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The anatomic distribution of melanoma and relationships with childhood nevus distribution in Colorado

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Abstract

The nature of the relationship between nevus development in childhood and later development of melanoma is unclear. Data on melanoma diagnoses by histologic type and anatomic site were obtained for 2351 white, non-Hispanics in Colorado from the Colorado Central Cancer Registry between 2000 and 2004. Nevus size and body site were ascertained during skin exams conducted in the summer of 2007 on 717 white, non-Hispanic children aged 8–9 years. Chi-square goodness-of-fit analysis was used to assess the association between the anatomic site distributions of nevi versus melanoma. Superficial spreading melanoma was the most frequent histology, followed by lentigo maligna melanoma. Nodular melanoma was the least common histology. For males, there was no significant difference between the distribution of medium-sized ($\geq 2\text{mm}$) nevi and the distribution of both superficial spreading and nodular melanomas. For females, there was no significant difference between the anatomic distribution of small-sized ($< 2\text{mm}$) nevi and the distribution of nodular melanoma, and there was marginal evidence for a difference between the distribution of medium-sized ($\geq 2\text{mm}$) nevi and the distribution of nodular melanoma. There was evidence for a difference between all of the nevus distributions and the distributions of superficial spreading and lentigo maligna melanoma in females. The similarities between the nevus and melanoma distributions are interesting findings, but it is difficult to interpret the significance of these findings based on the current state of knowledge of melanoma etiology.

Keywords

anatomic distribution; epidemiology; malignant melanoma; melanocytic nevi

Introduction

In addition to sun exposure, the presence of melanocytic nevi is a risk factor for melanoma development [1–4]. Nevus development begins in childhood and peaks in the third to fourth

decade of life [5]. Epidemiologic studies have demonstrated that sun exposure in early life is important in the etiology of both melanocytic nevi and of melanoma [6–8].

On the basis of the evidence that melanocytes are initiated by exposure to sunlight in early life, the hypothesis of different etiologies for melanoma development depending on the anatomic location of the primary site has been proposed. The divergent pathways hypothesis states that high cumulative sun exposure is necessary for the development of some melanomas, whereas in those who have a propensity to develop nevi, intermittent exposure to sunlight in the early stages of tumor development is sufficient to cause melanoma [9]. In nevus-prone individuals, melanomas tend to occur on areas such as the trunk, which receive intermittent exposure to sunlight. In those less susceptible to nevus development, melanomas tend to arise on the more chronically exposed sites and at older ages [9]. Different body sites receive varied amounts of sun exposure, yet melanomas occur on all parts of the body. This may represent differing pathways in the etiology of melanoma based on body location.

Cutaneous melanoma is divided into different histologies based on tumor attributes such as location on the body and tumor thickness, as well as pathological and molecular characteristics [10]. Superficial spreading melanoma (SSM) occurs more commonly on body sites categorized as intermittently exposed and at younger ages [11,12]. Nodular melanoma (NM) occurs more often on skin sites considered to be more chronically exposed to the sun, is more common at older ages, and is usually thicker compared with the other melanoma histologies [13]. Lentigo maligna melanoma (LMM) occurs later in life on chronically sun-exposed areas that often border sun-damaged skin [14].

Case-control studies that have assessed the presence of nevi at different sites across the body in melanoma patients and nonmelanoma controls to evaluate the site-specific relationship between nevi and melanoma have produced mixed results. Some studies have found a strong association between melanocytic nevus counts and melanoma occurrence [15,16], whereas other studies have found a weak association [17,18]. These have been largely cross-sectional studies in adulthood; however, and no studies have been published about the site-specific risk of melanoma as compared with the site-specific distribution of nevi in childhood. As there is evidence that the influence of sun exposure on nevus development occurs very early in life [19–21], it may be informative to examine the question of whether the anatomic distribution of nevi in childhood is similar to the anatomic distribution of melanomas in adulthood, and how those relationships might vary by melanoma type and age. If similarities between nevus distribution and melanoma distribution can be detected as young as 8–9 years of age, then this could have implications for identifying high-risk children at an early age. This study therefore compared the anatomic distribution of nevi in a cohort of Colorado children with the anatomic distribution of cutaneous malignant melanoma in Colorado adults.

