses as to where they located a dermatologist to examine the lesion. Fifty nine percent of the participants who followed up reported that they went to their usual dermatologist, and 49% responded that they did not recall the date that they were seen for follow up shown in Table 12. Twenty percent of the participants reported that they found their follow up provider by asking their primary care provider and 19% went to a physician that a family member or friend recommended.

TABLE 12: Where attendees with a suspicious skin lesion who completed the follow-up questionnaire located a physician

	FREQUENCY (N=94)	PERCENTAGE
Don't recall date seen		
Yes	22	49.0
No	23	51.0
Left blank	2	
Is this your usual dermatologist?		
Yes	51	59.0
No	35	41.0
Left blank	5	
How did you find this doctor?		
Tucson dermatological society	0	0.0
American academy of Dermatology website	1	1.1
Recommended by primary care provider	19	20.2
Recommended by a family member or friend	18	19.1
Insurance company handbook or website of eligible providers	10	10.6
Yellow pages	2	2.1
Chose a dermatologist from the list of Tucson dermatologists provided at the screening	13	13.8
Other	31	33.0
Left blank	1	

Table 13 summarizes results of the biopsies, if performed. Fifty three percent received a biopsy of the suspicious skin spot. Of the 90 participants who reported that they went to a provider to further evaluate their suspicious lesion, 53% had a biopsy performed. The self-reported diagnoses obtained from the biopsy results of the 77 participants who recalled their diagnosis were the following: 1% had a dysplastic or atypical mole, 21% had actinic keratosis, 16% had basal cell carcinoma, 8% had squamous cell carcinoma, 2% had melanoma, 38% did not have skin cancer, and 10% did not recall their diagnosis shown in Table 13.

TABLE 13: Whether or not a biopsy of the suspicious skin lesion was performed, and the self-reported diagnosis received from the biopsy among participants who saw a physician after their skin cancer screening

	FREQUENCY (N=98)	PERCENTAGE
Biopsy of the suspicious skin spot was performed		
Yes	52	53.06
No	46	46.94
Left blank	1	
Self-reported diagnosis from the biopsy		
Dysplastic or atypical nevus	3	1.16
Actinic Keratosis	18	20.93
BCC	14	16.28
SCC	7	8.14
Melanoma	2	2.33
Not skin Cancer	33	38.37
Don't recall the diagnosis	9	10.47
Left blank	2	

Missing data was excluded from the frequency and percentage calculations in this table.

Out of the 120 people who returned a follow-up questionnaire, 60% stated that they received treatment for the suspicious skin spot (Table 14,) approximately 59% received liquid nitrogen or cryosurgery, 16% received electrodesiccation and cauterization of the skin, 16% were given a prescription cream or topical medication, 25% underwent wider surgical removal after biopsy, 2% underwent wider surgical removal and sentinel lymph node biopsy. The majority of participants reported that their doctor recommended follow up visits after treatment once per year (33%).

TABLE 14: Whether or not participants received treatment for their suspicious skin lesion, and the specific treatment received among participants who followed up with a physician after their skin cancer screening

	FREQUENCY (N=95)	PERCENTAGE
Received treatment for the suspicious spot		
Yes	57	60.00
No	38	40.00
Left blank	1	
Received liquid nitrogen or cryosurgery therapy		
Yes	33	58.93
No	23	41.07
Left blank	1	
Electric needle (EDNC) numbing of skin and using instrument to burn skin		
Yes	9	16.07
No	47	83.93
Left blank	1	
Given a prescription cream or topical medication		
Yes	9	16.07
No	47	83.93
Left blank	1	
Underwent wider surgical removal after biopsy		
Yes	14	25.00
No	42	75.00
Left blank	1	
Underwent wider surgical removal and sentinel lymph node biopsy		
Yes	1	1.79
No	55	98.21
Left blank	1	
Received chemotherapy?*		
No	21	
Received immunotherapy*		
No	21	
Received radiation?*		
No	21	

*Asked only on the 2006-2008 follow-up questionnaires. Missing data was excluded from the frequency and percentage calculations in this table.

