The Framingham School Nevus Study

A Pilot Study

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Objectives: To (1) describe nevus patterns using digital photography and dermoscopy; (2) evaluate the relationship between host and environmental factors and prevalence of nevi in schoolchildren; and (3) demonstrate the feasibility of conducting a longitudinal study.

Design: Cross-sectional survey and 1-year prospective follow-up study.

Participants: Students from 2 classrooms, grades 6 and 7, in the Framingham, Mass, school system (N=52).

Main Outcome Measures: A survey was completed by students and 1 of their parents that included questions on demographic and phenotypic characteristics, family history of skin cancer, and sun exposure and protection practices. An examination of nevi on the back was performed that included digital photography and digital dermoscopy. Follow-up child and parent surveys and examinations were conducted at 1-year follow-up.

Results: At baseline, the median number of back nevi was 15 (mean [SD], 21.9 [15.3]). Older age, male sex, fair skin, belief that a tan is healthier, tendency to burn, and sporadic use of sunscreen were positively associated with mole count, although age was the only statistically significant factor. Predominant dermoscopic patterns for the index nevus were as follows: 38% globular, 14% reticulated, 38% structureless, and 10% combinations of the above patterns with no predominant characteristic. The overall participation rate from baseline to follow-up was 81% (42/52) for the skin examination process. At the 1-year follow-up examination, new nevi were identified in 36% of students (n=15), while 9.6% of baseline index nevi had changes in the dermoscopic pattern. Dominant dermoscopic pattern was related to nevus size: smaller nevi tended to be structureless, while larger nevi were of mixed pattern.

Conclusion: This study supports the feasibility and utility of digital photography and dermoscopy for the longitudinal study of nevus evolution in early adolescence.

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THE INCIDENCE AND MORTALITY rates of melanoma continue to rise at exceptionally high rates.[1] Melanoma is more common in people with many moles (nevi) and/or atypical (dysplastic) nevi.[2-6] Current knowledge of the evolution of nevi has been largely derived from cross-sectional studies, which suggest that adolescence is an important time of life for the formation and evolution of nevi.[7-10] However, there has been very limited research on the formation and evolution of individual common nevi during adolescence.

Knowledge of the evolution of nevi in children derives primarily from cross-sectional studies using visual examinations to identify and document nevi.[7,8,11-20] Many of these studies distinguish between common acquired and atypical (dysplastic) nevi. Common acquired nevi by definition are absent at birth, often present in the early years of childhood, present in greater numbers in early to middle life, and do not multiply thereafter.[21] They predominate on sun-exposed skin above the waist. It is generally believed that the common acquired nevus undergoes a predictable evolution over a period of years or decades. Initially, it appears as a tiny pinpoint macule (1 to 2 mm in diameter, uniformly tan or brown but occasionally black) and gradually enlarges to a maximum size of 4 to 6 mm.[21,22] Cross-sectional studies consistently demonstrate that nevi increase in number with age during childhood and adolescence and that sun exposure is an important correlate of the development of nevi. Older children (ages 13-14 years) have 30% to 50% more nevi than younger children (ages 9-10 years).[12] Several studies have shown that constitutional factors such as hair, eye,

and skin color as well as environmental factors are associated with the number of nevi.[7,8,12-20,23,24] Common acquired nevi appear to be at least 3-fold less common in blacks and Asians than in whites.[14,20,25,26]

Like common acquired nevi, atypical (dysplastic) nevi are by definition absent at birth. An early predictive factor is an increased number of morphologically normal nevi, first noted around age 5 to 8 years, and the development of nevi in the scalp area.[21] The characteristic clinical features of dysplastic nevi generally do not appear until ages 10 to 15 years, at which time the number and appearance of an affected patient's nevi may change dramatically: 21% of Australian children aged 15 years have at least 1 dysplastic nevus compared with 11% of 9-year-olds.[23] Cross-sectional observations have also led to the recognition in some children and adolescents of large darkly pigmented nevi with features similar to small congenital nevi.[27]

