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Characteristics, Rates and Trends of Melanoma Incidence among Hispanics in the United States

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Abstract

Purpose—The purpose of this study is to describe the epidemiology of melanoma among Hispanics using data that cover nearly 100% of the United States (US) population.

Methods—The study used population-based cancer incidence data from the National Program of Cancer Registries and the Surveillance Epidemiology and End Results program to examine melanoma incidence rates and trends among Hispanics by sex, age, race, histology, anatomic location, stage, and tumor thickness.

Results—From 2008 to 2012, 6,623 cases of melanoma were diagnosed among Hispanics. Rates were higher among males (4.6) than females (4.0), but females younger than age 55 had higher rates than males. The most common histologic subtype was superficial spreading melanoma (23%). Melanomas with poorer outcomes, such as nodular (NM) and acral lentiginous melanoma (ALM), were more common among males. Hispanic females had the highest proportion of melanoma on the lower limb and hip (33.7%) while Hispanic males had the highest proportion on the trunk (29.9%). Incidence rates for later stage and thicker tumors were significantly higher among Hispanic men than women. Incidence rates decreased significantly during 2003–2012 (AAPC= −1.4).

Conclusions—Clinicians and public health practitioners will need to reach the growing Hispanic population in the US with strategies for primary prevention and early diagnosis of melanoma. Results suggest Hispanics and providers need education to increase awareness about the characteristics of melanoma among Hispanics, including types that occur on non-sun-exposed areas (ALM, NM). Skin cancer prevention and awareness interventions targeting Hispanics should be culturally relevant.

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Keywords

Melanoma incidence rates; Melanoma incidence trends; Melanoma histology; Melanoma stage; Anatomic location of melanoma; Hispanics

Introduction

In the United States (US), over 65,000 people are diagnosed with melanoma, and over 9,000 people die from the disease each year [1,2]. In 2012, melanoma of the skin was about six times more common among whites (rate 22.6 per 100,000) than among Hispanics of all races (rate 4.2 per 100,000) [1]. Studies have described increasing melanoma incidence trends among Hispanics in California and Florida [3,4]. However, other state-level analyses have described stable rates [5,6].

Location and histology of melanoma varies by race and ethnicity [7–10,5,11–13], and certain histologic subtypes with poor outcomes such as nodular melanoma (NM) and acral lentiginous melanoma (ALM) may be more common among Hispanics [14,4,11,9,8,10,13,12]. Hispanics are diagnosed at an earlier age [12,11,9,5,8,10], but with later stage diagnosis and increased tumor thickness compared to non-Hispanic whites (NHW), and therefore have poorer survival [12,15,6,14,11,3–5,9,8,10]. Hispanics may be at greater risk of late-stage diagnosis even after controlling for insurance and poverty status [16].

The US Hispanic population includes people of many different races, countries of origin, and skin types [17]. Although US Hispanics are less likely to experience sunburn than NHWs, they may be more susceptible to UV damage compared to other groups with similar pigmentation and burning response, such as East Asians [17]. A recent study of National Health Interview Survey (NHIS) data found that 31% of Hispanics experienced one or more sunburns in the past 12 months [18], increasing risk of melanoma and other skin cancers. Certain groups of Hispanics may be more susceptible than others. Acculturated or US-born Hispanics have higher prevalence of sunburn [18,19], and Cubans have higher melanoma incidence rates than Mexicans and Puerto Ricans [20]. Sun protection can reduce the risk of skin cancer [2]. However, use of sun protection is low among Hispanics, and Hispanics have less knowledge of skin cancer risk factors and lower perceived risk of getting skin cancer compared to NHWs [21,22,13,23].

Hispanics are one of the fastest growing US demographics, projected to make up one-third of the US population by 2060 [24]. It will be important for clinicians and public health practitioners to understand the presentation of melanoma among Hispanics in order to increase opportunities for early detection and treatment and improve survival. The purpose of this study is to describe the epidemiology of melanoma among US Hispanics using data that cover nearly 100% of the US population.

Methods

Data sources

In order to maximize population coverage, we used data on melanoma incidence for the most recent available diagnosis years (2008–2012) that cover 99.1% of the US population to examine demographic and clinical characteristics (age, sex, race, histology, location, and stage). These data were reported to the Centers for Disease Control and Prevention (CDC)'s National Program of Cancer Registries (NPCR) and the National Cancer Institute's (NCI) Surveillance, Epidemiology, and End Results (SEER) Program in November 2014 and met United States Cancer Statistics publication criteria [25–27]. To accurately assess incidence trends over time, we used ten years of NPCR and SEER data (2003–2012) that cover a smaller proportion of the US population (92.2%). Data for tumor thickness were not available from NPCR registries, and therefore tumor thickness analyses used 2008–2012 data from 18 SEER registries (herein referred to as SEER 18) that cover 27.8% of the US population [28].

Study population

We limited analyses to cases diagnosed among patients of Hispanic ethnicity, regardless of race. We used the North American Association of Central Cancer Registry's (NAACCR) Hispanic Identification Algorithm to rectify potential misclassifications and improve identification of Hispanic identity. This algorithm uses ethnicity information from the medical record and reported to the cancer registry, and also evaluates the strength of the data for birthplace, race and surname (including maiden name, when available) associated with Hispanic ethnicity status [29]. Melanoma incidence data were limited to invasive, microscopically confirmed melanoma cases.

Variables

We categorized cases by sex, age at diagnosis (all ages, <40, 40–59, 60–79, and ≥80), and race (white, nonwhite, unknown). Histologic types were grouped as superficial spreading melanoma (SSM) (Morphology [M]8743), lentigo maligna melanoma (LMM) (M8742), nodular melanoma (NM) (M8721), acral lentiginous melanoma (ALM) (M8744), and melanoma not otherwise specified (NOS) or other (M8720, M8722–M8741, M8745–M8790). Anatomic locations were categorized as face and ears (C44.0–44.3), head and neck (C44.4), upper limb and shoulder (C44.6), trunk (C44.5), lower limb and hip (C44.7), and overlapping or NOS (C44.8–C44.9). For analyses using diagnosis years 2008–2012, we coded cancer stage using Derived SEER Summary Stage 2000 based on collaborative stage, a schema which combines the American Joint Committee on Cancer's TNM, SEER Extent of Disease (EOD), and SEER Summary Stage (SS) 1977 and 2000 coding schemes [30]. Because collaborative stage was not developed until 2004, trends analyses of cancer stage utilized a combination of SEER Summary Stage 2000 for diagnosis year 2003, and Derived SEER Summary Stage 2000 for years 2004–2012 [31]. Minnesota data for stage cannot be analyzed for diagnosis years 2008–2012 and 2003–2012 and was excluded from analysis of stage data. We grouped data using the SEER Summary Stage categories: local, regional, distant and unstaged. Tumor thickness was categorized as 1.00mm, 1.01–2mm, 2.01–4mm, and >4mm.