The majority (33%) of the participants who followed up received the recommendation to follow up 1 year after they received treatment for their suspicious skin lesions, and 5.8% of participants were informed that they needed a follow up appointment 2-3 months after they received their treatment shown in Table 15.

TABLE 15: Recommendations for follow-up frequency among the participants who saw a physician after their skin cancer screening and received treatment for their suspicious skin lesion

	FREQUENCY (N=69)	PERCENTAGE
Frequency of doctor recommended follow-up visits after treatment		
Every 2-3 months	4	5.80
Every 4-5 months	5	7.25
Every 6-8 months	21	30.43
Once per year	23	33.33
Do not recall	8	11.59
Other follow up period was recommended	8	11.59
Left blank	1	

Missing data was excluded from the frequency and percentage calculations in this table.

Sun Protection Practices and the Perceived Seriousness of Skin Cancer among the Follow-up Study Respondents (Tables 16-20)

The majority of participants who submitted a follow up questionnaire (64%) reported that they carefully examine all parts of their skin or use the help of a partner to examine their skin at home every few months. Additionally, 86% of participants stated that they apply sunscreen to their face, 57% apply sunscreen to their ears, 68% apply sunscreen to their arms, and 73% apply sunscreen to their neck shown in Table 16. Additionally, 68% of the participants who submitted questionnaires reported that they do not apply sunscreen to their chest, 51% do not apply sunscreen to their hands, 76% do not apply sunscreen to their back, 55% do not apply sunscreen to the legs, and 78% do not apply sunscreen to the feet shown in Table 16. The majority of follow up questionnaire participants (87%) also responded no to the statement that they do not use sunscreen.

TABLE 16: Use of sun protection among participants with a suspicious skin lesion who completed the follow-up questionnaire

	FREQUENCY (N=119)	PERCENTAGE
At home every few months, participant carefully examines all parts of skin or uses help of a partner to examine skin		
Yes	76	63.87
No	43	36.13
Apply sunscreen to face		
Yes	102	85.71
No	17	14.29
Left blank	1	
Apply sunscreen to ears		
Yes	68	57.14
No	51	42.86
Left blank	1	
Apply sunscreen to neck		
Yes	87	73.11
No	32	26.89
Left blank	1	
Apply sunscreen to chest		
Yes	38	31.93
No	81	68.07
Left blank	1	
Apply sunscreen to arms		
Yes	81	68.07
No	38	31.93
Left blank	1	
Apply sunscreen to hands		
Yes	58	48.74
No	61	51.26
Left blank	1	
Apply sunscreen to back		
Yes	28	23.53
No	91	76.47
Left blank	1	
Apply sunscreen to legs		
Yes	53	44.54
No	66	55.46
Left blank	1	
Apply sunscreen to feet		
Yes	26	21.85
No	93	78.15
Left blank	1	
Do not use sunscreen?		
Yes	15	12.60
No	104	87.40
Left blank	1	

Missing data was excluded from the frequency and percentage calculations in this table.

Table 17 summarizes the follow-up participants' perceptions about the seriousness of skin cancer. The majority of individuals who submitted a follow up questionnaire reported that skin cancer is very serious (50%) when asked how serious skin cancer is, and 38% reported that skin cancer is extremely serious. Forty-five percent of participants responded that they think that melanoma definitely is a fatal illness, and 36% responded that melanoma sometimes is a fatal illness.

TABLE 17: Perceived seriousness about skin cancer among participants who returned a follow-up questionnaire

	FREQUENCY (N=118)	PERCENTAGE
How serious is skin cancer		
Not at all serious	1	0.91
Somewhat serious	12	10.26
Very serious	59	50.43
Extremely serious	45	38.46
Left blank	3	
Do you think melanoma is a fatal illness?		
Definitely is	54	45.26
Probably is	21	17.80
Sometimes is	43	36.44
Left blank	2	

*Each of the questions in Table 17 were asked on all of the follow-up questionnaires from 2006-2013. Missing data was excluded from the frequency and percentage calculations in this table.