Methods

Study population

Data on all cases of cutaneous malignant melanoma in individuals diagnosed between 2000 and 2004 were obtained from the population-based Colorado Central Cancer Registry, which is housed in the Prevention Services Division of the Colorado Department of Public Health and Environment. Only melanomas of three specific histologies were included in this analysis: superficial spreading, nodular, and lentigo maligna. The most rare melanoma type, acral lentiginous, which accounts for only about 5% of all melanomas, was not included in this analysis because it typically occurs on body areas such as the palms, soles, and mucous membranes and is more common in persons with darker skin [22]. The registry provided

information on age at diagnosis, sex, race, Hispanic origin, primary site, laterality, depth of tumor, stage, histology, and year of diagnosis for each case. All cases were de-identified. As race is an important risk factor for melanoma, this analysis was restricted to white, non-Hispanic melanoma cases. A total of 2445 cutaneous malignant melanoma cases were obtained from the registry. Of the total, 14 (0.6%) cases had a nonspecified primary site and were excluded. In addition, 19 (0.8%) were classified as non-white races and 61 (2.5%) were classified to be of Hispanic origin and were excluded. The final dataset contained 2351 cases of cutaneous malignant melanoma in 2351 non-Hispanic, white individuals.

Nevus data were obtained from 1 year of a 4-year longitudinal study that followed a cohort consisting of 1145 children born in the year 1998 between January and September. These children were selected from a large health maintenance organization, private pediatric offices, and community locations in the Denver, Colorado metropolitan area during 2003–2004 [23]. Skin examinations conducted during the summer of 2007 on 850 (response rate 74%) children aged 8–9 years generated the nevus data for this study. Skin examinations were conducted by a team of seven physicians and nurses who were trained in the clinical classification of pigmented lesions by the lead dermatologist (J.F.M.). Nevi were defined as pigmented macules or papules of any size, excluding freckles, café-au-lait macules, and warts. Nevi were differentiated from freckles and café-au-lait macules by the fact that only nevi are raised and that flat, early junctional nevi are dark brown, have regular edges, and do not occur in patches as do freckles [6]. The protocol for identifying nevi is consistent with the International Agency for Research on Cancer protocol and several other nevus studies in children [24]. This definition did not specifically distinguish nevi from lentigines and did not distinguish between normal and atypical nevi, although a previous study suggests that atypical nevi are extremely rare in children [25]. Congenital nevi were recorded separately and excluded from overall nevus counts. Nevus size was determined by using a stencil with holes of various sizes, which was placed over a nevus to assess its diameter. Nevi were counted across the entire body except for the scalp, genitals, and buttocks and location and size were recorded on a standardized body map. All examiners participated in duplicate exams each year to determine interrater reliability. A total of 53 duplicate exams were conducted in 2007 and the interrater reliability coefficient was 0.88. This analysis was restricted to 717 white, non-Hispanic children to reflect the restriction of the melanoma cases to non-Hispanic white. The Colorado Multiple Institutional Review Board and the Kaiser Permanente of Colorado Institutional Review Board approved this study.

Data analysis

Melanoma counts, overall and by histology, were computed for each of four anatomic sites: head/neck (face, scalp, and neck), trunk (chest, abdomen, groin, and upper and lower back), upper limbs (upper arms, forearms, elbows, and hands), and lower limbs (thighs, lower legs, knees, and feet) based on the reported primary site of the tumor. Nevi of all sizes, both flat and raised, were included. Small nevi were classified as less than 2mm in diameter. Medium-sized nevi were classified as ≥ 2 mm in diameter. Only 0.4% of all nevi were ≥ 5 mm in diameter, and these were grouped with the medium-sized nevi. Site-specific nevi as a proportion of total body nevi, overall and by size, were computed for each of four anatomic sites. Palms of the hands and soles of the feet were excluded because nevus counts on these body sites were very small, and because the type of melanomas that occur here are rare. For each of the four body sites, counts of nevi and melanomas were converted into proportions (%) of the total body count of nevi and melanomas, respectively.