Analyses

We performed all data analyses using SEER*Stat software, version 8.2.1 (Surveillance Research Program, NCI, Silver Spring, MD, www.seer.cancer.gov/seerstat). We computed incidence rates, frequencies, percent distributions, and incidence trends by age group, race, histology, location, stage, and tumor thickness for each sex. For trends analyses, we collapsed tumor thickness into two categories, $\leq 2.00\text{mm}$ and $> 2.00\text{mm}$. Rates and percent distributions by anatomic location and tumor stage were calculated for males and females in each age group.

All rates presented were per 100,000 persons and age-adjusted to the 2000 US population standard using 19 age groups (Census P25–1130). We calculated 95% confidence intervals using the Tiwari modification. Rate ratios (RR) were calculated within each category and across sexes; they were defined as significant when they differed from 1.0 at $p < 0.05$. Rates based on fewer than 16 cases are not presented in order to ensure stability in rates and protect patient confidentiality. We calculated median ages using case listings from SEER and NPCR data for diagnosis years 2008–2012. We calculated average annual percent change (AAPC) using the least weighted squares method to assess trends in incidence data for diagnosis years 2003–2012 by age group, race, histology, location, stage, and thickness for each sex. AAPC was considered significant if it differed from 0 at $p < 0.05$.

Results

Demographic variables

From 2008 to 2012, there were 6,623 new cases of melanoma among Hispanics (Table 1). Hispanic females comprised 54% of melanoma cases. White Hispanics made up the majority of cases (93%). The melanoma incidence rate among Hispanics from 2008 to 2012 was 4.2 per 100,000, and was higher among males (4.6) than females (4.0) and among white Hispanics (4.2) than Hispanics of known other races (1.4). Overall, melanoma incidence rates for males were 10% higher than females (Table 1).

The median age of melanoma diagnosis for all Hispanics was 56 years, 61 years for males and 52 years for females (Table 1). Melanoma incidence was higher among young females than males (Table 1 and Figure 1), but incidence rates in men surpassed women in the 55–59 age group and continued to rise sharply with age (Figure 1). Melanoma incidence among Hispanic men age 80 years and older was double that of women in the same age group (Table 1).

Histologic Subtype

The majority of melanoma cases (61%) among Hispanics were classified as Melanoma NOS or other (Table 1). Among melanoma cases with specific histology data, SSM was the most common histological subtype (23%) among Hispanics followed by NM (9%) and ALM (5%). LMM was the least common subtype and made up only about 3% of cases. While females had higher rates of SSM (RR=0.8), males had higher rates of melanomas with poorer outcomes (NM (RR=1.5), LMM (RR=1.9), and ALM (RR=1.3)).

Anatomic Location

Melanoma was most commonly found on the lower limb and hip among Hispanic females and on the trunk among males (Table 1). Among men and women, the distribution of melanomas by anatomic location varied by age (Figure 2). Higher proportions of melanomas on the trunk were found at younger ages. The proportion of melanomas on the trunk decreased with age, while the proportion on the head and neck increased. Men age 80 and over had the highest proportion of head and neck melanomas. Women had higher proportions of melanoma on the lower limb and hip across all age groups; this proportion grew as women aged, reaching 40% of all melanomas among women 80 years and older (Figure 2).

Stage and tumor thickness

Hispanic males and females had similar rates of localized melanoma, but males had higher rates of melanoma diagnosed at a regional (RR=1.4) or distant stage (RR=1.8) than females (Table 1). Different patterns emerged when stage was examined by age group (Figure 3). Among Hispanics under age 40, females had higher rates of localized (RR=2.8) and regional stage (RR=1.4) melanomas while rates of distant stage melanoma were similar to males. Among Hispanics ages 40–59, women still had higher rates of local-stage melanoma (RR=1.7), but lower rates of regional stage (RR=0.9) and distant stage melanomas (RR=0.8) compared to men; there were no differences in regional stage melanomas. Among Hispanics ages 60 and older, men had higher rates at all stages compared to women, with the most pronounced differences between sexes in the oldest age group (80 +) (Figure 3).

Thin tumors (≤ 1 mm) made up about half of all melanoma diagnoses in Hispanics (n=2,717). Greater proportions of thicker tumors were diagnosed among Hispanic males than females. Diagnosis with tumors thicker than 4 mm was 60% higher among Hispanic males than females (Table 1).

Trends

Melanoma incidence among Hispanics significantly decreased at an average annual percent change (AAPC) of -1.4% from 2003 to 2012 (Figure 4). During that period, incidence rates decreased among females (AAPC= -1.7%); trends among males were stable (AAPC= -1.1% was not statistically significant) (Table 1). Melanoma incidence showed statistically significant decreases among Hispanics under 40 years (AAPC= -2.3%) and 40–59 years (AAPC= -2.2%), white Hispanics (AAPC= -1.4%), melanomas of NOS and other histology (AAPC= -1.8%), melanomas on the face and ears (AAPC= -3.4%), melanomas on the lower limb and hip (AAPC= -1.9%), local stage melanomas (AAPC= -2.0%), unstaged melanomas (AAPC= -3.8%), and melanomas less than or equal to 2 mm thick (AAPC= -1.7%) (Figure 4). In contrast, rates of regional and distant stage melanomas, and melanomas thicker than 2 mm, were stable (Figure 4).

When examined by sex (Table 1), decreases in incidence were statistically significant among females in the under 40 (AAPC= -2.6%) and 40–59 (AAPC= -2.1%) age groups, females of white race (AAPC= -1.6%), females with NOS and other histologies (those that are non-specific or differ from the histologic subtypes shown) (AAPC= -2.3%), females with

melanoma on the upper limb and shoulder (AAPC=-3.4%) and lower limb and hip (AAPC=-2.2%), and females with local stage tumors (AAPC=-2.4%), unstaged tumors (AAPC=-3.2%), or tumors less than or equal to 2 mm thick (AAPC=-3.2%). Among males, declines were statistically significant among the 40–59 age group (AAPC=-2.3%), for melanomas on the face and ears (AAPC=-3.5%), and for unstaged melanomas (AAPC=-4.6%) or melanomas of unknown thickness (AAPC=-3.3%).