Table 18 summarizes the participants' perceptions of the ability of sun protection behaviors to reduce their risk of skin cancer. Sixty one percent of the follow up participants reported that wearing sunscreen as recommended reduces their chances of getting skin cancer a lot, and only 1.7% reported that they believe that wearing sunscreen reduces their risk of developing skin cancer only a little. Sixty-two percent reported that spending little time in the sun reduces their chances of getting skin cancer a lot, and 63% responded that wearing clothing that protects their skin from the sun reduces the chances of getting skin cancer a lot.

TABLE 18: Perceptions about sunscreen use and sun protective behaviors to reduce skin cancer risk among participants who returned a follow up questionnaire

	FREQUENCY (N=118)	PERCENTAGE
Wearing sunscreen as recommended reduces my chances of getting skin cancer		
A lot	72	61.02
Some	44	37.29
Only a little	2	1.69
Left blank	2	
Spending little time in the sun reduces my chances of getting skin cancer		
Completely	1	0.91
A lot	72	61.54
Some	39	33.33
Only a little	3	2.56
Not at all	2	1.71
Left blank	3	
Wearing clothing that protects my skin from the sun reduces my chances of getting skin cancer		
Completely	4	3.39
A lot	74	62.71
Some	38	32.20
Only a little	2	1.69
Left blank	2	

*Each of the questions in Table 18 were asked on all of the follow-up questionnaires from 2006-2013. Missing data was excluded from the frequency and percentage calculations in this table.

Table 19 shows the responses for their perception of how much regular self-skin examinations can reduce the risk of dying from skin cancer. The majority of participants stated that examining their skin regularly would decrease their risk of dying of skin cancer a lot (53%), 39.5% reported that examining their skin regularly would decrease their risk of dying of skin cancer somewhat, and 1.7% stated that they believed that self-skin examinations would not decrease their risk of dying from skin cancer at all.

TABLE 19: Follow-up questionnaire data including the participants' perceptions regarding the influence that examining their own skin regularly has on decreasing their risk of dying of skin cancer

	FREQUENCY (N=120)	PERCENTAGE
How much would examining your own skin regularly decrease your risk of dying of skin cancer?		
Completely eliminate my risk of dying of skin cancer	0	0.00
Decrease the risk a lot	63	52.94
Decrease the risk somewhat	47	39.50
Decrease the risk only a little	7	5.88
Would not decrease the risk at all	2	1.68
Left blank	1	

*The question in Table 19 was asked on each of the follow-up questionnaires from 2006-2013.

Table 20 indicates that over 82% of participants reported that having a dermatologist or other health care professional examine their skin regularly would decrease their risk of dying of skin cancer a lot and only 2 individuals thought that it would decrease their risk only a little or not at all. Over 39% of the participants thought that they probably or definitely will develop a skin cancer.

TABLE 20: Follow-up participants’ perceptions regarding the influence that having a dermatologist or other healthcare professional examine their skin regularly has on their risk of dying of skin cancer

	FREQUENCY (N=119)	PERCENTAGE
How much would having a dermatologist or other health care professional examine your skin regularly decrease your risk of dying of skin cancer?		
Completely eliminate my risk of dying of skin cancer	5	4.20
Decrease the risk a lot	98	82.35
Decrease the risk somewhat	14	11.76
Decrease the risk only a little	1	0.84
Would not decrease the risk at all	1	0.84
How likely is it that you will develop skin cancer at all or develop it again?		
Definitely won’t	1	0.85
Probably won’t	19	16.10
About a 50-50 chance	51	43.22
Probably will	44	37.29
Definitely will	3	2.54

*The questions in Table 20 were asked on all of the follow-up questionnaires from 2006-2013. Missing data was excluded from the frequency and percentage calculations in this table.

More than 77% of the participants felt that they had a greater than 50% chance of developing a skin cancer in the future shown in Table 20. Twenty nine percent of the participants who followed up reported that they believed that they had a 50% chance of developing skin cancer at all or developing it again in the future, 12% reported that they had a 70% chance of developing skin cancer at all or developing it again in the future, and 2.6% reported that they had a 100% chance of developing skin cancer at all or again in the future.