Nevi appear to share a common causal pathway with melanoma that involves interplay between constitutional factors and sun exposure.[12] It has been proposed that, akin to the model of tumor progression in colonic neoplasia described by Vogelstein et al,[28] nevi represent intermediate steps in the evolution of a significant subset of superficial spreading melanomas, the most common histogenic subtype of the disease.[22,29] Recent studies distinguish between common nevi and atypical (dysplastic) nevi as important risk markers and lesional steps in melanocytic tumor progression.[2,3,30] A limitation of these studies is the lack of a consistent definition of nevi, which is related to the existing controversy surrounding the clinical and histologic definitions of common and atypical nevi.[31] An improved understanding of the natural history of nevi at the subsurface (dermoscopic) level may generate new biologic hypotheses regarding the evolution of nevi.

Knowledge of the causes and evolution of nevi has significant public health importance for the primary and secondary prevention of melanoma. Understanding the evolution of nevi during adolescence is important for improving the early detection of relatively rare melanomas that occur in this age group and perhaps even more important for avoiding unnecessary excisions of large numbers of changing benign nevi. We report the results of a pilot study in schoolchildren, grades 6 and 7, in Framingham, Mass. This study provides preliminary data for the first population-based longitudinal study of nevi in US children. The overall objectives of the study were to describe nevi patterns using digital photography and dermoscopy, evaluate the roles of host and environmental factors and prevalence of nevi in schoolchildren, and demonstrate the feasibility of conducting this type of research in a cohort of US schoolchildren.

METHODS

STUDY SITE AND STUDY OVERVIEW

The present study was conducted with children and their parents from the Framingham, Mass, school system. We identified 2 classrooms from grades 6 and 7 and obtained informed consent from 100% of the children and their parents (N=52). Children were asked to complete a self-administered survey, and a survey was also provided to 1 parent of each child for completion. During December 2001, skin examination and photography of back nevi were performed in concert with mandatory screening examinations for scoliosis (curvature of the spine) that are conducted annually in Massachusetts for grades 5 through 9. Follow-up child and parent surveys and skin examinations were conducted 1 year later.

SKIN EXAMINATION AND PHOTOGRAPHY PROCESS

The examination was limited to the back and included digital photography and digital dermoscopy. The study examination took an average of 2.5 minutes for boys and 3 minutes for girls. All children completed an informal exit interview to elicit feedback about the study process. The only significant complaint reported by the children was that the room was too cold.

The scoliosis examination was performed by the school nurse behind a privacy curtain. Boys were asked to remove their shirts, and girls were asked to wear a loose fitting shirt (with a bathing suit underneath) that could be readily lifted off and draped in front of them.

At baseline, immediately following the scoliosis examination, an overview digital photograph of each student's back and a close-up digital photograph of the largest nevus on the back were taken. Digital dermoscopy was also performed on the largest nevus. Appropriate clothing and draping techniques were used in consideration of the student's comfort and modesty.

The school nurse instructed the student to hold his or her hair off the shoulders and neck, using an elastic band or hair clip as necessary. For girls, the nurse lifted up the straps of the swimsuit top to ensure that no nevi were hidden and so that all nevi could be assessed. Also, if the tops of pants covered the iliac crest, the nurse instructed the student to roll the top of the pants slightly so that the back area near the iliac crest could be photographed.

The area photographed was defined from the nape of the neck to the posterior iliac crests. The field of view of the photographs was 51 cm (20 in) wide and 76 cm (30 in) high. The largest pigmented nevus on the back was chosen for close-up photography and dermoscopy by 2 examiners, a nondermatologist and a dermatologist. Agreement was reached in 49 of 50 instances. At the 1-year follow-up examination, the number of nevi undergoing close-up and digital photography was increased to 4 per student.

Close-up photographic and dermoscopic images were obtained using a digital camera system with and without an epiluminescence microscopy attachment. The overview and close-up pictures were automatically stored directly on a laptop computer in a proprietary database archived by study number, nevus number, image type, and date. The pictures were encrypted on entry into the database and viewable only through the secure software. Security level access to the software is available only to key study personnel.