Analyses were stratified by nevus size, sex, and melanoma histology. The χ^2 goodness-of-fit test, which tests whether an observed distribution conforms to another distribution, was used to compare the observed nevus and melanoma proportions across body sites with the expected body-surface-area distributions. The commonly used rule of nines was used to

estimate body surface area for each of the four anatomic sites for the adults [26]. Newly proposed skin surface proportions for 8-year-old boys and girls provided estimates of body surface area for each of the four anatomic sites for the children [27]. The χ^2 goodness-of-fit test was also used to compare the nevus proportions across body sites with the melanoma distributions. For the χ^2 goodness-of-fit analysis, the nevus distributions were treated as the observed values and the melanoma distributions were treated as the expected values. Distributions with P values less than 0.05 for the χ^2 statistic were considered significantly different.

Counts and body locations of cutaneous malignant melanoma in white, non-Hispanic patients by sex and age were obtained from the Surveillance Epidemiology and End Results (SEER) database for the years 2000–2004. These data were used to verify that the anatomic distribution of melanoma by sex in the Colorado Central Cancer Registry was similar to that in the national SEER database.

The incidence rates of melanoma by anatomic location (per 100 000 persons) were derived using the Colorado Census population data of the year 2000, which were stratified by sex and age for whites [28]. The age-specific incidence rates were calculated for 10-year age groups, except for 10–29 years age group, as there were small numbers of cases in the age group of 10–19 years. In addition, patients aged above 79 years were excluded because of small numbers.

Results

Melanoma cases

Of the 2351 melanoma cases, 1287 (55%) were male and 1064 (45%) were female. Patients ranged in age from 12 years to 100 years. The majority of tumors, 1998 (85%), were diagnosed in a localized stage. The mean tumor thickness was 1.01mm, whereas the median tumor thickness was 0.6 mm. SSM was the most frequent histology (1722; 73%), followed by LMM (352; 15%). NM was the least common histology (277; 12%). Interestingly, there were 17% more melanomas on the left arm compared with the right arm. Of note, χ^2 goodness-of-fit test was used to assess the anatomic distribution of melanoma by sex in Colorado to the anatomic distribution of melanoma in the SEER database; the distributions were not significantly different.

Anatomic distribution of melanoma

For males, all melanoma distributions differed significantly from the distribution expected based on the proportional surface area of the anatomic site (Table 1). In males, all types of melanoma were disproportionately high on the head/neck compared with body surface area expectations, and disproportionately low on the lower limbs. This was particularly true for LMM, which were also disproportionately low on the trunk. For females, all melanomas – combined, NM, and LMM distributions – were significantly different from that expected based on the proportional surface area of the anatomic site, whereas there was no significant difference between the distribution of SSM and the body surface area distribution (Table 1). In females, melanoma distribution differences from body surface area were less dramatic, and the patterns were different from those observed for males. NM was more common on the lower limbs and less common on the trunk than expected. Although the LMM distribution showed the greatest difference from the body surface area distribution for females, differences were less profound than for males.

Nevi in children

In our population of children aged 8–9 years, 335 (47%) were male and 382 (53%) were female. The mean number of nevi of all sizes was 42 and the median number was 37, whereas the mean number of nevi ≥ 2 mm was 3, and the median number was 2.

