RESEARCH LETTER

Biopsies of Nevi in Children and Adolescents in the United States, 2009 Through 2013

The increase in incidence and mortality of melanoma over the past 30 years has heightened public and physician awareness. It is suggested that the combination of increasing detection pressure and poor specificity of current diagnostic strategies is driving biopsy rates to alarming levels in younger individuals despite a low risk of melanoma. Nevertheless, the number of nevi biopsied in children and adolescents remains poorly characterized in the United States.

Methods | Institutional review board approval and informed consent were waived. No patient identifiable data were used, only statistical data based on the counts and year of diagnoses. All data were accessed and used in compliance with the Health Information Portability and Accountability Act of 1996 (HIPAA), and any regulation promulgated thereunder, to include the Privacy Rule, Title 45 of the Code of Federal Regulations, Part 160 and Subparts A and E of Part 164. To estimate the number of nevus biopsies in children and adolescents aged 19 years or younger in the United States during 2009 through 2013, we conducted analyses using (1) a large regional private dermatopathology laboratory database, the Pinkus Dermatopathology Laboratory database, and (2) a large commercial health insurance administrative claims database, the HealthCore Integrated Research Database (HIRD).

Surgical specimens used for pathologic analysis from the dermatopathology database were categorized by histopathologic diagnosis of (1) melanoma, (2) nevi (ie, acquired, congenital, blue, Spitz nevi), or (3) all other diagnoses, and age categories (0-9, 10-14, 15-19 years).

We identified all patients in HIRD with at least 1 Current Procedural Terminology code for excision, shave removal, or biopsy (referred to collectively as “biopsies”). Only the first biopsy in the calendar year counted for each individual. Multiple biopsies for the same individual that spanned calendar years were counted as distinct biopsies. Total biopsy counts were reduced by 41.9% on the basis of data from the dermatopathology database to account for the number of biopsies expected for diagnoses other than nevi (such as warts and rashes) (see Results). We then calculated rates of biopsies in the HIRD population and applied them to 2010 US Census data to estimate age-specific and sex-specific biopsy counts extrapolated to the US population. We used age-specific and sex-specific melanoma incidence rates from the Surveillance, Epidemiology, and End Results Program 2006-2010 (SEER) and applied them to extrapolated biopsy rates to quantify the expected number of melanomas. We calculated the number of nevi needed to biopsy (NNB) to detect 1 melanoma (NNB = number of nevi biopsies divided by number of melanomas) as a measure of accuracy and public health relevance.

Results | A total of 18 601 surgical specimens were identified in the dermatopathology database from 2009 through 2013, with 16 melanomas (0.09%), 10 800 nevi (58.1%), and 7785 all other diagnoses (41.9%), resulting in an overall NNB of 676. In the HIRD, 133 431 biopsies for nevi were identified during the 5-year period. On the basis of age-specific and sex-specific SEER cancer rates, there were an estimated 136 melanomas, with a resulting NNB of 982 (Table). We estimated that 2 007 423 biopsies of nevi occurred in individuals 19 years or younger, along with 1940 melanomas and an overall NNB of 1035 during 2009 through 2013 in the United States, on the basis of HIRD and 2010 US Census data.

Discussion | We used 2 robust US data sources to quantify the number of nevus biopsies in children and adolescents. Consistent with our findings, a study from Austria estimated an NNB of 594 in individuals 19 years or younger. In another study, the number needed to excise ranged from 149 to 224 for similarly aged patients being seen in specialized and non-specialized clinics.

The generalizability of this study is limited by source databases, although results are similar to cited studies.

Table. Nevi, Melanomas, and Number Needed to Biopsy (NNB) to Detect 1 Melanoma by Age Group in the Pinkus Dermatopathology Laboratory Database and HealthCore Integrated Research Database (HIRD), 2009 Through 2013

<table>
<thead>
<tr>
<th>Age, y</th>
<th>Pinkus Dermatopathology Database, No.</th>
<th>HIRD, No.</th>
<th>NNB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All Biopsies</td>
<td>Nevi*</td>
<td>Melanomas</td>
</tr>
<tr>
<td>0-9</td>
<td>861</td>
<td>861</td>
<td>0</td>
</tr>
<tr>
<td>10-14</td>
<td>3374</td>
<td>3372</td>
<td>2</td>
</tr>
<tr>
<td>15-19</td>
<td>6581</td>
<td>6567</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
<td>10 816</td>
<td>10 800</td>
<td>16</td>
</tr>
</tbody>
</table>

* Nevi (acquired, congenital, blue, and Spitz nevi).
* Number of patients in HIRD with at least 1 Current Procedural Terminology code for excision, shave removal, or biopsy. Total number of biopsies reduced by 41.9% to account for biopsies of all diagnoses other than nevi.
* Expected melanomas based on Surveillance, Epidemiology, and End Results Program age-specific and sex-specific melanoma incidence rates applied to the HIRD population.
Referring clinicians for the dermatopathology data comprised more than 95% dermatologists in private practice, with few samples from dermatologists in academic or surgical settings. The HIRD sample is representative of commercially insured populations.

The predictive value of any test depends on both diagnostic accuracy and disease prevalence, and the latter is very low for melanomas before age 18 years. The very high NNB is also likely attributable to reliance on "change" as an important criterion for recognizing melanoma. Evolution of nevi is common in childhood, and hence change is a poor predictor of melanoma in this age group. Understanding the normal evolution of nevi during childhood and adolescence, as well as development of novel noninvasive diagnostic tools, is important in helping to reduce unnecessary biopsies, health care costs, and morbidity in this age group.1

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1. Cohen B. To biopsy or not to biopsy changing moles in children and adolescents: are we removing too many pigmented nevi in this age group?: comment on "Variables predicting change in benign melanocytic nevi undergoing short-term dermoscopic imaging." Arch Dermatol. 2011;147(6):659-660.


Trends in Indoor Tanning Among US High School Students, 2009-2013

Indoor tanning increases the risk of skin cancer, particularly among frequent users and those initiating use at a young age.1,2 While previous research has demonstrated that indoor tanning is common among youth,3 to our knowledge, this study provides the first national estimates of indoor tanning trends among this population.

Methods | We used data from the 2009, 2011, and 2013 national Youth Risk Behavior Surveys, which used independent, nationally representative samples of public and private US high school students in grades 9 through 12 (http://www.cdc.gov/HealthyYouth/yrbs/index.htm). Indoor tanning was defined as using an indoor tanning device (eg, sunlamp, sunbed, tanning booth, excluding a spray-on tan) at least once during the 12 months before each survey period. Frequent indoor tanning was defined as using an indoor tanning device 10 or more times during the same period. The Youth Risk Behavior Survey had a student sample size of 16 410 in 2009, 15 425 in 2011, and 13 583 in 2013; overall response rates were 71%, 71%, and 68%, respectively. Data were weighted to account for oversampling of black and Hispanic students and nonresponse. The Youth Risk Behavior Survey protocol was approved by the Centers for Disease Control and Prevention's Institutional Review Board. The Youth Risk Behavior Survey is conducted in accordance with parental permission procedures in each locality.

We stratified our analyses by sex because of differences between sexes in indoor tanning behavior.3 Temporal changes were examined using logistic regression that controlled for age and race/ethnicity. Linear time variables were treated as continuous and were coded using orthogonal coefficients. Data were analyzed using SUDAAN, version 10.1 (RTI International).

Results | Among female high school students during 2013, a total of 20.2% engaged in indoor tanning and 10.3% engaged in frequent indoor tanning. Among male high school students, 5.3% engaged in indoor tanning and 2.0% engaged in frequent in-