DISCUSSION

In our study, 1979 participants attended the community skin cancer screening events from 2006-2013. Of these participants, 748 people were referred for follow up due to a suspicious skin lesion. The 748 people consisted of 725 individuals with the referred box checked on their AAD forms, and 23 individuals who had a biopsy recommended on their AAD form but the referred box was not selected. Out of the 748 total referred individuals, 741 consented to be contacted to complete the follow-up questionnaire. Only 120 follow-up questionnaires were received, and 90 reported that they followed up with a physician for further evaluation of their suspicious skin lesion, and 30 individuals did not follow up.

In a study by Jonna et al., 464 individuals were screened at a free skin cancer screening in California, 269(58%) had abnormal screening results, and 132(28%) participants were given presumptive diagnoses of skin cancer [15]. The majority of the participants were female (57%) and Caucasian non-Hispanics (94%) [15]. Thirty five participants had presumptive diagnoses of melanoma, 24 had a presumptive diagnosis of squamous cell carcinoma, and 73 had a presumptive diagnosis of basal cell carcinoma [15]. Participants in the screening events with presumptive diagnoses were sent letters in the mail asking them if they had followed up with a physician and to share the results of their visit [15]. If participants did not respond to repeat letters, they were contacted by phone [15]. One hundred and fifteen participants (87%) out of the 132 participants with presumptive diagnoses of skin cancer provided follow up information [15]. Seventy seven percent (n=88) participants with a presumptive diagnosis of skin cancer received a definitive workup for skin cancer and 23% did not [15]. Twenty one (60%) of participants with a presumptive diagnosis of melanoma, 17 (71%) with a presumptive diagnosis of squamous cell carcinoma, and 50 (68%) with a presumptive diagnosis of basal cell carcinoma reported follow- up with a physician after the screening [15]. Histopathological analysis confirmed 2 melanomas, 1 squamous cell carcinoma, and 23 basal cell carcinomas resulting in a positive predictive value of 6-15% for melanoma, 4-12% for squamous cell carcinoma, and 32-85% for basal cell carcinoma [15]. In comparison, in our study, we had 1979 total participants at screenings from 2006-2013, and 725 participants had abnormal screening results. The

majority of the participants in our study were also Caucasian females and did not have risk factors for the development of skin cancer [15].

In a multicenter study by Koh et al, 2560 participants attended skin cancer screening events, 1773 had a normal screen, and 787 (31%) were informed that they had a suspicious skin lesion requiring follow-up [2]. Of the 787 people with suspicious skin lesions, 58% were female and 38% were male [2]. Twenty six participants had a suspected diagnosis of melanoma, 26 had a suspected diagnosis of squamous cell carcinoma, 210 had a suspected diagnosis of basal cell carcinoma, 170 had a suspected diagnosis of dysplastic nevus, 27 had a suspected diagnosis of congenital nevus, and 288 had a suspected diagnosis of actinic keratosis [2]. Out of the 459 participants with suspected melanoma skin cancer, dysplastic nevi, and congenital nevi, 288 (63%) received follow up, 22% chose not to obtain follow up, and 15% did not provide follow up information [2]. Therefore, the overall response rate to follow up was 85% [2]. One hundred and forty two participants were diagnosed with skin cancer including 9 melanomas, 9 squamous cell carcinomas, 82 basal cell carcinomas, 39 dysplastic nevi, and 3 congenital nevi [2]. The pathologically confirmed diagnoses were the following: 9 melanomas, 7 squamous cell carcinomas, 54 basal cell carcinomas, 27 dysplastic nevi, and 3 congenital nevi [2].

In a study by Breitbart et al., a population based SCREEN (Skin Cancer Research to Provide Evidence for Effectiveness of Screening in Northern Germany) project in Schleswig Holstein in Germany, citizens who were 20 years of older with health insurance became eligible to receive a standardized whole-body examination during a 12 month period of time [6]. The participation rate was 19%, as 360,288 eligible participants received a screening exam for skin cancer out of an eligible population of 1,880,000 [6]. There were a total of 62,555 participants who were determined to be at risk for malignant melanoma. Out of this group, 2.6% of the participants had a personal history of malignant melanoma, 6.1% had a family history of malignant melanoma, and 16.9% had a personal history of non-melanoma skin cancer [6]. In our study, 18% of all attendees had a personal history of melanoma, 28% had a family history of melanoma, 25% had a personal history of basal cell carcinoma, and 21% had a personal history of squamous cell carcinoma [6]. In our study, 19% of the participants with suspicious skin