Discussion

To our knowledge, this study is the most extensive population-based assessment characterizing melanoma among US Hispanics. Other studies have only used state level data, data only from SEER registries, or have not focused specifically on Hispanics. Our study showed melanoma incidence among Hispanics is still relatively uncommon compared to NHWs. Although earlier state-level analyses of Hispanics in California and Florida described increasing rates of melanoma among Hispanics [4,3], our study showed rates in the US were generally stable or declining. This could be due to changes in incidence in more recent years, or differences in UV exposure, behavior, Hispanic subgroups, and melanoma reporting by state. Although melanoma incidence rates are decreasing or stable, the number of Hispanics in the US continues to grow [24] which could possibly contribute to more cancers being diagnosed in this population. Melanoma case counts among Hispanics rose 33% between 2003 and 2012 (not shown). Changing demographics, in conjunction with the increased priority of skin cancer as a national public health problem, highlights the need to better understand skin cancers in this population [2].

We found notable similarities and differences in patterns of melanoma among Hispanics compared to NHWs which can inform clinicians and public health practitioners who serve this population. Our findings were similar to other studies that found Hispanics were diagnosed at a younger median age, but had a greater proportion of late stage and thicker tumors compared to NHWs [32,12]. Similar to NHWs, Hispanic males had higher overall melanoma incidence rates compared with females, and young Hispanic males had lower incidence rates than young Hispanic females [12,10,33]. Patterns in age at diagnosis between Hispanic females and males are similar to those of NHW females and males with females being diagnosed at a younger age males. However, the switch from females to males having higher incidence rates of melanoma occurred at a later age among Hispanics than reported among NHWs [2].

Our histology findings were similar to those reported in previous studies of melanoma among Hispanics, including one that used both NPCR and SEER data [12]. As in other studies, SSM was the most common histologic subtype among Hispanics. SSM has strong associations with UV [34], suggesting that efforts to increase use of sun protection and decrease sunburn and indoor tanning among Hispanics can be effective at reducing incidence rates [2]. Similar to previous studies, we also found that Hispanics had higher proportions of subtypes with very poor outcomes including ALM or NM compared to NHWs [12,13,11,4]. ALM usually occurs on non UV-exposed areas such as soles of the feet, palms of the hand, and under the nail bed and does not appear to be UV-related [35,36].

We found rates of melanoma subtypes with lower survival (e.g., ALM and NM) were slightly higher among Hispanic men, particularly among older age groups. NM is a particularly aggressive cancer, and five-year survival rates are only about 67% among Hispanics [12]. Differences in histology and tumor thickness may explain some of the disparities in stage of diagnosis between males and females in our study. Melanoma death rates are also higher among Hispanic males than females [37], even at younger ages where incidence rates are higher among females [33]. Increased tumor thickness, later stage diagnosis and higher mortality among males could be due to greater health-seeking behaviors by women that may lead to earlier diagnosis [38]. Our findings indicate a need for increased awareness of melanoma among males, especially for ALM and NM which are often diagnosed at a later stage.

Melanomas occurring on different body sites also likely have different etiologic pathways [39]. Similar to previous studies, we found melanomas on the trunk and lower limb and hip were the most common locations among Hispanics [12,7,8,5]. The higher proportions of melanoma on the lower limb and hip likely reflect higher proportions of ALM. Similar to findings among NHWs, melanomas on the head and neck were more common among older age groups and melanomas on the trunk were more common among younger ages [40–42]. Melanomas appearing on the head and neck may be more strongly related to chronic UV exposure, while melanomas of the trunk are more strongly related to genetic factors, higher mole counts, and intentional tanning [40,42,43].

The highest proportion of melanomas on the head and neck occurred among older Hispanic men, suggesting long-term occupational exposure to UV may be a contributor [43]. Studies show that chronic UV exposure acquired through occupational settings increases risk for squamous cell carcinoma, but the relationship between occupational UV exposure and melanoma is less clear [44,45]. Studies that stratified by UV level found that outdoor workers in UV-intense areas had an increased risk of melanoma [46,47]. Molecular evidence from genetic sequencing suggests nearly all melanomas have a UV signature [48]. Given that the scientific evidence is not settled on this topic and chronic UV exposure is linked to nonmelanoma skin cancers that can be costly to treat and disfiguring, interventions to reduce UV exposure in the outdoor occupational setting are appropriate and recommended [49]. Hispanics make up a high proportion of the outdoor workforce [50], and sun protection, especially of the head and neck, may not be adequate in certain outdoor occupations [51–53]. Among Latino farmworkers in the US, Salas and colleagues reported most men always or often used long sleeve shirts and hats, but not necessarily wide-brimmed hats or sunscreen [51]. Only about a quarter of Latino postal workers in California reported using a wide-brimmed hat or sunscreen [52]. A more recent survey of US Hispanic outdoor workers across 5 southern and western states found low reported use of sunscreen, hats and protective clothing, with nearly 70% rarely or never using sunscreen, fewer than 20% wearing clothing or a hat to cover the face and neck, and only 40% wearing clothing to cover their arms while working outside [53]. Policy and educational interventions at outdoor worksites have been effective at increasing sun protective behaviors of workers [49], but it will be important to adapt these interventions to reach Hispanics of low English literacy [50].

Young Hispanic females had higher proportions of melanoma occurring on the lower limb and hip and upper arms and shoulders compared to males of similar age. Melanoma occurring on the upper and lower limbs is associated with history of severe and painful sunburn, although the relationship is stronger with the upper limbs [40]. More research is needed to understand our findings, but they suggest exposure to intense or intermittent UV early in life may be a contributing factor. They also suggest that like NHW women, young Hispanic women may be engaging in behaviors that increase their UV exposure, including intentional tanning. This is further corroborated by our finding that similar to NHWs, young Hispanic females have higher melanoma incidence rates compared to males [33].

