ABSTRACT

The incidence of skin cancer is rising drastically and is believed to be at epidemic proportions. Although preventive efforts have focused mainly on increasing public knowledge of the dangers associated with ultraviolet radiation, increased knowledge does not consistently translate into safe sun practices. The present study provided a "snapshot" of knowledge, attitudes and actual behaviour related to sun safety in a sample of 2,064 individuals attending a major community event. Despite almost uniform acknowledgment of a sun-cancer link, and the belief that certain behaviours can reduce the chances of getting skin cancer, only 38% of respondents reported wearing sun screen. Differences in sun safe behaviours were observed across age groups. The present results emphasize the need to target behaviours as well as knowledge and attitudes regarding sun safety.

ABRÉGÉ

L'incidence du cancer de la peau augmente rapidement et on pense que ce problème a atteint des proportions épidémiques. Bien que les efforts de prévention soient centrés principalement sur la sensibilisation du public aux dangers associés aux radiations ultra-violettes, de meilleures connaissances ne sont pas forcément reliées à des pratiques plus sécuritaires en matière d'exposition au soleil. Cette étude présente un tableau pris sur le vif des connaissances, des attitudes et du comportement des gens dans ce domaine, à l'aide d'un échantillon de 2 064 personnes participant à un événement communautaire majeur. Bien que la plupart des gens soient conscients du lien entre le soleil et le cancer, et savent que certains comportements peuvent réduire les risques de contracter un cancer de la peau, seulement 38 % des répondants ont signalé qu'ils avaient appliqué un filtre solaire. Des différences sur le plan du comportement face au soleil sont notées selon le groupe d'âge. Ces résultats soulignent le besoin de viser certains comportements aussi bien que certaines connaissances et attitudes en matière d'exposition au soleil.

Ultraviolet Radiation and Safety Behaviours at an Outdoor Community Event

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Despite the lack of a strong direct epidemiological link between sun exposure and skin cancer, there is currently sufficient indirect evidence to implicate ultraviolet radiation (UVR) from the sun as a major correlate of skin cancer.^{1,2} In 1995, the National Cancer Institute of Canada estimated that there were 63,850 new cases of skin cancer, of which 3,050 were new cases of melanoma.³ The estimated Canadian lifetime probability of developing melanoma is 1%, and melanoma is the most rapidly increasing form of cancer in males at an estimated rate of 4.5% annually (1% annual increase in females).³ In the last decade there has been an increase in research devoted to UV radiation and its effects on the skin. At an international symposium on diseases related to UVR (Ottawa, 1992) various medical experts and public health organizations concluded that "exposure to UVR must be reduced as much as possible, and where such exposure cannot be avoided, eyes and skin must be protected against the adverse effects of UVR".² Consequently, Health Canada and Environment Canada in association with the Canadian Cancer Society have supported efforts to develop and disseminate consistent information concerning what is known about UVR, the health risks associated with UVR exposure and the strategies to reduce UVR exposure and related health risks.⁴

The development and evaluation of educational programs is one area of research that has endeavoured to raise public knowledge of sun hazards with the express aim of increasing sun safe behaviours. These programs are often aimed at children and adolescents because of their increased exposure and vulnerability to the harmful effects of the sun.⁵⁻⁷ Most educational programs are successful at increasing participants' knowledge about the hazards associated with exposure to the sun. However, it is clear that increased knowledge does not necessarily translate into sun safe behaviours.⁷⁻¹⁰ In a population with non-melanoma skin cancer, Robinson found that old sun habits were difficult to break, even with continual education.¹¹ There appear to be several moderators of safe sun behaviour, including but not limited to age, sex and attitude.^{8,12-16} A review of the psychological literature concerning sun tanning and sun protection can be found in Arthey et al.¹⁷

The purpose of the present study was to obtain a "snapshot" of general sun knowledge versus actual sun behaviour. Most studies to date have relied solely on subjective self reporting of past and intended future sun behaviours. By observing what the participants were actually doing to protect themselves from the harmful effects of the sun, the present study was able to overcome some of the inherent problems associated with self reporting (e.g., social desirability).

METHODS

The population of study was a convenience sample of persons attending the 12th Annual Teddy Bears' Picnic (July 1995) sponsored by the Children's

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Hospital of Eastern Ontario. The annual picnic is a free public community event attracting approximately 30,000 people. Although attendees represented a good cross-section of the local population, the majority were families with young children. The weather on that day was cool and cloudy with both sunny and rainy periods. The UVB index for the day registered at 8.4 (this level of UVR falls into the high-risk reference category).

