

Trends in Malignant Melanoma Incidence and Mortality in Wisconsin, 1979–1997

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ABSTRACT

Objective—To explore trends in malignant melanoma incidence and mortality in Wisconsin from 1979 to 1997, by age, gender and time period. Comparisons are also made to US trends over this period.

Data—Incidence data for Wisconsin were provided by the Wisconsin Cancer Reporting System Bureau of Health Information, within the Wisconsin Department of Health and Family Services, while US data were extracted using SEER*Stat 3.0. Mortality data for both Wisconsin and the US were compiled using CDC WONDER.

Results—Wisconsin malignant melanoma incidence rates rose 25% from 1979 to 1998, compared to a US increase of 132%. For mortality rates, however, both Wisconsin (22%) and the US (15%) exhibited only modest increases. Between the mid-1980s and mid-1990s, the largest increases in both incidence and mortality (over 70%) occurred among males over age 65. In contrast, declines of 30% to 40% were found for males age 0–34. Patterns were less consistent among females.

Conclusions—Since the mid-1980s, malignant melanoma incidence in Wisconsin appears to have increased sharply among males and females over age 65, with a corresponding rise in mortality among males in this age group. These trends should be a source of concern for clinicians and policy makers alike. Because current evidence on the effectiveness of early treatment is inconclusive, it is especially important to take preventive measures now—such as educational and community-based interventions—to

reduce future incidence.

INTRODUCTION

The incidence of malignant melanoma has increased dramatically in recent decades. In the United States, from 1973 to 1994, rates of malignant melanoma soared 121%.¹ Some debate exists about whether incidence rates have been artificially inflated due to increased screening.² However, 2 recent studies cite evidence that much of the increase is, in fact, real.^{1,3} Over this same period, age-adjusted malignant melanoma mortality rates increased from 1.8 to 2.5 per 100,000, an increase of 39%. Because mortality has risen more slowly than incidence, it is possible that screening and early treatment programs are having desirable outcomes. Unfortunately, there is not yet sufficient research on the effectiveness of screening to support this empirically.^{4,5}

Previous research indicates that Wisconsin compares favorably to the United States in terms of both malignant melanoma incidence and mortality. As of 1994, Wisconsin was tied with Michigan and Minnesota for the third lowest rate of melanoma mortality in the nation.¹ Despite Wisconsin's favorable history, continued monitoring of malignant melanoma incidence and mortality is imperative. This report extends previous comparisons of Wisconsin and the United States to include recent data. In addition, Wisconsin incidence and mortality rates are examined by gender, age, and time period. This will identify subgroups at greatest risk and those experiencing significant changes over time.

METHODS

Malignant melanoma incidence data (ICD-9 172.0–172.9) for the US population were obtained from the Surveillance, Epidemiology and End-Results (SEER) system using SEER*Stat 3.0. SEER data from 9 geographic regions (Metro-Atlanta, Connecticut, Metro-Detroit, Hawaii, Iowa, New Mexico, San Francisco-Oakland, Seattle-Puget Sound and Utah) were ana-

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lyzed for the period 1979-1997.⁶ Wisconsin incidence data was provided by the Wisconsin Cancer Reporting System Bureau of Health Information (WCRS), within the Wisconsin Department of Health and Family Services.⁷ All incidence rates include in situ and invasive cancers.

In Wisconsin, data collection and reporting methods for malignant melanoma incidence have changed over time. To allow for valid comparisons, we account for 3 additional factors in our analysis.

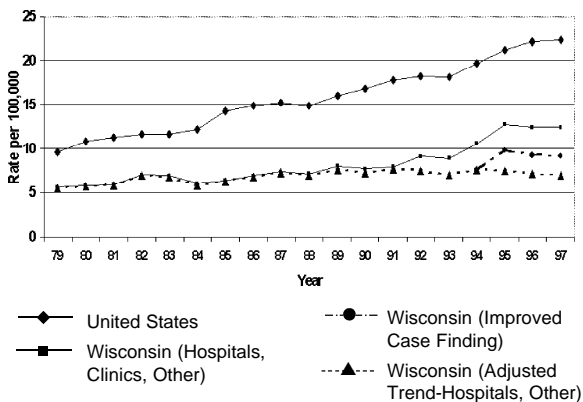
First, a substantial number of malignant melanoma cases (6%–32% annually) were reported after the publication of WCRS annual reports. Additional data (for 1282 late-reported cases—of 8364 total cases) were acquired from the WCRS and incorporated into the analysis.

Second, until 1992, malignant melanoma cases diagnosed at clinics were rarely reported to the WCRS. Therefore, data prior to this date largely reflect cases treated in hospitals and underestimates the true incidence of malignant melanoma. The reporting of cases diagnosed in clinics was gradually phased in from 1992 to 1995. This resulted in a roughly 25% increase in the total number of cases reported. In this analysis, we present data separately according to facility of diagnosis to account for this effect.