CHILD AND PARENT SURVEYS

The child and parent surveys were self-administered at baseline and at 1-year follow-up. They included questions on demographics, skin type, family history of skin cancer (parents only), eye and hair color, and sun protection practices, including the use of hats and sunscreen, limiting time in the sun, seeking shade, and frequency of sunburns. Parents were also asked questions regarding their child's sun protection practices and exposure.

IMAGE ASSESSMENT

The digital images were reviewed for clarity by 2 dermatologists (A.A.M. and A.C.H.). All overview images were of excellent quality and consistent resolution, readily permitting the recognition

of nevi 2 mm or more in diameter and the distinction of nevi from inflammatory lesions. The inclusion of fiducial size markers, as a fixed basis for comparison, demonstrated consistency of magnification in the images as viewed on the monitors. All close-up photographic and dermoscopic images were sharp and readily evaluated for the presence of clinical and dermoscopic features. Inclusion of fiducial markers in the images demonstrated excellent consistency of color rendition on calibrated monitors. Dermatologists (A.A.M. and A.C.H.) counted back nevi independently. The interobserver nevus counts were highly correlated with a correlation coefficient, $r^2 = 0.97$.

The close-up photographic and dermoscopic images were assessed for individual clinical attributes, including nevus asymmetry, color, border, dermoscopic pattern (eg, globular, reticular, structureless, and complex/mixed), and the presence of dermoscopic structures (eg, globules). Following the first-year pilot examinations, all images were independently evaluated by the dermatologists. We conducted a small reproducibility study to determine whether a physician could be trained to correctly identify and categorize dermoscopic features of nevi according to the study protocol. A physician (A.A.M.) who participated in the pilot study and classified the dermoscopic features of the images was responsible for training a dermatologist (D.S.) who had not participated in the pilot study. Once the training session was completed, the 2 physicians independently reviewed the same 20 images. Nevi were evaluated for the presence or absence of each of 6 dermoscopic features: reticular pigment network, globules, structureless areas, blotches, dots, and streaks.

The results showed that there was consensus between the physicians regarding the presence or absence of dermoscopic patterns. The physicians achieved 100% agreement on reticular pigment network, 70% agreement on globules, 80% agreement on structureless areas, and 100% agreement on blotches. The κ values for interrater reliability for these patterns ranged from 0.35 to 1.0. Ninety percent agreement was reached for prominence of the reticulation (κ=0.73). None of the nevi in the reproducibility study appeared to have dots, streaks, blotches, or peripheral globules, and thus the interobserver agreement for these characteristics could not be evaluated. Based on these results, a further simplified schema was applied to the 1-year follow-up images. In the final schema, nevi were classified on dermoscopy into 4 groups: reticular, globular, structureless, and complex (mixed) based on the overall global pattern. Dermoscopic blotches, dots, streaks, peripheral globules, and vascular structures were considered local features and occurred infrequently. Thus, they did not change the overall lesion classification.

STATISTICAL ANALYSIS

Descriptive statistics were calculated to characterize the study cohort and describe the prevalence of back nevi. The prevalence of nevi was described by age group and median mole count. Univariate statistics including odds ratios and 95% confidence intervals were used to describe the relationship between host and environmental factors and median mole count. Dermoscopic features of the index moles at follow-up were presented using descriptive statistics stratified by size of the index nevi and upper vs lower back.