lesions had a personal history of melanoma, 29% had a personal history of basal cell carcinoma, 23% had a personal history of squamous cell carcinoma, and 29% had a family history of melanoma. There were a total of 265,309 female participants and 94,982 male participants [6] who were examined. In the SCREEN Study, 2911 participants had a histopathologically confirmed malignant diagnosis [6]. Out of these participants, 20.1% had malignant melanoma/lentigo maligna melanoma, 67.4% had basal cell carcinoma, 13.5% were diagnosed with squamous cell carcinoma, and 5.7% had another type of skin cancer [6].

FUTURE DIRECTIONS

For this evaluation of a community screening program, only 120 participants out of 441 consented participants returned their questionnaires. As a result, the response rate was only 27%. The primary future direction for this project is to increase the number of participants with a suspicious skin lesion who follow-up with a physician after the skin cancer screening in order to prevent skin cancers from not being definitively diagnosed. Also, although we sent a reminder to follow-up two-months after each screening to the participants with a suspicious lesion along with information regarding the follow-up study, this was not sufficient, and a formal reminder protocol is necessitated. One potential option is to contact the participants by phone or email with a reminder to follow-up with their physician every 2-3 weeks until the follow-up questionnaire is mailed four months later. Also, the consent forms that were required by the IRB and the questionnaire was lengthy, which may have decreased the response rate.

Additionally, one of the limitations of questionnaire data is that participants who followed up with a physician for evaluation of their suspicious skin lesion after the screening event may be more likely to return a follow up questionnaire, than those individuals who did not follow up. In our study, 75% (90 participants) followed up with a physician following the screening, and 25% (30 participants) did not follow up. In order to increase the response rate from all participants with suspicious lesions including those who were not compliant with the recommendations to follow up with a physician for further evaluation of their suspicious skin lesion, it will be necessary to contact each of the consented participants directly along with implementing a reminder system. The direct contact and reminder system will allow an opportunity to emphasize the importance of follow up, and will lead to improved facilitation of follow up by allowing the individuals conducting the study to determine barriers to follow up sooner.

Another recommendation is that it would be beneficial to obtain permission to review the histopathology reports and/or to obtain consent to contact the physician that the participants who followed up saw in order to ensure that an accurate diagnosis and treatment

are recorded for each follow up participant. Additionally, obtaining the histopathological diagnosis from the physician will allow those conducting the study to calculate positive and negative predictive values of the efficacy of the community skin cancer screening program.

CONCLUSION

Between 2006-2013, a total of 1,979 community members were seen at a skin cancer screening sponsored by the Skin Cancer Institute. Of these individuals, 725 (37.5%) were referred to their own dermatologist or health care provider for further evaluation of a suspicious skin lesion. A total of 441 referrals consented to be contacted for a follow-up study, but only 120 individuals returned a follow-up questionnaire. However, the majority of participants who returned a follow-up questionnaire (90 participants, 75%) were compliant with recommendations to receive further evaluation of a suspicious skin lesion. However, with this low response rate (28%), it is difficult to draw conclusions about the significance of the responses that were obtained from the questionnaires that were received. Also, without the histopathology reports to confirm the diagnoses in the follow-up participants, positive and negative predictive values could not be calculated.

Among those participants in the follow-up study, all of whom had a suspicious lesion at the screening, two (2.33%) reported that their biopsy results were melanoma, seven (8.14%) reported that their biopsy results showed squamous cell carcinoma, fourteen (16.28%) reported that their biopsy results were basal cell carcinoma, eighteen (20.93%) stated that their biopsy results were diagnosed actinic keratosis, and three (1.16%) reported that their biopsy results showed dysplastic nevi. In turn, this demonstrates that the skin cancer screenings played a role in the diagnosis of both precancerous and cancerous lesions in this community sample. Overall, additional data from participants with suspicious skin lesions who are instructed to follow up for further evaluation is necessary for determining the efficacy of the screening events.

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