Melanoma risk in relation to height, weight, and exercise (United States)

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\section*{Abstract}

Height and weight and derivations thereof are positively associated with a number of cancers. While several authors have reported an increased risk of melanoma among people at the higher extremes of these measures, the association has not been fully explored. New cases of primary cutaneous melanoma in 1997 in western Washington State (n = 386) were compared to controls selected by random-digit dialing (n = 727). Each study participant completed a telephone survey, and data were collected on height, weight, sun-related melanoma risk factors, demographic characteristics, as well as habits such as diet and exercise. Risk of melanoma was analyzed by logistic regression with adjustment for age, hair color, lifetime sun exposure, and fruit and vegetable intake. An excess risk of melanoma was identified in men in the upper quartiles of height (OR = 2.4, 95\% confidence interval (CI) = 1.3–4.5), weight (OR = 2.8, CI = 1.5–5.2), and body surface area (OR = 2.8, CI = 1.5–5.1) vs. the lowest quartiles. In women, no association was present for any anthropometric measure. In addition, we found that men and women exercising five to seven days per week were at a decreased risk of melanoma (OR = 0.7, CI = 0.5–1.0). The anthropometric findings are largely consistent with previous studies, while this is the first report of an association of exercise with melanoma risk. The mechanisms for the effect of exercise and for the difference between men and women in the effect of anthropometric factors are unknown. Future research in basic and epidemiologic science should focus on biochemical or behavioral explanations for these observations.

\section*{Introduction}

Anthropometric measures such as height, weight, and body mass index (BMI) are associated with an increased risk of certain malignancies. While these effects are typically modest, they remain as interesting findings that may be suggestive of pathophysiologic mechanisms of cancer. Weight and measures of obesity are correlated with various serum hormones that may play a role in cancer. Adult height may place an individual at risk secondary to an increased number of cells in a particular organ [1], or it may relate to behaviors thought to predispose to cancer, such as caloric intake in childhood [2–5]. Melanoma has infrequently been examined in relation to anthropometric variables, although there is reason to believe that these same mechanisms may operate in its pathogenesis [6, 7].

We utilized a case-control design to examine the association between melanoma and four anthropometric measures: height, weight, BMI, and body surface area (BSA). Standard calculation of BSA is thought to be a reasonably accurate proxy of skin surface area for men and women [8], and increased skin area may put an individual at a higher risk of melanoma. We also examined risk of melanoma associated with exercise, because exercise is one of the main correlates of BMI [9].
Methods

Case selection

We identified all cases of newly diagnosed primary cutaneous melanoma during the calendar year 1997 among men and women age 35–74 years within the 13-county region of Washington State that comprises the Seattle–Puget Sound Surveillance, Epidemiology, and End Results (SEER) registry. Cancer incidence data are collected through hospitals and pathologists, as well as examination of death certificates.

Cases were excluded if they were reported as in situ disease or Hutchinson’s melanotic freckle. Hutchinson’s melanotic freckle is a distinct subtype of melanoma thought to have different causal pathways than other histologies of melanoma [10]. We further excluded all non-whites and Hispanic whites, who contribute minimally to overall disease burden [11] and accounted for less than 1% of our cases.

After these exclusions there were 488 cases identified. Of these, 16 (3%) were deceased at the time of the study. Six (1%) cases were excluded due to lack of home phone, inability to effectively communicate, or change of residence to a region outside of our study area, because these criteria were necessary for selection of our control population. We were left with 466 (95%) eligible cases. Of these, 57 (12%) were lost to follow-up, 15 (3%) were not contacted due to physician refusal, and eight (2%) patients refused to be interviewed. Interviews were completed on 386 eligible cases (201 men, 185 women), for a response rate of 83% of eligible cases still living.

Control selection

We identified controls from Washington State via random-digit dialing as described by Troldahl and Carter [12]. To increase the efficiency of the random-digit dialing the numbers were pre-screened for businesses and non-working/disconnected phone numbers by GENESYS Sampling Systems. They then provided us with a list of numbers sampled from all residential exchanges in Washington State. All numbers had an equal probability of inclusion in this selection. Each number selected was dialed at least 15 separate times at different times of the day and week.

Statewide, 5506 numbers were randomly called. Of these, 2719 (49%) were ineligible due to the number being either non-residential (29% of ineligibles), non-working or changed number (42% of ineligibles), repeatedly unanswered (12% of ineligibles and approximately equal to the percent of numbers that are phone booths), non-English-speaking respondent (4% of eligibles), repeated FAX or fast busy signals (8% of ineligibles), or in some other way ineligible (deceased, moved after screening, no adult at number, non-Washington resident) (5% of ineligibles). After these exclusions, 2787 potential controls remained, of whom we obtained complete interviews from 1751 (response rate of 63%). We were unable to obtain complete interviews because of 777 (28%) refusals, 121 (4%) answering machines, 61 (2%) phones that were repeatedly busy, 54 households (2%) where the selected household member was ill or away for the period of study, and 23 households (1%) where we were unable to determine eligibility for various other reasons.

Of the 1751 interviewed persons we included in the study those who were between the ages of 35 and 74 and residing in the same geographic region as the cases, yielding 833 controls. Lastly, we excluded 90 (11%) controls who were a race other than non-Hispanic white and 16 (2%) controls with a history of melanoma. We therefore included 727 controls (261 males, 466 females) in our final analysis.

Data collection

Information was collected using a questionnaire administered during a phone interview for both cases and controls. Subjects were asked to report their height (without shoes) and weight (without clothes). From these data we calculated both BMI and BSA (BMI: kg/m²; BSA [13]: 0.007184 × height (cm)0.725 × weight (kg)0.425). Our four anthropometric exposure variables (height, weight, BMI, and BSA) were then divided into quartiles by sex based on the distribution of the variables in the control population. Data on physical exercise were collected by asking subjects how many times per week they “participated in any physical exercise for at least 20 minutes, such as running, health club workouts, sports, or walking for exercise.” Lifetime sun exposure was ascertained by eliciting lifetime history of places of residence and days per week the subject spent 4 or more hours in sun at each residence or each decade of life (if he/she resided one place more than 10 years). Number of nevi was elicited by asking participants to count the number of raised, pigmented moles on both their arms. We also collected information on demographic factors (education, income, marital status, age), health/cancer history (including history of squamous cell and basal cell carcinomas), fruit and vegetable intake, parity, smoking status, sunburn history, sensitivity of the skin to chronic and intermittent sun exposure, hair color, and number of freckles at age 20 (none, few, several, a lot). Cases were asked to report all