RESULTS

BASELINE RESULTS

We obtained informed consent from 100% (N=52) of the children and their parents. Completed surveys were returned for 51 of 52 children and parents. Examinations, digital photography and dermoscopy were performed on

Table 1. Demographic Characteristics of Student Population

Characteristic	Finding*
Mean (SD) age, y	12.4 (0.68)
Sex	
Male	22 (43)
Female	29 (57)
Race	
White	46 (90)
Nonwhite†	4 (8)
Color of untanned skin	
Very fair/fair	41 (80)
Olive/very dark	10 (20)
No. of sunburns during previous summer	
0	7 (14)
1	23 (45)
2	12 (24)
≥3	9 (18)
Do people look healthier with a tan?	
Yes	24 (47)
No	15 (29)
Don't know	11 (22)
What happens to your skin after you go outside in the sun for 45 minutes in the summer?	
Always burn	1 (2)
Usually burn	8 (16)
Sometimes burn	20 (39)
Rarely burn	21 (41)
How often do you apply sunscreen when you go to the beach or pool?	
Never/less than half of the time	15 (29)
Most days/every day	33 (65)
During the past summer, when outside, how often do you have sunscreen on?	
Never/less than half of the time	32 (63)
Most days/every day	18 (35)

*While n = 51, responses do not total 51 because of missing or incomplete questionnaire data. Unless otherwise indicated, data are number (percentage) of respondents.
†Asian, Hispanic, and other.

50 children (participation rate, 96%; 50/52); 2 children were absent from school on the day of the scheduled examination. The characteristics of the study cohort at baseline are summarized in **Table 1**; 90% were white; 57% were girls; and the median age was 12.5 years (range, 11-13.8). Eighty percent of children (n=39) stated that their skin was fair/very fair (corroborated by 97% of parents' responses [n=38]). Eighty-six percent of children reported having at least 1 sunburn the previous summer (n=42).

Parent respondents were generally female (n=44; 86%) with a median age of 42 years. Nearly two thirds of them (n=33) stated that they were at average to high risk of developing skin cancer. More than 25% (n=14) reported a first-degree relative with skin cancer, and 70% (n=36) reported themselves to be fair skinned.

At baseline, the median number of back nevi was 15, and the mean (SD) number of nevi was 21.9 (15.3) (range, 2-70) based on the review of digital images (**Figure 1**). The prevalence of nevi described by age is presented in **Figure 2**. An important and significant trend with increasing age and median mole count was observed. No differences were apparent when analyses were stratified by male vs female student. **Table 2** summa-
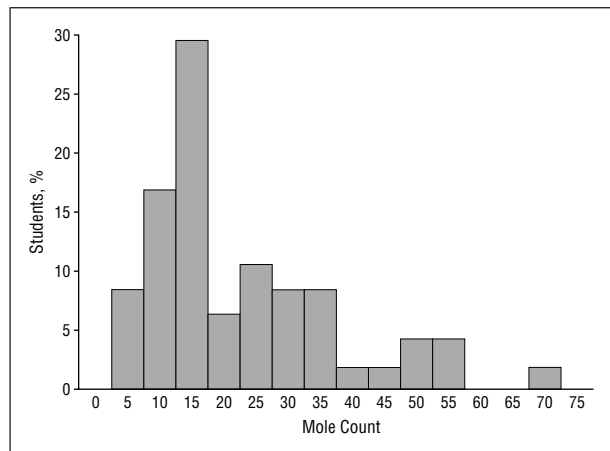
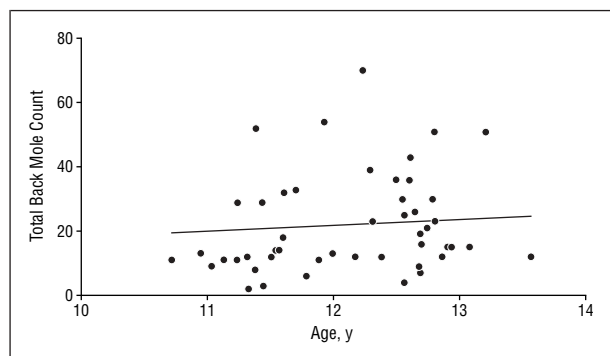**Figure 1.** Distribution of back mole counts in 50 students.