A brief survey was conducted concerning general knowledge and attitudes as well as specific behaviours related to sun safety. A one to two minute questionnaire was read to the participants by one of 20 trained volunteer interviewers. There were approximately equal numbers of male and female interviewers, who each had a predetermined geographical area to cover. Volunteers were recruited through their association with the hospital and were primarily university students and hospital staff who were not otherwise directly involved with this project. They were not informed about any specific associations to be investigated. Interviewers made direct observations before the interview for all participants with respect to sun safe behaviours (i.e., whether they were wearing a sun safe hat—one that covered the ears). Potential participants were approached randomly while they were waiting in line for picnic activities, and informed consent was obtained orally. Objective information on age, sex and sun screen use was gathered first, followed by subjective information on perceived skin type and likelihood of skin to burn. In addition, 905 participants (individuals over the age of 11) were identified as respondents for additional questions on attitudes and knowledge about sun safety. These questions were answered at the very end of the interview. This order of data collection was consistent across interviewers.

RESULTS

A total of 2,080 individuals were approached for their participation and a 99% response rate was obtained. Of the 2,064 respondents, 41.7% were male and 58.3% female; the mean participant age was 20.4 years (sd=16.9). Each volunteer tallied the number of individuals who

TABLE I
Percentage of Individuals Wearing a Hat/Safe Hat and Responding Positively to Survey Questions, by Age and Sex

		Age in Years				
		0-3 (n=384)	4-10 (n=561)	11-19 (n=104)	20-39 (n=743)	40+ (n=263)
Wore a hat	male	73.5	69.8	62.5	45.1	53.5*
	female	67.6	47.2	30.9	20.1	26.4*
Wore a safe hat	male	41.0	22.3	0.0	9.2	20.0*
	female	49.5	27.1	10.4	8.7	14.4*
Wore sun screen	male	46.4	42.5	31.3	28.7	26.2*
	female	47.6	38.0	43.7	39.1	38.6
Burns easily	male	38.7	38.2	16.7	34.3	31.0
	female	49.2	37.4	26.8	44.4	46.2†
Skin type: light-med	male	82.2	73.0	51.7	69.2	72.0†
	female	85.4	77.0	65.7	79.0	71.2†
	male	17.8	27.0	48.3	30.8	28.0†
	female	14.6	23.0	34.3	21.0	28.8†

$\chi^2_{(4, n=2055)}$ * $p = 0.000$ † $p < 0.01$

TABLE II
Reasons Given by Respondents for Not Wearing Sun Screen

	N	%
Weather	448	75.3
Never use / allergic	45	07.6
Wearing protective clothing	30	05.0
Forgot to apply	20	03.4
Never burn	15	02.5
No time to apply	11	01.8
Could not be bothered	09	01.5
UV index too low	05	00.8
Do not believe in it	04	00.7
Other (e.g., financial reasons, only for kids, want a tan)	08	01.3

Note: Percentages based only on those individuals who provided a reason for not wearing sun screen. In 61 cases there were missing data or no reason was provided.

Table III
Significant Covariates in the Final Logistic Regression Models

Sun Screen Use		Odds Ratio	95% CI
Age (reference category ages 0-3)	4-10	0.78	(0.59 - 1.03)
	11-19	0.94	(0.58 - 1.51)
	20-39	0.65*	(0.49 - 0.85)
	≥40	0.58*	(0.41 - 0.81)
Skin Type (reference category - med-dark)		1.28†	(1.01 - 1.63)
Burn (reference category - not likely to burn)		1.62‡	(1.32 - 1.98)
Safe Hat Use			
Age (reference category ages 0-3)	4-10	0.41‡	(0.30 - 0.56)
	11-19	0.11‡	(0.05 - 0.25)
	20-39	0.12‡	(0.08 - 0.17)
	≥40	0.26‡	(0.18 - 0.39)
Burn (reference category not likely to burn)		1.42*	(1.12 - 1.81)

* $p < 0.01$ † $p < 0.05$ ‡ $p = 0.000$

refused to complete the questionnaire; however, no information was gathered on these 16 refusers.

Table I summarizes participants' behavioural data by age category and sex. Information was requested on their per-

ceived skin type (light-medium or medium-dark), whether they burned easily, whether they were wearing sun screen and the level of UV protection provided by the sun screen worn.

Of the total sample, 76% described themselves or their children as having light to medium skin type and 39% reported that they burned easily. Only 38% reported wearing sun screen on the day of the survey. Among those who wore sun screen, 99% wore SPF 15 or greater. Sun safe behaviours were highest for the infant age category (0-3 years) and decreased in frequency for age categories 4-10, 11-19 and 20-39. Those in the infant age category were most likely to be rated as having light-medium skin type and to burn easily. Those in the adolescent age category (11-19) were most likely to rate themselves as having medium to dark skin type and to indicate that they were least likely to burn.