Anatomic distribution of nevi

Nevus proportions also varied by anatomic site and sex; all nevus distributions in males and females differed significantly from the distribution expected based on the proportional surface area of the anatomic site (Table 2). In males, all nevus sizes, nevi < 2 mm in diameter, and nevi ≥ 2 mm in diameter were disproportionately high on the head/neck compared with body-surface-area expectations, and disproportionately low on the lower limbs. Moreover, all nevus sizes and nevi < 2 mm in diameter were disproportionately high on the upper limbs and low on the trunk in males. The patterns of the nevus distribution differences from the body surface area distribution observed in females were comparable with those observed in males. Like the males, the distributions of all nevus sizes and nevi < 2 mm in diameter were disproportionately high on the upper limbs and low on the trunk in females compared with the body surface area distribution (Table 2). In addition, nevi ≥ 2 mm in females were disproportionately high on the head/neck compared with the body surface area expectations and disproportionately low on the lower limbs. Differences on the head/neck and lower limbs for all nevus sizes and nevi less than 2mm in diameter were more striking for males than for females.

Comparison of the anatomic distribution of nevi and melanoma

As shown in Table 3, the χ^2 goodness-of-fit analysis indicated some similarities and some differences between nevus and melanoma distributions. For males, there was no significant difference between the distribution of medium-sized (≥ 2 mm) nevi and the distribution of all melanoma, SSM, and NM. For females, there was no significant difference between the anatomic distribution of all nevi and small-sized (< 2 mm) nevi and the distribution of NM. Furthermore, in females, there was no significant difference between the distribution of medium-sized (≥ 2 mm) nevi and the distribution of all melanoma. In addition, there was marginal evidence for a difference between the distribution of medium-sized (≥ 2 mm) nevi and the distribution of NM. There were significant differences between all of the nevus distributions and the distribution of LMM in females.

Melanoma distribution by age

As shown in Fig. 1, melanoma rates differed by age with females having higher rates than males at younger ages. The rates in males became higher compared with females at later ages (> 50 years), and at age 70–79 years the combined rate for males was 3.2 times that for females (218/100 000 for males compared with 67/100 000 for females). In both sexes, melanoma incidence increased with age. For males, there were more melanomas on the trunk compared with other body sites for all age groups, with rates for the trunk, upper limbs, and head/neck rising dramatically across age groups. Melanomas on the lower limbs remained relatively lower across all age groups for males. For females, melanomas were highest on the trunk between 30 and 39 years of age. For 40–49 years of age, melanomas on the lower limbs became most prevalent and by 70–79 years of age, the rates were similar for all four body sites. In contrast to males, head/neck melanomas were the least frequent across age groups until they converged with the other sites at 70–79 years of age in females.

Comparison of anatomic distribution of melanoma by sex and age with the nevus distribution

Table 4 compares nevus distribution in children with melanoma distribution (SSM and NM combined) by sex and age. The χ^2 goodness-of-fit analysis showed that there were no significant differences between the medium-sized nevus distribution and the distributions of SSM and NM combined in males of the following age groups: 10–39, 40–49, and 60+ years. There were no significant differences between all, small, and medium-sized nevus distributions and the distribution of SSM and NM combined in females aged 60+ years.

Discussion

In general, we found that neither nevi nor melanomas are distributed equally across the body based on skin surface area except in the case of SSM in females. In general, both nevi and melanomas occur more often on the head/neck compared with other body areas. As the face is the most commonly exposed body site to the sun, this supports a role of sun exposure for both nevi and melanomas. The lack of significant difference between the body surface area distribution and SSM in females may be evidence for a systemic effect rather than a site-specific effect from sun exposure. Males, however, had a higher number of SSMs on the head/neck and trunk than would be expected based on skin surface area. This suggests that a site-specific effect of sun exposure might be occurring in males but not in females, perhaps because of sex-related differences in occupational exposure or use of sun protection. Our results showed a higher count of melanomas on the left arm compared with the right arm, which is consistent with other studies that have shown a left-sided excess of melanomas [29–31]. It has been suggested that this could be because of an asymmetric distribution of melanocytes or greater sun exposure to the left side [29–31].