Figure 2. Scatterplot of number of back nevi by age of student (n=50). The regression line is based on simple linear regression with total mole count as the dependent variable and age as the predictor with the intercept being suppressed.

rizes the univariate statistics for host and environmental factors and median mole count. Older age, male sex, fair skin, belief that a tan is healthier, tendency to burn, and sporadic use of sunscreen were positively associated with higher median mole count, although only age was statistically significant.

On close-up clinical examination, the median diameter of the largest nevus was 4 mm, and the mean (SD) diameter was 4.3 (1.7) mm. Asymmetry was specified across 0, 1, or 2 axes. All nevi were asymmetric: 94% were asymmetric in 1 axis, and 6% were asymmetric in 2 axes. Clinical borders were assessed as fuzzy or distinct and as regular or irregular. Eighty-percent (40) of the nevi had fuzzy borders and 58% (29) had regular borders. Nevus color was assessed by the presence of 7 colors: light brown, medium brown, dark brown, red, black, white, and blue/gray. The predominant colors present in the nevi were the shades of brown: 62% (31) of the nevi contained light brown; 52% (26), medium brown; and 30% (15), dark brown. Red was observed in 20% (10) of the nevi, and black, white, and blue/gray were not observed in any of the index nevi.

All of these clinical features were compared between younger and older students (dichotomized at the median age), between boys and girls, and based on skin color (very fair to fair vs olive to very dark). There were no significant differences detected for any of these com-

parisons. No children demonstrated nevi requiring referral to a dermatologist. Nevi were classified into groups based on the predominant dermoscopic characteristic. Predominant dermoscopic patterns for the index nevus were as follows: 38% (19) globular, 14% (7) reticulated, 38% (19) structureless, and 10% (5) combinations of the above patterns with no predominant characteristic.

FOLLOW-UP RESULTS

At 1-year follow-up, 42 of 51 surveys (parent and child) were returned, for a response rate of 82%, and 42 of 50 children completed the follow-up examination, for a participation rate of 84%. There was an overall participation rate from baseline to follow-up of 81% (42/52) for the skin examination process. Of the 8 students who did not participate in the follow-up (42/50), 2 refused to participate, 2 were absent on the day of the examination, 2 had moved to nearby schools in Framingham, and 2 had moved to other school systems.

An increased number of nevi were observed at the 1-year follow-up examination: new nevi were identified in 36% of students (n=15). We assessed changes in dermoscopic pattern in the single baseline index nevus over the year follow-up interval and observed changes in 10% of these lesions (n=5). The results of the dermoscopic classification of nevi at the follow-up examination are summarized in **Table 3**. Dominant dermoscopic pattern appears to be related to nevus size: smaller nevi tend to be structureless, while larger nevi are of mixed pattern. Table 3 also summarizes the results of a stratified analysis for globular and reticular nevi by anatomic site, suggesting that reticulation is more common on the upper back.

COMMENT

We report results of a pilot study in Framingham, Mass, schoolchildren that describes the prevalence of nevi using digital photography and digital dermoscopy. This is the first study to document clinical and dermoscopic features of common nevi in schoolchildren using recent advances in technology and to explore the interrelationship between nevi and host and environmental factors.

Knowledge of the causes and evolution of nevi has significant public health importance for the primary and secondary prevention of melanoma. Public health campaigns and clinical efforts to reduce melanoma deaths currently target individuals with many nevi or apparently atypical nevi. Identification of factors that predict the development of multiple and atypical nevi will improve targeting of primary prevention efforts in early life. Because these factors may be apparent earlier in life, there is an opportunity to intervene when sun protection efforts are more likely to succeed. Nevus phenotype is currently used to identify high-risk individuals for directed efforts in sun protection and early detection. In regard to the secondary prevention of melanoma, recent efforts in early detection have intensified across all age groups with an emphasis on the importance of change in a nevus as a sensitive marker of early curable disease.