For the subsample of respondents over 11 years of age ($n=905$; mean age = 34.3, $sd=10.1$; 43.0% males, 57.0% females), 98% indicated that they believed there is a link between exposure to the sun and skin cancer. Ninety-six percent believed that wearing sun screen and suitable clothing can protect against skin cancer. Despite their knowledge of the sun-cancer link, only 35% reported wearing sun screen on the day of the survey, and only 10% were wearing a safe hat. Table II lists the reasons respondents gave as to why they did not wear sun screen. The overwhelming response was that the weather that day (cool, and cloudy with sunny and rainy periods) did not require any protection.

Logistic regression analyses were performed to predict who would be most likely to use each of two sun protection strategies (i.e., sun screen, safe hat). Crosstabulations were first run examining sex, age categories, perceived skin type and the propensity to burn, by sun protection strategy. Variables significant through bivariate analysis were entered into a logistic regression model in order to calculate odds ratios and 95% confidence intervals. Since there was no variability in the answers to the two knowledge questions (over 95% responded accurately to each question) they were not included in the regressions. Table III lists the variables that

were significant predictors for each sun protection strategy (i.e., age category, perceived skin type and propensity for skin to burn easily). Individuals between the ages of 20 and 29 and those 40 and over were less likely to wear sun screen than those in the 0-3 age category. Individuals who perceived their skin type as light-medium and easy to burn were more likely to wear sun screen than those who viewed their skin as medium-dark and not easy to burn. Variables that predicted wearing a safe hat were age category and likelihood for skin to burn. Specifically, all age groups were less likely than the youngest age group (0-3) to wear a safe hat. In addition, those who reported that their skin burned easily were more likely to wear a safe hat than those who reported that their skin was not likely to burn.

DISCUSSION

Environment Canada provides a daily UV index accompanied by a health message. Despite a high-risk UVB index for the day in question, 75% of individuals who did not wear sun screen gave the weather as their reason. An additional 1% reported not wearing sun screen because the UV index was too low. It is possible that individuals in the present study were not aware of the daily UV Index, did not understand it, or did not believe it was useful information. As these questions were not asked in the present study, future research should try and clarify the extent to which Environment Canada's UV index is consulted and whether the information provided is understood. An important health message that should continue to be put forth is that cloudy and overcast days do not protect the skin from the harmful effects of the sun.

Although our findings show that sun screen use in the younger age groups (0-3, 4-10 and 11-19) was higher than in the 20-39 and 40+ age groups, there were still more infants, children and youth who did not wear sun screen than who did. Infants' and children's sun behaviour is largely in the hands of their parents. Studies have found that sun protection in children, either in the form of sun screen use or sun exposure, is predicted by sun protection in

parents.^{13,18} Furthermore, Lowe et al. found that students in grades 7, 9 and 11 ranked their parents as the persons most likely to encourage them to protect themselves from the sun.¹⁶ These findings suggest that adult health education is as important as child and adolescent education. Parents need to be reminded of the importance of modelling irrespective of the direct precautions they may take to protect their young children. Modelling of appropriate behaviours by parents is more likely to change long term patterns of behaviour in children than a "do as I say, not as I do" approach.

The type of behaviour targeted for change is also relevant. For example, Fritschi et al. found that hat wearing was a sociocultural behaviour and less likely to change than sun screen use.¹⁹ In the present study, although many individuals wore some type of hat on the day in question, this was not necessarily related to safe hat use (62.5% of adolescent males wore a hat, 0% wore a safe hat).

There are certain limitations to our study that require mentioning. First, the "broad brush snapshot" approach that was taken to evaluate knowledge, attitudes and behaviours clearly restricts the conclusions that can be drawn from the data. The representativeness of the one point in time assessment of overall sun protection behaviour is questionable. In order to further evaluate the relationships between attitudes and behaviour, the study could be repeated under different weather conditions. Second, although our sample was generally representative of the population of families with young children, the adolescent age group was significantly underrepresented, and further study of this age cohort is recommended. Third, in our attempt to avoid being overly intrusive, we did not attempt to cross-validate statements about sun screen use. Consequently, sun screen use and SPF factor may be overestimated in our survey.

The data on knowledge confirm previous research suggesting that there is a good appreciation of the risks associated with sun exposure. As well, when asked, individuals do agree that certain sun safe behaviours can decrease the risks associated with sun exposure. The present findings

strongly suggest that knowledge of the risks and of the related protective measures that can be taken do not always translate into appropriate behaviours. Therefore, efforts that target solely knowledge and attitudes may well have limited impact on actual behaviours. This may be particularly the case for specific groups of individuals within the general population. Future studies could include on-site interventions targeting behaviours as well as attitudes, such as the Rhode Island Sun Smart Project.²⁰ The potential costs of unsafe sun behaviours are well worth the continued efforts in this area.

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