Hispanics and NHWs in the US may also have similar beliefs regarding the attractiveness of tanned skin. In one study, a large proportion of Hispanic adolescents believed that tanning improves attractiveness, and only a few believed it made people appear older [54]. These beliefs may increase with greater acculturation to the US [55]. One possible source of intense UV exposure among young Hispanic women is indoor tanning. A 2013 survey of US high school students showed that nearly 8% of Hispanic female high school students engaged in indoor tanning in the past year [56]. Many young Hispanic females also report low use of sunscreen, with 88% reporting never, rarely, or sometimes using sunscreen when out on a sunny day for more than one hour [57]. Appearance-based messaging and behavioral counseling are potential strategies to address intentional tanning and low use of sunscreen among young Hispanic women [58,59], but more research is needed to determine effective messages for this population.

Increased awareness of skin cancer and ways to prevent it on the part of providers and patients has the potential to decrease incidence, increase early diagnosis, and improve outcomes among Hispanics [13]. Current recommendations for behavioral counseling by health care providers on skin cancer prevention only include fair-skinned youth ages 10–24 [60]. Although this recommendation is based on skin tone and not race, some providers may not consider Hispanics fair-skinned despite their actual skin tone [13] and miss an appropriate opportunity to educate young patients. Hispanics may be more likely to believe that there is little they can do to prevent skin cancer, to believe their risk is below average compared with others of similar age, and to report they are unsure about which prevention recommendations to follow [61–63]. Primary care physicians and dermatologists can dispel the myth that melanoma only affects NHWs, and educate Hispanic patients in a culturally appropriate manner on melanoma risk factors, how to recognize sunburn, how to identify abnormal lesions, and the need to check non sun-exposed areas for ALMs that are comparatively more common among Hispanics than among NHWs [64,65]. Skin cancer prevention messages and interventions targeting Hispanics will also need to consider level of acculturation. Hispanics with greater acculturation to the US English-speaking population generally report higher levels of sunscreen use, but lower levels of shade-seeking, sun avoidance, and use of protective clothing and hats [19,66]. Additionally, acculturation is associated with increased risk behaviors such as indoor tanning, sunbathing, and sunburn [66,67,18].

Our study is subject to several limitations. Although Hispanics have different cancer risk based on their country of origin and whether they are foreign-born [20,68], we were unable

to examine incidence rates by birth place because these data were not reported for most cases. Additionally, accurately defining the Hispanic population can be challenging in cancer registries [29]. Hispanics may be misclassified by appearance or surname, which is particularly problematic for women [69]. Furthermore, persons with origins in traditionally Portuguese-speaking countries are excluded from this definition, even though they may originate from geographic areas with neighboring Spanish-speaking countries [29]. Due to small numbers, we could not disaggregate data on Hispanics of other races from data on Hispanic whites for all analyses. Therefore, Hispanics in our analyses represent varying complexions and propensity to sunburn.

Reporting melanoma data from central cancer registries is also challenging. Melanoma incidence rates are susceptible to underreporting and reporting delays because they are often diagnosed in outpatient settings [70]. Consistent with other studies of melanoma, some cases were missing data on tumor thickness and a large percentage were lacking specific histologic information [12]. The issue of missing histology in cancer registry data is not limited to melanoma [71]. Patient-level data for insurance status were not available in our analytic file, so we were unable to examine the impact of insurance status on stage of diagnosis as discussed by Hu and colleagues [16]. We observed a decline in the rate of unstaged melanomas from 2003 through 2012, likely related to the North American Association of Central Cancer Registries' decision to change how stage was coded by cancer registries in 2004 [30]. We could not fully assess to what extent declines in overall rates were due to actual decreases in disease incidence rather than reporting delays, changes in stage classification, better reporting of stage, or delayed diagnosis resulting from a decrease in timely access to care, particularly during the recent economic downturn [72]. Clinicians and pathologists can support population-based cancer registration by ensuring they report every melanoma diagnosis to their state cancer registry, as information from both sources are often critical for completeness of the cancer record. Efforts to improve systems to collect and report accurate patient information on both race and ethnicity, as well as data on tumor attributes such as histology and tumor thickness will support future efforts to examine melanomas among minority populations.

In conclusion, our findings indicate that clinicians, Centers for Disease Control and Prevention-funded comprehensive cancer control programs, and other public health practitioners will need to be better equipped to reach the growing Hispanic population in the US with strategies for primary prevention and early diagnosis of melanoma, and researchers will need to continue monitoring Hispanic melanoma rates and UV-related behaviors to inform appropriate interventions [2]. Improvements in identification of Hispanics in cancer surveillance data and refinements in melanoma reporting, including more complete information on histology, race/ethnicity, and country of origin of cases, would allow for better characterization of melanoma among this population and different Hispanic subgroups. Future behavioral research can inform strategies to increase awareness of skin cancer and promote sun protection among Hispanics, taking into consideration different Hispanic subgroups and levels of acculturation.

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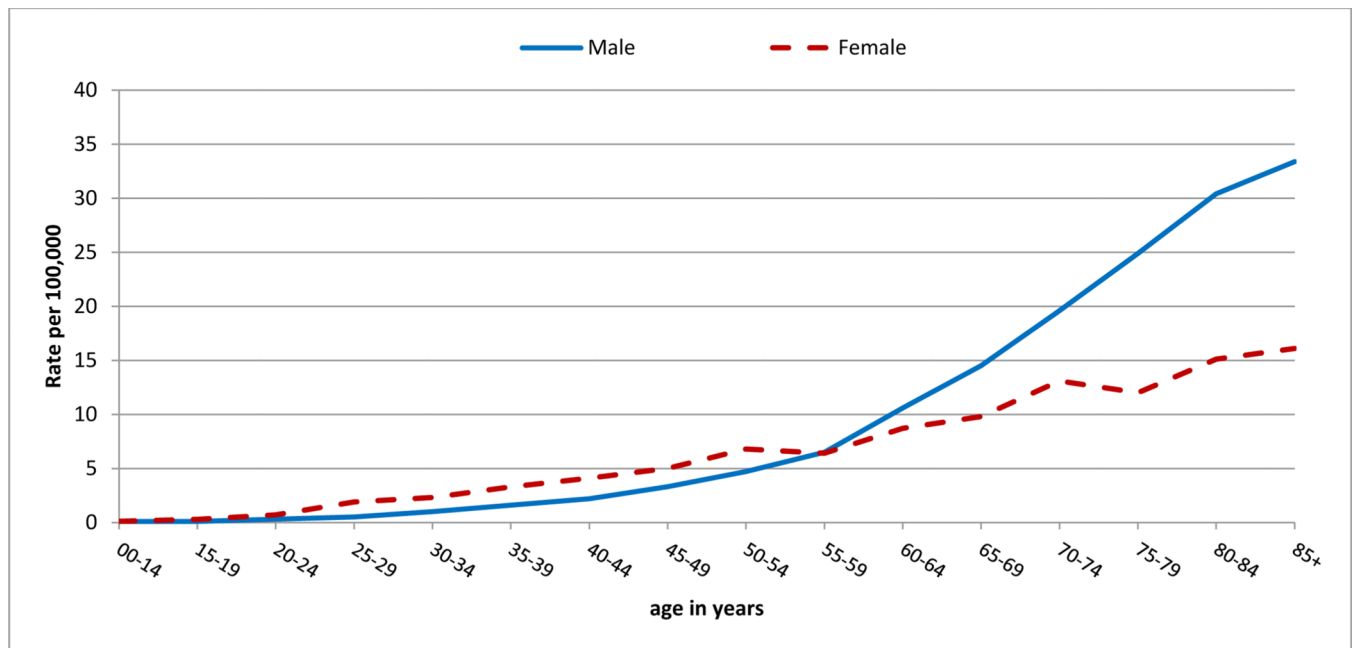