Our results showed that the median number of back nevi was 15, with a significant association of increasing

Table 2. Univariate Statistics by Median Mole Count in 50 Students

Variable	No. of Students*	Median Mole Count	OR (95% CI)†
Age			
Younger (11.0-12.3 y)	24	12.5	1.0
Older (12.4-13.5 y)	25	23	3.6 (1.1-11.4)‡
Sex			
Female	28	14.5	1.0
Male	21	25	2.5 (0.68-9.41)
Race			
White	44	18.5	1.0
Nonwhite§	4	7.5	. . .
Color of skin			
Olive/very dark	10	11.5	1.0
Very fair/fair	39	16	1.57 (0.41-6.07)
No. of sunburns in previous summer			
0-1	30	16	1.0
>1	19	15	0.90 (0.30-2.80)
Do people look healthier with a tan?			
No	15	14	1.0
Yes	24	21	1.6 (0.49-5.87)
Don't know	10	10	0.50 (0.09-2.66)
What happens to skin after 45 minutes in sun?			
Sometimes/rarely burn	40	15	1.0
Always/usually burn	9	25	1.38 (0.34-5.50)
How often do you apply sunscreen when you go to the beach or pool?‖			
Routinely	13	13	1.0
Sporadically	33	18	2.70 (0.71-9.98)
During the past summer, when outside, how often did you have sunscreen on?‖			
Routinely	8	12	1.0
Sporadically	40	17	3.31 (0.66-13.1)

Abbreviations: CI, confidence interval; OR, odds ratio.
*Responses do not total 50 because of missing or incomplete data.
†Odds ratio for association between variable of interest and higher median mole count. Ellipses indicate unable to provide OR estimate owing to small contingency cell counts
‡*P*<.05.
§Asian, Hispanic, or other.
‖Sporadically includes "never" and "most days"; routinely includes "every day."

Table 3. Dermoscopic Pattern by Size and Site of Index Mole at Follow-up Examination of 50 Students*

| Characteristic | No. (%) of Moles | | | |
	Structureless	Globular/Reticular	Mixed	Total (N = 155)
Size, mm				
≤2.0	26 (40.6)	22 (34.4)	16 (25.0)	**64**
2.1-4.0	16 (24.6)	23 (35.4)	26 (40.0)	**65**
≥4.1	2 (7.7)	8 (30.7)	16 (61.5)	**26**
Site				
Upper back	NA	17 (39.5)/8 (80.0)	NA	NA
Lower back	NA	26 (60.5)/2 (20.0)	NA	NA

Abbreviation: NA, not applicable.
*Each student contributed up to 4 index nevi.

age with higher median mole count. Older age, male sex, fair skin, belief that a tan is healthier, tendency to burn, and sporadic use of sunscreen were positively associated with mole count, although age was the only statistically significant factor. Predominant dermoscopic patterns for the index nevus were as follows: 38% globular (n=19), 14% reticulated (n=7), 38% structureless (n=19), and 10% combinations of patterns (n=5). It has been observed that globules are often seen in enlarging and congenital nevi.[32,33] The fact that 38% of nevi were globular might suggest that many of these nevi were growing or congenital. We may have selected for this by evaluating young children and selecting the largest nevi for close-up photography. A total of 19 (38%) of the nevi were structureless, and this may also be consistent with a congenital pattern.[34] However, it should be noted that studies have found congenital nevi to be prevalent in only 1% to 6% of the population and the interpretation that these small nevi are congenital is only suggestive.[23,35,36]

Only 3 longitudinal studies have examined the evolution of nevi in individual children over time and assessed the relationship between nevus evolution and risk

factor exposures.[17-19] Two large studies conducted in Europe and Canada assessed nevi in children at 2 time points.[18,19] The European study included 377 children examined at ages 7 and 12 years, and the Canadian study conducted entrance and exit examinations of 309 first and fourth graders who were part of a 3-year randomized trial of broad-spectrum sunscreen use. Both studies used nevus counts obtained from clinical examination. The results showed a significant increase in nevus counts over time and a strong association between nevus count and skin type, pigmentation characteristics, and freckling. In a small cohort study of 102 Australian schoolchildren,[20] melanocytic nevi were counted, and in a subset of 20 students aged 12 to 14 years, all nevi of the face and neck were photographically mapped and clinically assessed annually during 4 years. This study of 20 adolescents represents the only longitudinal study of individual nevi in this age group to date. Over the follow-up period, nevus numbers increased 47% in the first year, with smaller increases in older students.[26]