There is question as to whether nevi are in the pathway to melanoma development or whether having a lot of nevi at a body site increases the risk of melanoma occurrence in that area. One study that investigated nevus-associated melanomas showed that these melanomas were more likely to occur on the trunk, in younger patients, and within SSM [10]. A second study also found that melanomas on the trunk were more likely to be associated with a nevus [32]. Conversely, NMs, which are more often thicker than SSM [33], may be less likely to emerge from a preexisting nevus [34]. LMMs are least likely to arise from a nevus [3]. Other studies have shown that nevi may be precursors to SSM and NMs, but not to LMMs [35,36]. One study that observed a strong site-specific association between nevi and melanoma found that counts of nevi at the site of the melanoma were one of the strong predictors of SSM [16].

Other studies have investigated the anatomic distribution of these different types of melanoma and have concluded that there may be differing etiologies for each type [37–40]. Our study showed that, in males, there was no significant difference between the distribution of medium-sized nevi in children and the distribution of SSM and NM. In females, there was no significant difference between the anatomic distribution of small-sized nevi and the distribution of NM. The distinction between NM and SSM, however, is not always clear and these two forms of cutaneous melanoma often have overlapping clinical, pathological, and molecular characteristics. With this in mind, we have shown here, as have others [13], that NMs seem to occur more commonly on chronic sun-exposed body sites (head/neck/arms) when compared with SSM. Others have shown that the molecular pathways involved in melanoma development in areas with different ultraviolet (UV) exposure are genetically distinct [41] and it is likely that despite the overlap between SSM and NM clinically, future studies will reveal important differences between these forms of the disease.

Our results lend some support to the divergent pathways hypothesis that proposes two paths to the development of melanoma: one in which high cumulative sun exposure is necessary for the development of some melanomas, whereas in those who have a propensity to develop nevi, intermittent exposure to sunlight in the early stages of tumor development is sufficient to cause melanoma [9]. Our data show that SSM occurs most frequently on the trunk in males and females, which is a body site that receives intermittent exposure to the sun. Possibly, higher counts of nevi on the trunk in childhood may be associated with an increased risk of developing SSM in young adult males who have a propensity to develop nevi. This same association may not be present in females because of differing clothing habits, with males having a tendency to reveal more of the truncal skin to the sun compared with females. Likewise, childhood nevi may be related to an increased risk of SSM, which is more often associated with a nevus compared with NM. Furthermore, commonly acquired nevi have mutations in bRAF, and bRAF mutations are more common in melanomas occurring on skin subject to intermittent sun exposure where SSM is most common [42–44].

Our study shows a combined rate of SSM and NM in the oldest age groups (70–79 years) that is dramatically higher for males compared with females. This difference is also evident in the US SEER data [45], although the male–female difference for the national data is about 2.4 fold (including all types of melanoma), whereas the male–female difference in the Colorado data is 3.2 fold (including only SSM and NM). Colorado has overall melanoma rates that are 30% higher than the US as a whole [46], and it is possible that the male–female difference is magnified in a region with high daily UV exposure.

One of the main strengths of this study is sample size; there were large numbers of children and of melanoma cases, both from Colorado, which has a sunny climate, high altitude, and increased UV exposure levels compared with many other locations. Moreover, the present analysis was possible because, as far as we know, this is the only nevus study in the US that includes whole-body nevus counts in children. As the distribution of melanoma in Colorado was similar to the distribution of melanoma in the SEER database, our results are likely generalizable to the US. Although there are no other US studies with which our nevus data can be compared, our total nevus counts are similar to two studies conducted on 7- to 9-year-old children in the UK [47,48], lower than those reported in Canadian children of a similar age [49], and higher than those reported in a study conducted on children aged 9–10 years in Lithuania [50]. Our study had low power to study large nevi ($\geq 5\text{mm}$), as counts of these nevi were quite low. In addition, the scalp, genital areas, and the buttocks were not examined in the children so the true proportions of nevi in other areas may be slightly overestimated. Finally, this study compared two different populations, not the distribution of nevi to melanoma within the same persons over the decades between childhood and the onset of melanoma. Although we believe that geography is important in our analysis, we do not know whether the adults under study actually received their sun exposure as children in Colorado, or the extent to which they are genetically similar to children currently residing in Colorado. It should also be noted that over the last few decades there have been changes in social and behavioral practices that have been reflected in changes in the distribution of melanoma by body site and histologic type [51,52]. These changes have influenced patterns of sun exposure, which likely differ between the cohorts of children and adults that we examined in this study.