Figure 1. Melanoma incidence rates in Hispanic males and females by age, United States, 2008–2012

Incidence data are from population areas that meet United States Cancer Statistics publication criteria (http://www.cdc.gov/cancer/npcr/uscs/technical_notes/criteria.htm) for 2008–2012 and were reported to the National Program of Cancer Registries (Centers for Disease Control and Prevention) and the Surveillance, Epidemiology, and End Results (SEER) Program (National Cancer Institute). They cover about 99.1% of the U.S. population.

Rates are per 100,000 people and are age-adjusted to the 2000 U.S. Standard Population

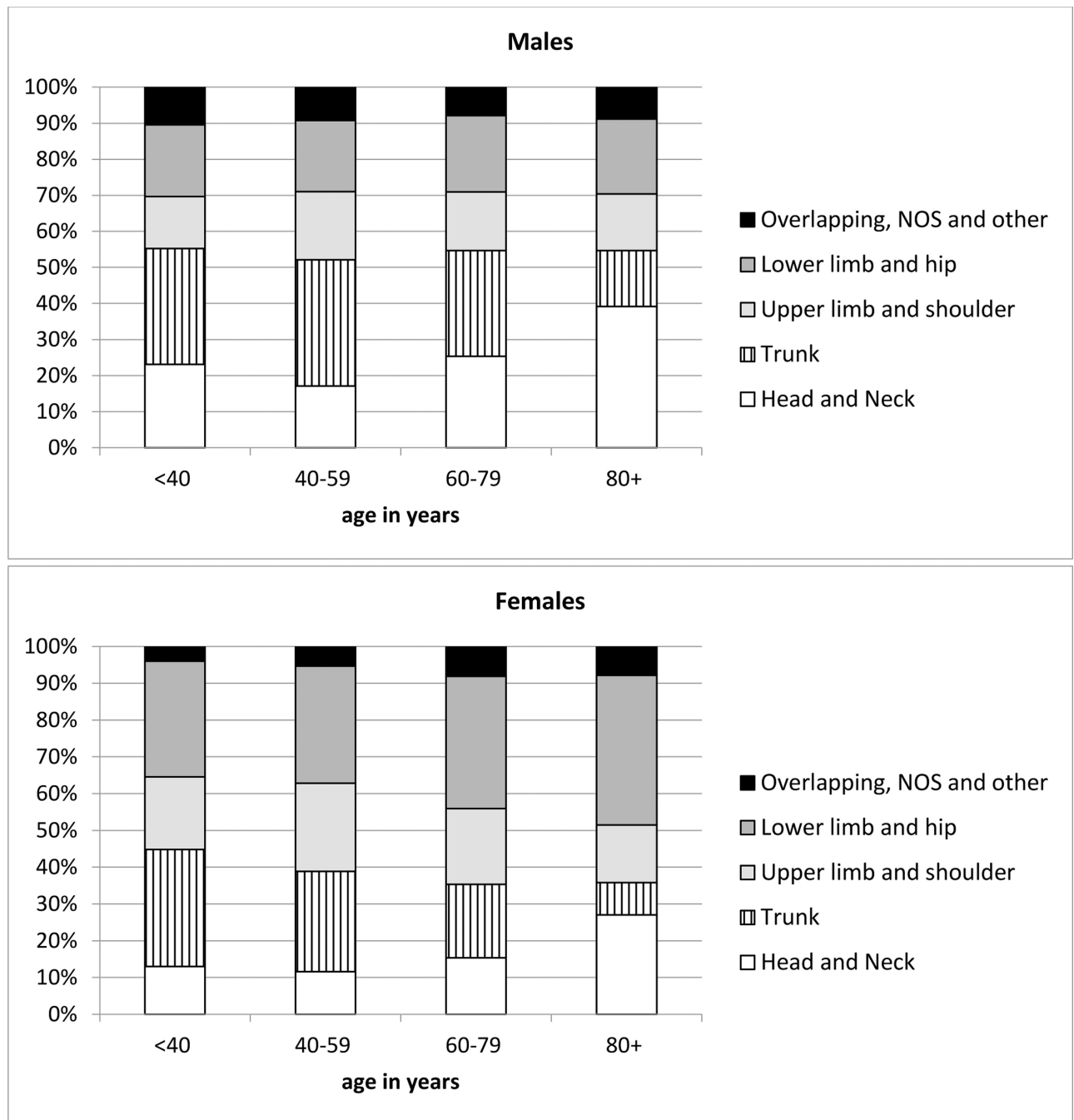


Figure 2. Proportion of melanomas by anatomic location in Hispanic males and females by age, United States, 2008–2012

Incidence data are from population areas that meet United States Cancer Statistics publication criteria (http://www.cdc.gov/cancer/npcr/uscs/technical_notes/criteria.htm) for 2008–2012 and were reported to the National Program of Cancer Registries (Centers for Disease Control and Prevention) and the Surveillance, Epidemiology, and End Results (SEER) Program (National Cancer Institute). They cover about 99.1% of the U.S. population.