The selection of the back as the anatomic focus for this study was based on logistic and epidemiologic considerations.[7,8] The existing infrastructure at the schools for administering scoliosis examinations along with the efficiency of restricting the study to the skin of the back resulted in very high participation rates and excellent data quality. The back as a site is ideal for photography studies because it is a relatively flat surface, and the surface area can be determined with precision, which is required for assessment of proportionate vs disproportionate nevus growth.[37] Although it would have been optimal to conduct a skin examination and photography of the full body, the utility and efficiency of restricting our study to the back is supported by several epidemiologic studies: English and Armstrong[8,38] have demonstrated the least interobserver variation for nevus counts of the back relative to other anatomic sites and excellent correlation between back nevus counts from photographs and those from direct examination. Autier et al[7] have demonstrated a strong correlation between back and total nevus counts and recognize the phenotype of back nevi as an excellent marker of melanoma risk.

We demonstrated the feasibility of implementing and conducting this type of research and maintaining high compliance with minimal loss to follow-up. The strength of this study is the high response rate achieved for survey completion and the skin examination and photography process. A limitation is the small size of the sample, which was a function of the pilot nature of the study. The cohort sampled represents a predominantly white group. The survey data used for this analysis was obtained from the responses from the child survey. In collecting data from parent and child, we recognize that discrepancies in responses will arise between them. Analysis of these discrepancies will permit an indirect assessment of the validity of responses and will be part of a separate study report.

Nevi appear to share a common causal pathway with melanoma that involves interplay between constitutional factors and sun exposure.[12] Recent studies distinguish between common and atypical (dysplastic) nevi as important risk markers and lesional steps in melanocytic tumor progression.[2,3,30] A limitation of these stud-

ies is the lack of a consistent definition of nevi, which is related to the existing controversy surrounding the clinical and histologic definitions of common and atypical nevi. An improved understanding of the natural history of nevi at the subsurface (dermoscopic) level may prove especially informative in this regard and will likely generate new biologic hypotheses regarding the evolution of nevi.

Understanding the evolution of nevi during adolescence is important for improving the early detection of relatively rare melanomas that occur in this age group and perhaps even more important for avoiding unnecessary excisions of large numbers of changing benign nevi. An analysis of data from patients aged 0 to 14 years (N = 96 255) seen in the Henry Ford Health System in the year 2001 shows that full-thickness excisions of suspect skin lesions (excluding shave excisions of epidermal or dermal lesions) were performed at rates of 1.2 per 1000 children aged 0 to 9 years and 4.2 per 1000 children aged 10 to 14 years (Christine Cole Johnson, PhD, personal written communication, January 2003). An extrapolation of these data to the 2000 US Census estimates suggests that there are over 125 000 full-thickness excisions of skin lesions performed on children younger than 14 years annually in the United States despite the very low incidence of skin cancer in this age group.

Dermatologists (A.A.M. and A.C.H.) counted back nevi images independently. The interobserver nevus counts were highly correlated with a correlation coefficient, $r^2 = 0.97$. On review, it was discovered that the primary source of nevus count discrepancies was the skipping and double-counting of nevi on freehand counts. A tagging tool provided in the image archiving software that permits tagging of each nevus as it is counted can be used to reduce these discrepancies.

We demonstrated the feasibility of conducting a study in US schoolchildren to determine the prevalence and dermoscopic features of back nevi and to attain high response rates and collect important data on host factors of children and parents. Health systems in schools can be natural settings for researchers to obtain high response rates. This study lays the foundation for future studies that will elucidate the relationship between nevus evolution and phenotype, genotype, and risk factor exposures in a population-based cohort.

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