Changes in the pattern of sun exposure and sun protection in young children from tropical Australia

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Background: Australia has one of the highest rates of skin cancer globally. Lifetime risk is associated with childhood sun exposure.

Objective: We sought to investigate whether skin cancer prevention programs have resulted in improvements in sun-exposure and sun-protection behavior among young children in tropical Australia.

Methods: Two cohorts of 12-to 35-month-old children from Townsville, Australia, were compared: cohort 1 was recruited from hospital birth records (1991) and cohort 2 was recruited via local child-care centers (1999-2002). Children's phenotypic characteristics were assessed. Parents completed questionnaires detailing children's demographic characteristics, and sun-exposure and sun-protective practices.

Results: Although 1-year-old children from cohort 2 spent more time in the sun than those from cohort 1 (median 2.2 vs 2.8 h/d; $P = .002$), a higher proportion almost always wore sunscreen and a swim-shirt year round. Although more 1-year-old children in cohort 2 had experienced a sunburn (35.5% vs 51.2%; $P = .007$), both cohort 2 age groups experienced fewer hours of sun exposure to the back of the trunk ($P < .001$), were less likely to have been sunburned on the back/shoulders (age 1 year 34.8% vs 10.1% and age 2 years 52% vs 10.1%; $P < .001$), and acquired fewer melanocytic nevi at these sites ($P < .001$).

Limitations: There was potential for socially desirable responses (information bias).

Conclusion: Although duration of sun exposure in early childhood did not decrease during an 8-year period, reported use of personal sun protection did. The observed increase in popularity of swim-shirts and sunscreen between cohorts coincided with the development of significantly fewer melanocytic nevi in these children. (J Am Acad Dermatol 2013;68:774-83.)

Key words: early childhood; melanocytic nevi; skin cancer prevention; sun exposure; sun protection; sunburn; trends over time; tropical Australia.

Queensland, Australia, has one of the highest rates of skin cancer[1] with melanoma incidence continuing to increase.[2] The risks of developing melanoma and melanocytic nevi (MN), the strongest risk factor for melanoma,[3] are directly linked to high levels of sun exposure in early childhood.[4-6] Evaluation of prevention campaigns suggests sun-protective behaviors have improved[7-9] but

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This research was supported by funding from the Australian National Health and Medical Research Council and Queensland Health. Drs Harrison and Nowak received some salary support from the Cancer Council Queensland.

Conflicts of interest: None declared.

Presented by Dr Smith at the First International Conference on Ultraviolet and Skin Cancer Prevention in Copenhagen, Denmark, on May 4, 2011 as "Skin Cancer Prevention Beginning in Childhood: An Australian Perspective."

Accepted for publication October 27, 2012.

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Published online December 26, 2012.
0190-9622/$36.00

http://dx.doi.org/10.1016/j.jaad.2012.10.057

it is uncertain whether this will translate into a reduction in melanoma incidence.

National Skin Cancer Prevention goals for Australia target children and adolescents for primary prevention[10] and align with those of the World Health Organization[11] to minimize sun damage and foster lifelong sun-protective behaviors.[10] These are best achieved through multifaceted skin cancer programs[9] advocating use of shade, sunscreen, hats, and clothing, and sun avoidance at peak ultraviolet (UV) radiation times,[7,12] some of which are underused, particularly in childhood.[10,13]

MN, the precursor lesions of up to 60% of melanomas,[14] are the most important biomarker for melanoma.[3,15] Children raised in Queensland, Australia, develop MN earlier and in higher numbers than children raised elsewhere.[5,16,17] As nevus development is related to sun exposure during childhood,[5,16] MN offer a short-term measure of the efficacy of sun protection thereby facilitating objective assessment of skin cancer prevention programs.[13]

Few studies have evaluated trends in childhood sun protection using modifiable biomarkers such as MN.[13] We assessed changes in sun-safety practices during a period of more than 8 years to inform current and future skin cancer prevention activities.

CAPSULE SUMMARY

- The risk of developing melanoma and melanocytic nevi is linked to high levels of sun exposure in early childhood.
- Although sun exposure in early childhood did not decrease over an 8-2year period in Townsville, Australia, reported sun-protective practices improved and children developed significantly fewer melanocytic nevi.
- Maintaining the focus on reducing sun exposure and increasing sun protection in infants and young children is important, particularly in regions of high ultraviolet radiation.

METHODS

Sun-protective practices of 2 cohorts of 12-to 35-month-old children from Townsville, Australia, were compared more than eight years apart: in 1991 and in 1999 through 2002. Townsville (latitude 19°16'S) in North Queensland, Australia, has a dry, tropical climate and high levels of ambient solar UV radiation throughout the year.[18]

Recruitment

The first cohort was recruited in 1991 from hospital birth records of the 2 main maternity hospitals in Townsville, Australia. A letter and questionnaire were sent to mothers, inviting them to participate. Cohort 1 included all children younger than 3 years from the original article.[5] This subset was selected to match the approximate age of cohort 2. There were 201 children who fulfilled the inclusion criteria: Caucasian (at least 3 grandparents of European origin), with parents who intended to remain in the study area and provided written consent. Cohort 1 included 201 children (n = 95 age 1 year [12-23 months] and n = 106 age 2 years [24-35 months]).

The second cohort was recruited via 26 local child-care centers in Townsville, Australia, between 1999 and 2002. In all, 25 (96.2%) child-care centers participated. Center directors provided enrollment lists (first name, date of birth, and attendance pattern of children age <3 years). A study information sheet, questionnaire, and consent form were sent to parents of eligible children via child-care centers. The inclusion criteria for cohort 2 were the same as for cohort 1 plus regular attendance at a participating child-care center between November 1999 and July 2002. Cohort 2 included 463 children aged 12 to 35 months (n = 394 age 1 year [12-23 months] and n = 69 age 2 years [24-35 months]). Cohort 2 formed the baseline group for a randomized controlled intervention trial to determine whether the development of MN in early childhood can be prevented or delayed by using sun-protective clothing.[13]

Demographics

Age (months), sex, place of birth, and time spent in the tropics were determined from birth and child-care records and parent questionnaires. Socioeconomic status of the child's suburb was classified using the Socioeconomic Indexes for Areas (3 levels).[19] Parents' education levels were determined from questionnaires, and ethnicity was assessed according to the number of the child's Caucasian grandparents.

Clinical examination (phenotype and MN)

Hair and eye color were recorded by reference to standard charts as described previously[5] and categorized for analysis following the method of Kelly et al.[17] Skin reflectance of the inner upper aspect of the arm was determined using a reflectance spectrophotometer (Colormet 3.1, Instrumar, St John's, Newfoundland, Canada, at 680 nm [cohort 1]; Evans Electroselenium Ltd, model 99; Diffusion Systems Ltd, London, United Kingdom at 685 nm [cohort 2]) for