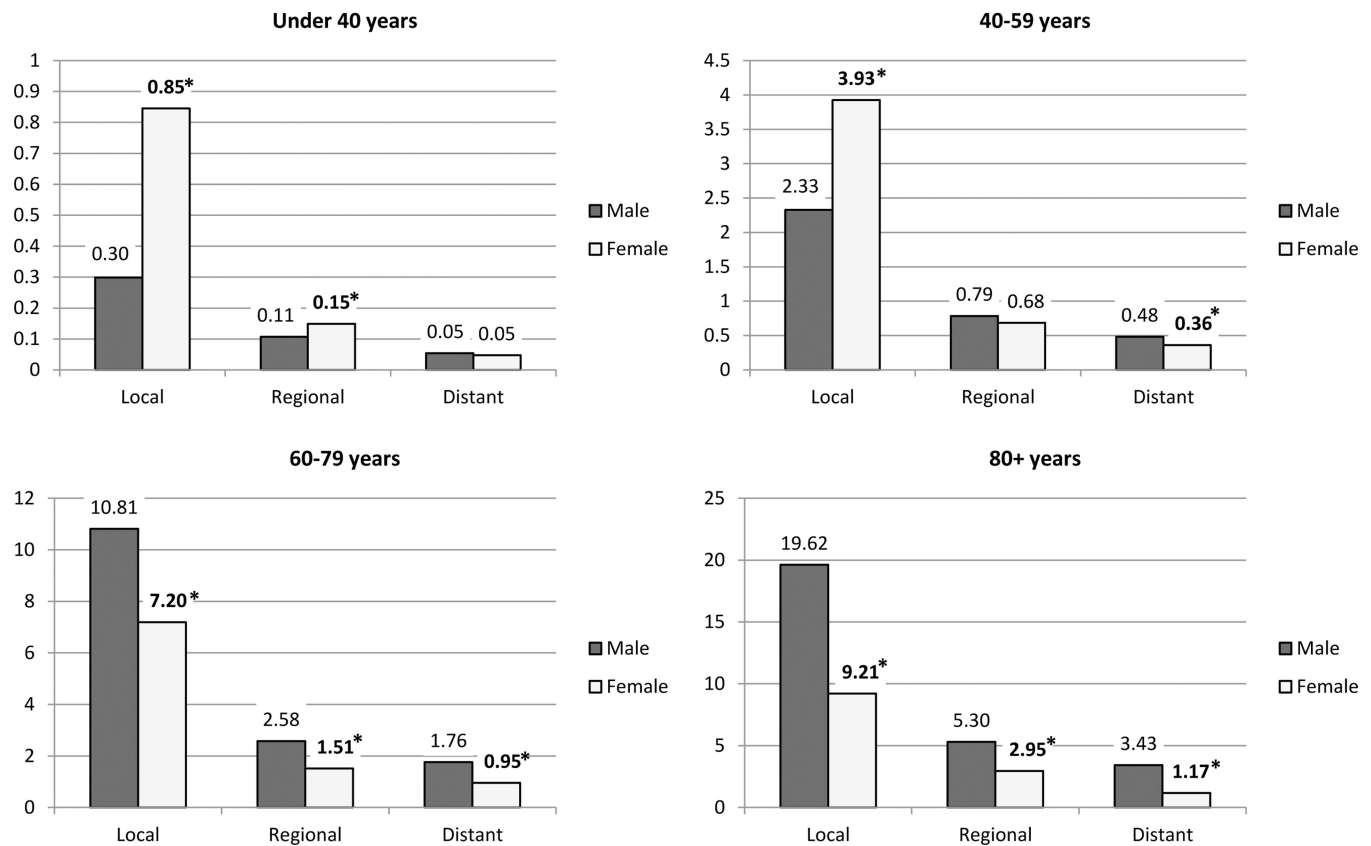


Figure 3. Melanoma incidence rates by stage among Hispanic males and females of different age groups, United States, 2008–2012^a

Incidence data are from population areas that meet United States Cancer Statistics publication criteria (http://www.cdc.gov/cancer/npcr/uscs/technical_notes/criteria.htm) for 2008–2012 and were reported to the National Program of Cancer Registries (Centers for Disease Control and Prevention) and the Surveillance, Epidemiology, and End Results (SEER) Program (National Cancer Institute). They cover about 99.1% of the U.S. population.

Rates are per 100,000 people and are age-adjusted to the 2000 U.S. Standard Population.

^a Figure excludes data from Minnesota. Minnesota data for stage cannot be analyzed for 2008–2012 diagnosis years.

* The rate ratio indicates that the female rate is significantly different than the rate of males ($p < 0.05$)

