



Ocular melanoma incidence rates and trends in the United States, 2001–2016

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To the Editor:

Ocular melanoma is a rare form of melanoma (less than 5% of melanoma cases) arising from melanocytes of the uveal tract, conjunctiva, or orbit; however, up to 50% of patients will develop metastatic disease [1, 2]. Causes of ocular melanoma are unclear, but some possible risk factors include type B ultraviolet radiation, light eye color, ocular melanocytosis, and ubiquitin carboxyl-terminal hydrolase BAP1 mutations [1]. A previously published study using National Cancer Institute's Surveillance, Epidemiology, and End Results Program data examined 4999 cases and found a statistically significant increase of 0.5% in uveal melanoma (the most common type of ocular melanoma) incidence rates among whites from 1973 to 2013 [3]. The purpose of this study is to provide an update and overview of the incidence of ocular melanoma for the entire United States (US).

We examined population-based cancer registry incidence data from the US Cancer Statistics (USCS) 2001–2016 Public Use Research Database, covering the entire US population [4]. Ocular melanomas were defined by ICD-O-3 site code of C69.0–69.6 or C69.8–69.9 and ICD-O-3 histology code of 8720–8790 [4].

We used SEER*Stat software version 8.3.5 to calculate age-adjusted rates per 1,000,000 population. We examined rates by period (2001–2005, 2006–2010, and 2011–2016), by age group (0–44, 45–54, 55+ years), race/ethnicity, and sex. We examined trends in ocular melanoma incidence rates using joinpoint regression modeling, which fits a series of joined straight lines on a logarithmic scale to the trends in the annual rates [5].

For each period examined, the most commonly diagnosed type of ocular melanoma was choroid (C69.3) (Table 1). Rates were highest among those ≥ 55 , non-Hispanic whites, and males (Table 1).

After limiting analysis to non-Hispanic whites, we observed increasing trends in ocular melanoma rates in males and females combined (APC = 1.08%) and females alone (APC = 1.49%) for age group ≤ 44 years from 2001 to 2016 (Fig. 1), and females alone (APC = 2.76%) for age group ≥ 55 from 2001 to 2007 (Fig. 1). The rates remained stable for the rest (Fig. 1).

Consistent with previous research, cancer of the choroid was the most common type of ocular melanoma (75% overall) [3]. Our data allowed examination of rare cancer incidence among all race/ethnicity groups. Non-Hispanic whites had the highest incidence followed by Non-Hispanic American Indian/Alaska Native and Hispanic. Furthermore, there was a modestly higher increasing trend from 2001 to 2016 among non-Hispanic whites compared with previously published trends from 1973 to 2013 (1.08% vs. 0.5%) [3]. Although females comprised a lower percentage of ocular melanoma cases, increasing trends were seen among non-Hispanic white females in the younger and older age groups. These results provide important preliminary information that could be enhanced by future studies about groups that could benefit from prevention efforts, as early detection and treatment might be vital for positive long-term survival [2]. The strength of this study lies in the comprehensive data from USCS, covering 100% of the US population. However, the results

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Table 1 Tumor and demographic characteristics of ocular melanoma patients in the United States, 2001–2016.