This analysis has shown associations between the nevus distribution in children and the melanoma distribution in adults. The similarities between the nevus and melanoma distributions are interesting findings, but it is difficult to interpret the significance of these findings based on the current state of knowledge of melanoma etiology.

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Fig. 1. (a) Rates (per 100 000) of melanoma in males by age at diagnosis and body site in Colorado, during 2000–2004 ($n=977$). (b) Rates (per 100 000) of melanoma in females by age at diagnosis and body site in Colorado, during 2000–2004 ($n=882$). Rates represent superficial spreading and nodular melanoma types.

Table 1

Anatomic distribution of melanoma in adults by sex and histologic type, Colorado ($n = 2351$ people) and difference between the expected surface area distribution and the observed melanoma distribution

Body site	Body surface area (%)	All melanoma (n = 2351)		Superficial spreading melanoma (n = 1722)		Nodular melanoma (n = 277)		Lentigo maligna melanoma (n = 352)	
		%	Difference ^a	%	Difference ^a	%	Difference ^a	%	Difference ^a
Males									
Head/neck	9.0	32.3	+23.3	21.8	+12.8	35.1	+26.1	70.2	+61.2
Trunk	37.0	38.5	+1.5	45.9	+8.9	29.8	-7.2	16.4	-20.6
Upper limbs	18.0	20.7	+2.7	22.8	+4.8	21.6	+3.6	12.5	-5.5
Lower limbs	36.0	8.5	-27.5	9.5	-26.5	13.5	-22.5	0.9	-35.1
Goodness-of-fit statistic ^b		$\chi^2 = 81.7$		$\chi^2 = 41.1$		$\chi^2 = 91.8$		$\chi^2 = 463.5$	
Females									
Head/neck	9.0	14.8	+5.8	8.6	-0.4	17.0	+8.0	55.8	+46.8
Trunk	37.0	31.3	-5.7	35.3	-1.7	20.8	-16.2	12.5	-24.5
Upper limbs	18.0	25.8	+7.8	24.6	+6.6	34.9	+16.9	26.7	+8.7
Lower limbs	36.0	28.1	-7.9	31.5	-4.5	27.3	-8.7	5.0	-23.1
Goodness-of-fit statistic ^b		$\chi^2 = 9.7$		$\chi^2 = 3.0^*$		$\chi^2 = 31.1$		$\chi^2 = 290.4$	

^aDifference between the expected surface area distribution and the observed melanoma distribution.

^bChi-square goodness-of-fit statistic for expected body surface area to observed melanoma distribution.

* $P > 0.05$ indicating that there was no significant difference between the distribution of melanoma and the body surface area distribution.

Anatomic distribution of nevi in children aged 8 to 9 years by sex and nevus size, Colorado ($n=30$ 137 nevi in 717 children) and difference between the expected surface area distribution and the observed nevus distribution