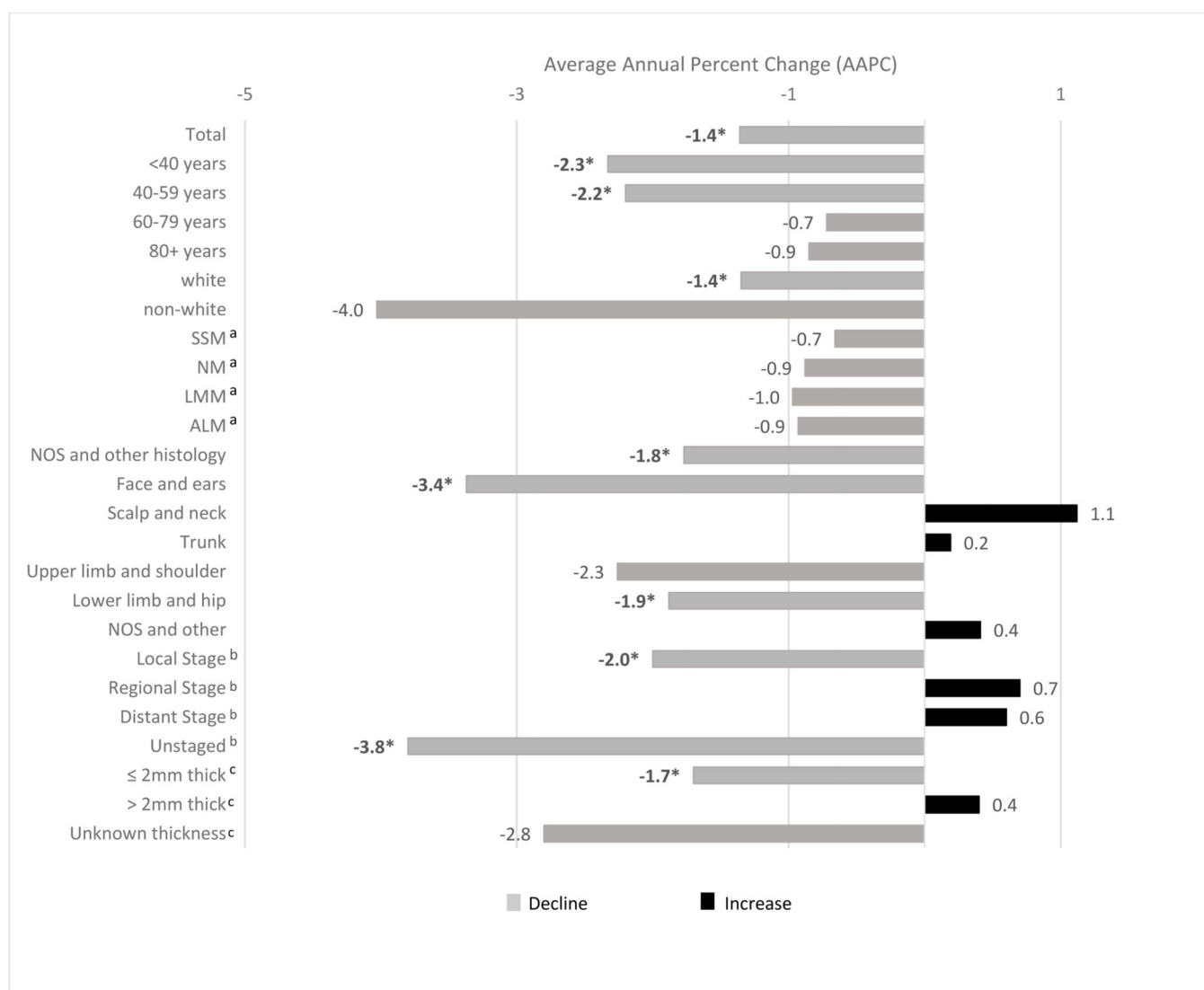


Figure 4. Trends in melanoma incidence among Hispanics, United States, 2003–2012

Incidence trends were calculated using data from population areas that meet United States Cancer Statistics publication criteria (http://www.cdc.gov/cancer/npcr/uscs/technical_notes/criteria.htm) for 2003–2012 and were reported to the National Program of Cancer Registries (Centers for Disease Control and Prevention) and the Surveillance, Epidemiology, and End Results (SEER) Program (National Cancer Institute). They cover about 92.2% of the U.S. population.

AAPC, average annual percent change was calculated using weighted least squares method. Rates are per 100,000 people and are age-adjusted to the 2000 U.S. Standard Population.

^a Abbreviations for histologic type are SSM for Superficial Spreading Melanoma, NM for Nodular Melanoma, LMM for Lentigo Maligna Melanoma, ALM for Acral Lentiginous Melanoma, and NOS for Not Otherwise Specified.

^b Stage excludes data from Minnesota. Minnesota data for stage cannot be analyzed for 2008–2012 diagnosis years.

^c Tumor Thickness is calculated only using data from the Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov 2014 Sub (2000–2012) <Katrina/Rita Population Adjustment> - Linked To County Attributes - Total U.S., 1969–2013 Counties, National Cancer Institute, Division of Cancer Control and Population Sciences, Surveillance Research Program, Surveillance Systems Branch, released April 2015, based on the November 2014 submission. Data from SEER 18 registries cover about 27.8% of the US population.

* The asterisk and bold font indicate that the AAPC is significantly different from zero ($p < 0.05$).

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Table 1

Average Annual Counts (AAC) and Incidence Rates of Melanoma among Hispanics (2008–2012) and Average Annual Percent Change (AAPC) (2003–2012) by Age, Race, Histology, Location, Stage and Tumor Thickness for Males and Females, United States

	All			Male (M)			Female (F)			M to F	
	AAC (%)	Rate (95% CI)	RR	AAPC	AAC (%)	Rate (95% CI)	RR	AAPC	AAC (%)	Rate (95% CI)	RR
Total (n=6,623)	1325 (100)	4.2 (4.1, 4.3)		-1.4*	604 (45.6)	4.6 (4.4, 4.8)		-1.1	721 (54.4)	4.0 (3.9, 4.1)	
Median Age (years)	56				61				52		
Age Categories											
<40 years	253 (19.1)	0.8 (0.8, 0.8)	Ref	-2.3*	80 (13.3)	0.5 (0.4, 0.5)	Ref	-2.0	172 (23.9)	1.1 (1.1, 1.2)	Ref
40–59 years	489 (36.9)	4.6 (4.5, 4.8)	5.8*	-2.2*	204 (33.8)	3.9 (3.7, 4.1)	7.8*	-2.3*	286 (39.6)	5.4 (5.1, 5.7)	4.8*
60–79 years	446 (33.7)	13.3 (12.8, 13.9)	16.6*	-0.7	244 (40.5)	16.7 (15.8, 17.7)	33.6*	-0.5	202 (28.0)	10.7 (10.0, 11.4)	9.4*
80+ years	136 (10.3)	21.6 (20.0, 23.3)	27.0*	-0.9	75 (12.4)	31.8 (28.6, 35.2)	63.9*	-1.0	61 (8.5)	15.6 (13.9, 17.4)	13.7*
Race											
white	1236 (93.3)	4.2 (4.1, 4.4)	Ref	-1.4*	564 (93.4)	4.7 (4.5, 4.9)	Ref	-1.1	673 (93.3)	4.1 (3.9, 4.2)	Ref
non-white	36 (2.7)	1.4 (1.2, 1.7)	0.3*	-4.0	19 (3.1)	1.7 (1.3, 2.1)	0.4*	–	18 (2.5)	1.3 (1.0, 1.6)	0.3*
unknown	52 (3.9)	~	~	~	21 (3.5)	~	~	~	30 (4.2)	~	~
Histologic Type^a											
SSM	304 (23.0)	0.9 (0.8, 0.9)	5.2*	-0.7	113 (18.7)	0.8 (0.7, 0.9)	3.4*	-0.8	191 (26.5)	1.0 (0.9, 1.1)	8.1*
NM	115 (8.7)	0.4 (0.3, 0.4)	2.2*	-0.9	61 (10.1)	0.5 (0.4, 0.5)	2.0*	-1.3	54 (7.5)	0.3 (0.3, 0.3)	2.5*
LMM	44 (3.3)	0.2 (0.1, 0.2)	Ref	-1.0	25 (4.1)	0.2 (0.2, 0.3)	Ref	–	19 (2.6)	0.1 (0.1, 0.2)	Ref
ALM	62 (4.7)	0.2 (0.2, 0.3)	1.4*	-0.9	31 (5.1)	0.3 (0.2, 0.3)	1.1	-0.6	31 (4.2)	0.2 (0.2, 0.2)	1.6*
NOS and other	801 (60.5)	2.5 (2.4, 2.6)	15.2*	-1.8*	374 (61.9)	2.8 (2.7, 3.0)	12.3*	-1.2	427 (59.2)	2.4 (2.3, 2.5)	19.5*
Anatomic Location											
Face and ears	166 (12.6)	0.6 (0.6, 0.6)	Ref	-3.4*	94 (15.6)	0.8 (0.7, 0.9)	Ref	-3.5*	72 (10.0)	0.4 (0.4, 0.5)	Ref
Scalp and neck	81 (6.1)	0.3 (0.2, 0.3)	0.5*	1.1	51 (8.4)	0.4 (0.4, 0.5)	0.5*	2.5	31 (4.3)	0.2 (0.1, 0.2)	0.4*
Trunk	359 (27.1)	1.0 (1.0, 1.1)	1.7*	0.2	180 (29.9)	1.2 (1.2, 1.3)	1.5*	-0.9	178 (24.7)	0.9 (0.9, 1.0)	2.1*
Upper limb and shoulder	255 (19.3)	0.8 (0.7, 0.8)	1.3*	-2.3	102 (16.9)	0.8 (0.7, 0.8)	0.9	-0.6	154 (21.3)	0.8 (0.8, 0.9)	1.9*
Lower limb and hip	366 (27.7)	1.2 (1.1, 1.2)	2.0*	-1.9*	124 (20.5)	0.9 (0.9, 1.0)	1.2*	-1.4	243 (33.7)	1.4 (1.3, 1.5)	3.1*