| | 2001–2005 | | 2006–2010 | | 2011–2016 | |
|--|---------------------|--------------|---------------------|--------------|---------------------|---------------|
| | Rate (95% CI) | Count (%) | Rate (95% CI) | Count (%) | Rate (95% CI) | Count (%) |
| Total | 6.46 (6.33–6.59) | 9454 | 6.31 (6.19–6.44) | 10,179 | 6.20 (6.10–6.31) | 13,392 |
| ICD-O-3 site code | | | | | | |
| Conjunctiva (C69.0) | 0.39 (0.36–0.43) | 574 (6.1) | 0.38 (0.35–0.41) | 600 (5.9) | 0.37 (0.34–0.39) | 776 (5.8) |
| Cornea NOS (C69.1) | 0.02 (0.01–0.03) | 31 (0.3) | 0.02 (0.01–0.03) | 31 (0.3) | 0.01 (0.01–0.02) | 22 (0.2) |
| Retina (C69.2) | 0.05 (0.05–0.08) | 93 (1.0) | 0.05 (0.04–0.06) | 79 (0.8) | 0.02 (0.01–0.03) | 41 (0.3) |
| Choroid (C69.3) | 4.74 (4.63–4.86) | 6957 (73.6) | 4.69 (4.59–4.80) | 7583 (74.5) | 4.77 (4.67–4.86) | 10,334 (77.2) |
| Ciliary body and iris (C69.4) | 0.66 (0.62–0.70) | 961 (10.2) | 0.72 (0.68–0.77) | 1165 (11.4) | 0.71 (0.67–0.74) | 1500 (11.2) |
| Lacrimal gland (C69.5) | ^a | ^a | ^a | ^a | 0.01 (0.01–0.01) | 18 (0.1) |
| Orbit NOS (C69.6) | 0.08 (0.06–0.09) | 114 (1.2) | 0.07 (0.06–0.08) | 112 (1.1) | 0.06 (0.05–0.07) | 135 (1.0) |
| Overlapping lesion of eye and adnexa (C69.8) | 0.12 (0.10–0.14) | 178 (1.9) | 0.07 (0.05–0.08) | 106 (1.0) | 0.04 (0.03–0.05) | 85 (0.6) |
| Eye NOS (69.9) | 0.37 (0.34–0.41) | 546 (5.8) | 0.31 (0.28–0.34) | 503 (4.9) | 0.23 (0.21–0.25) | 481 (3.6) |
| Age | | | | | | |
| 0–44 years | 1.33 (1.25–1.40) | 1201 (12.7) | 1.31 (1.24–1.39) | 1165 (11.4) | 1.37 (1.30–1.45) | 1461 (10.9) |
| 45–54 years | 8.33 (7.94–8.74) | 1699 (18.0) | 7.84 (7.48–8.22) | 1751 (17.2) | 7.70 (7.37–8.05) | 2065 (15.4) |
| 55+ years | 20.92 (20.41–21.43) | 6563 (69.4) | 20.59 (20.11–21.07) | 7273 (71.4) | 19.98 (19.59–20.39) | 9866 (73.7) |
| Race and ethnicity ^b | | | | | | |
| Non-Hispanic white | 7.73 (7.57–7.89) | 8828 (94.2) | 7.80 (7.64–7.96) | 9506 (94.4) | 7.82 (7.68–7.97) | 12,256 (93.7) |
| Non-Hispanic black | 0.55 (0.43–0.68) | 81 (0.9) | 0.53 (0.43–0.66) | 91 (0.9) | 0.60 (0.50–0.71) | 135 (1.0) |
| Non-Hispanic American Indian/ Alaska native | 3.33 (2.10–4.97) | 26 (0.3) | 4.33 (3.01–6.01) | 39 (0.4) | 2.36 (1.60–3.35) | 34 (0.3) |
| Non-Hispanic Asian or Pacific Islander | 1.32 (1.00–1.69) | 67 (0.7) | 0.73 (0.54–0.96) | 53 (0.5) | 1.05 (0.86–1.27) | 112 (0.9) |
| Hispanic | 3.27 (2.92–3.65) | 367 (3.9) | 2.65 (2.37–2.95) | 377 (3.7) | 2.40 (2.19–2.62) | 536 (4.1) |
| Sex | | | | | | |
| Male | 7.46 (7.25–7.67) | 4950 (52.3) | 7.11 (6.92–7.31) | 5264 (51.7) | 6.96 (6.79–7.13) | 6996 (52.2) |
| Female | 5.68 (5.51–5.85) | 4513 (47.7) | 5.68 (5.52–5.84) | 4925 (48.3) | 5.59 (5.45–5.73) | 6396 (47.8) |

Rates age-adjusted per 1,000,000.

NOS not otherwise specified.

^aThese rates could not be calculated due to fewer than 16 cases.

^bUnknown race and ethnicity were excluded.

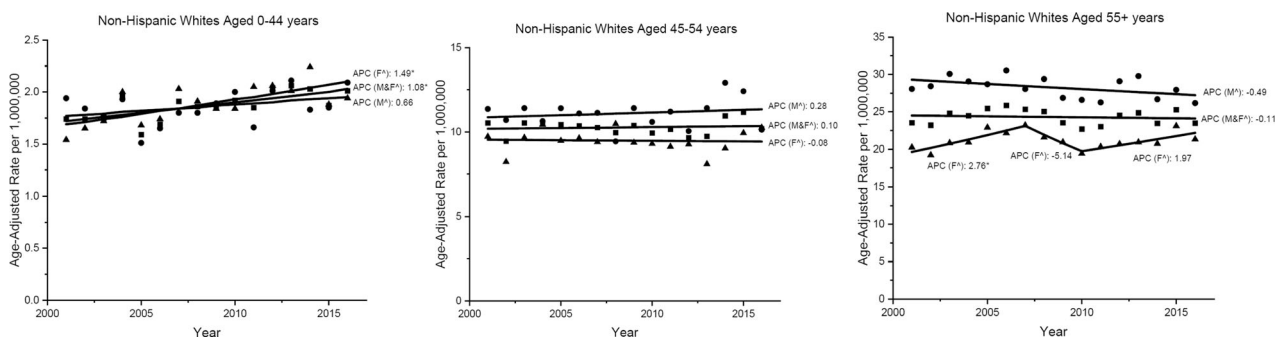


Fig. 1 Ocular melanoma observed (symbols) and joinpoint modeled (lines) rates for non-Hispanic whites by age and sex, 2001–2016. Rates age-adjusted per 1,000,000. M&F^ males and

females, M^ males, F^ females. An asterisk indicates that the *t*-test for the annual percent change (APC) had a *p* value < 0.05.

are limited by the rarity of this disease, meaning we were unable to stratify for further geographical analyses or to examine clustering.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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