Table 2

Body site	Body surface area (%)	All nevus sizes (<i>n</i> = 30 137)		Nevus size < 2 mm (<i>n</i> = 27997)		Nevus size ≥ 2 mm (<i>n</i> = 2140)	
		%	Difference ^a	%	Difference ^a	%	Difference ^a
Males							
Head/neck	8.7	25.0	+16.3	24.7	+16.0	28.0	+19.3
Trunk	36.8	24.7	-12.1	23.4	-13.4	41.3	+4.5
Upper limbs	19.0	30.1	+11.1	31.1	+12.1	17.9	-1.1
Lower limbs	35.5	20.2	-15.3	20.8	-14.7	12.8	-22.7
Goodness-of-fit statistic ^b		$\chi^2 = 47.6$		$\chi^2 = 48.1$		$\chi^2 = 57.9$	
Females							
Head/neck	8.9	15.9	+7.0	15.5	+6.6	21.5	+12.6
Trunk	36.6	19.5	-17.1	18.7	-17.9	30.2	-6.4
Upper limbs	18.3	36.9	+18.6	37.6	+19.3	26.9	+8.6
Lower limbs	36.2	27.7	-8.5	28.2	-8.0	21.4	-14.8
Goodness-of-fit statistic ^b		$\chi^2 = 34.4$		$\chi^2 = 35.8$		$\chi^2 = 29.1$	

All χ^2 statistics in this table were $P < 0.05$ indicating significant differences between body surface area and nevus distributions.

^a Difference between the expected surface area distribution and the observed nevus distribution.

^b Chi-square goodness-of-fit statistic for expected body surface area to observed nevus distribution.

Table 3

Chi-square goodness-of-fit test statistics for nevus distributions in 717 children aged 8 to 9 years, Colorado and melanoma distributions in 2351 adults, Colorado, during 2000–2004

Nevus size	All melanomas	Superficial spreading melanoma	Nodular melanoma	Lentigo maligna melanoma
Males				
All nevus sizes	26.9	24.6	10.4	NA ^a
Nevus size < 2 mm	30.7	27.8	12.5	NA ^a
Nevus size ≥ 2 mm	3.3*	4.4*	6.5*	NA ^a
Females				
All nevus sizes	9.3	19.8	0.2*	139.4
Nevus size < 2 mm	10.5	20.5	0.5*	144.2
Nevus size ≥ 2 mm	4.7*	23.5	8.5	99.9

^aToo few lentigo maligna melanoma on the lower limbs in males for χ^2 statistic to be calculated.

* $P > 0.05$ indicating that there was no significant difference between the distribution of nevi and the distribution of melanoma using a χ^2 critical value of 7.81 with 3 degrees of freedom.

Anatomic distribution of nevi in a cohort of children aged 8 to 9 years, Colorado ($n=30$ 137 nevi in 717 children) and of melanoma^a by age in Colorado, during 2000–2004 ($n=1996$ people)

Table 4

Body site	Nevi among children aged 8 to 9 years			Melanoma all ages			
	All (%)	< 2 mm (%)	≥ 2 mm (%)	Age 10–39 years (%)	Age 40–49 years (%)	Age 50–59 years (%)	Age 60 + years (%)
Males	($n = 14\ 919$)	($n = 13\ 860$)	($n = 1059$)	($n = 164$)**	($n = 197$)**	($n = 257$)	($n = 436$)**
Head/neck	25.0	24.7	28.0	18.3	21.3	17.9	31.0
Trunk	24.7	23.4	41.3	47.0	45.2	46.3	39.2
Upper limbs	30.1	31.1	17.9	18.3	21.8	26.1	22.5
Lower limbs	20.2	20.8	12.8	16.4	11.7	9.7	7.3
Females	($n = 15\ 218$)	($n = 14\ 137$)	($n = 1\ 081$)	($n = 305$)	($n = 237$)	($n = 189$)	($n = 211$)***
Head/neck	15.9	15.5	21.5	7.2	5.9	6.4	19.9
Trunk	19.5	18.7	30.2	47.2	28.3	30.2	22.7
Upper limbs	36.9	37.6	26.9	18.0	24.5	31.7	33.2
Lower limbs	27.7	28.2	21.4	27.6	41.3	31.7	24.2

^aOnly superficial spreading and nodular types are included in the melanoma distribution.

** $P > 0.05$ indicating that there was no significant difference between the distribution of nevi ≥ 2 mm in diameter and the distribution of melanoma.

*** $P > 0.05$ indicating that there was no significant difference between the distributions of all nevi, nevi < 2 , and ≥ 2 mm in diameter and the distribution of melanoma.