	All				Male (M)				Female (F)				M to F	
	AAC (%)	Rate (95% CI)	RR	AAPC	AAC (%)	Rate (95% CI)	RR	AAPC	AAC (%)	Rate (95% CI)	RR	AAPC	RR	
NOS and other	96 (7.3)	0.3 (0.3, 0.3)	0.5 *	0.4	53 (8.8)	0.4 (0.3, 0.5)	0.5 *	0.6	43 (6.0)	0.3 (0.2, 0.3)	0.6 *	0.3	1.5 *	
SEER Summary Stage^b (n=6587)	AAC=1,317				AAC=600				AAC=717					
Localized	879 (66.8)	2.7 (2.7, 2.8)	7.2 *	-2.0 *	373 (62.2)	2.9 (2.7, 3.0)	5.7 *	-1.6	506 (70.6)	2.8 (2.7, 2.9)	9.7 *	-2.4 *	1.0	
Regional	208 (15.8)	0.7 (0.6, 0.7)	1.7 *	0.7	109 (18.2)	0.8 (0.7, 0.9)	1.6 *	1.1	99 (13.8)	0.6 (0.5, 0.6)	2.0 *	0.6	1.4 *	
Distant	116 (8.8)	0.4 (0.3, 0.4)	Ref	0.6	68 (11.3)	0.5 (0.4, 0.6)	Ref	-0.1	49 (6.8)	0.3 (0.3, 0.3)	Ref	1.4	1.8 *	
Unstaged	114 (8.6)	0.4 (0.3, 0.4)	1.0	-3.8 *	50 (8.4)	0.4 (0.4, 0.5)	0.8 *	-4.6 *	63 (8.8)	0.4 (0.3, 0.4)	1.3 *	-3.2 *	1.1	
Tumor Thickness^c (n=2717)	AAC=543				AAC=243				AAC=300					
1.00 mm	269 (49.5)	2.1 (2, 2.2)	4.2 *	-	104 (42.6)	2.0 (1.8, 2.2)	3.1 *	-	165 (55.0)	2.3 (2.1, 2.5)	5.7 *	-	0.9 *	
1.01–2.00 mm	75 (13.8)	0.6 (0.6, 0.7)	1.3 *	-	38 (15.5)	0.8 (0.7, 0.9)	1.2	-	37 (12.4)	0.6 (0.5, 0.6)	1.4 *	-	1.4 *	
2.01–4.00 mm	56 (10.3)	0.5 (0.4, 0.5)	0.9	-	28 (11.3)	0.5 (0.4, 0.6)	0.8	-	29 (9.5)	0.5 (0.4, 0.5)	1.1	-	1.1	
> 4.00 mm	55 (10.2)	0.5 (0.4, 0.6)	Ref	-	31 (12.6)	0.7 (0.5, 0.8)	Ref	-	25 (8.3)	0.4 (0.3, 0.5)	Ref	-	1.6 *	
Unknown; no size given	88 (16.2)	0.8 (0.7, 0.8)	1.5 *	-2.8	44 (17.9)	0.8 (0.7, 1.0)	1.3 *	-3.3 *	44 (14.8)	0.7 (0.6, 0.8)	1.7 *	-2.8	1.2	

Incidence data are from population areas that meet United States Cancer Statistics publication criteria (http://www.cdc.gov/cancer/npcr/uscs/technical_notes/criteria.htm) for 2008–2012 and were reported to the National Program of Cancer Registries (Centers for Disease Control and Prevention) and the Surveillance, Epidemiology, and End Results (SEER) Program (National Cancer Institute). They cover about 99.1% of the U.S. population.

AAC means Average Annual Count. AAPC means Average Annual Percent Change. Rates are per 100,000 people and are age-adjusted to the 2000 U.S. Standard Population.

^a Abbreviations for histologic type are SSM for Superficial Spreading Melanoma, NM for Nodular Melanoma, LMM for Lentigo Maligna Melanoma, ALM for Acral Lentiginous Melanoma, and NOS for Not Otherwise Specified.

^b Minnesota data for stage cannot be analyzed for diagnosis years 2008–2012 and 2003–2012 and was excluded from analysis.

^c Tumor Thickness is calculated only using data from the Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Registries Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov 2014 Submission (2000–2012) <Katrina/Rita Population Adjustment> - Linked To County Attributes - Total U.S., 1969 2013 Counties, National Cancer Institute, Division of Cancer Control and Population Sciences, Surveillance Research Program, Surveillance Systems Branch, released April 2015, based on the November 2014 submission.

– Statistic could not be calculated due to small numbers.

~ Statistic could not be calculated due unknown denominator.

* The rate ratio indicates that the rate is significantly different than the rate of the reference value ($p < 0.05$)