Third, during 1995 and 1996, the WCRS conducted a series of special training sessions with hospitals to enhance their case-finding procedures—particularly for out-patient diagnoses. The resultant improved reporting led to an estimated 25% increase in the number of cases reported by hospitals during subsequent years. In this analysis, we either present data separately for this period or adjust data from previous periods to reflect the prior undercount.

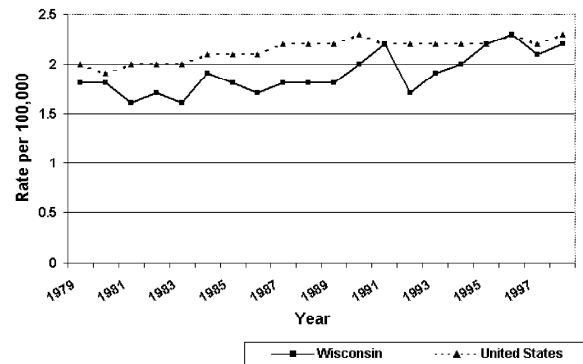
Malignant melanoma mortality data for Wisconsin and the US were compiled using CDC WONDER.⁸ Incidence and mortality rates for Wisconsin were stratified by gender and age to compare malignant melanoma trends over the past decade. To enhance robustness, data were compiled for two 5-year periods (1983-1987 and 1993-1997) to generate average annual rates for each time period. Rates were not further stratified by race due to very low rates of malignant melanoma among non-whites which, when compounded by the low proportion of minorities in Wisconsin, rendered such estimates unreliable. Because we have not controlled for race, a small proportion of rate differences (13%) between the US/SEER (21.4% non-white) and Wisconsin (8.0% non-white) data will be due to variations in racial composition across the two populations. As our

Figure 1. Malignant Melanoma Incidence, Wisconsin and the United States, 1979–1997



Note: Rates are age-adjusted to the 1970 US standard population.

Figure 2. Malignant Melanoma Mortality, Wisconsin and the United States, 1979–1998.



Note: Rates are age-adjusted to the 1970 US standard population

major purpose is to compare incidence and mortality trends across time, however, conclusions should be relatively insensitive to these racial differences. Incidence and mortality rates were age-adjusted to the 1970 US standard population, except when stratifying by age group.

RESULTS

Incidence—Malignant melanoma incidence data for Wisconsin and the United States are presented in Figure 1. Wisconsin incidence rates are presented with separate trend lines to account for total cases, the advent of regular clinic reporting, and improved data collection procedures at hospitals beginning in 1995. Although the total incidence rate rose 121% from 1979 to 1997, after accounting for changing data collection procedures, the increase was only 25%. While adjusted rates rose 38% from 1979 to

Table 1. Malignant Melanoma Incidence and Mortality, Wisconsin and the United States, by Age, Gender, and Time Period

Wisconsin						
	Incidence Rate per 100,000 1983–1987†	Incidence Rate per 100,000 1993–1997†	Percent Change	Mortality Rate per 100,000 1983–1987	Mortality Rate per 100,000 1993–1997	Percent Change
Males Age						
0–34	2.7	1.6	-41	0.4	0.3	-30
35–64	15.7	15.7	0	3.9	3.7	-5
65+	27.1	49.9	+84	8.6	15.0	+74
Total*	9.5	11.8	+24	2.3	2.9	+26
Females Age						
0–34	2.8	2.9	+2	0.2	0.2	-16
35–64	12.3	12.6	+2	1.8	2.0	+15
65+	16.0	22.7	+42	6.7	7.2	+7
Total*	7.3	8.1	+11	1.3	1.4	+8
Overall*	8.4	9.9	+18	1.8	2.1	+17
United States						
Males	15.8	25.4	+61	2.9	3.2	+10
Females	12.1	17.3	+43	1.5	1.5	0
Overall*	13.6	20.7	+52	2.1	2.2	+5

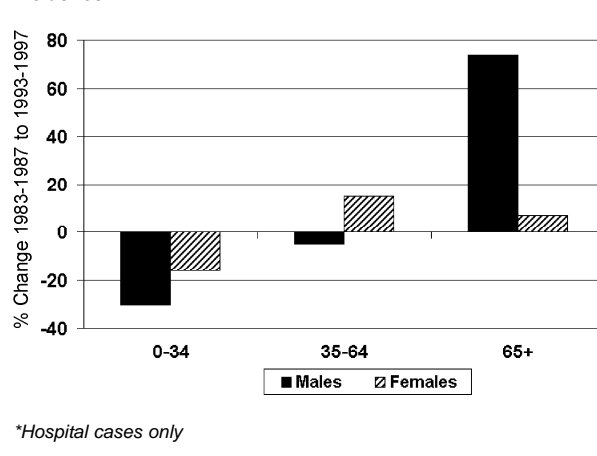
**Totals are age-adjusted to the 1970 US census population*
 To permit comparability across time, Wisconsin incidence rates are for hospital cases only, and have been adjusted to reflect the

1989, they actually fell 9% during the 1990s. This is in sharp contrast to US rates, which steadily rose 132% from 1979 to 1997. Despite the recent increases in case reporting, Wisconsin's total incidence rate remains nearly 50% below the US average.

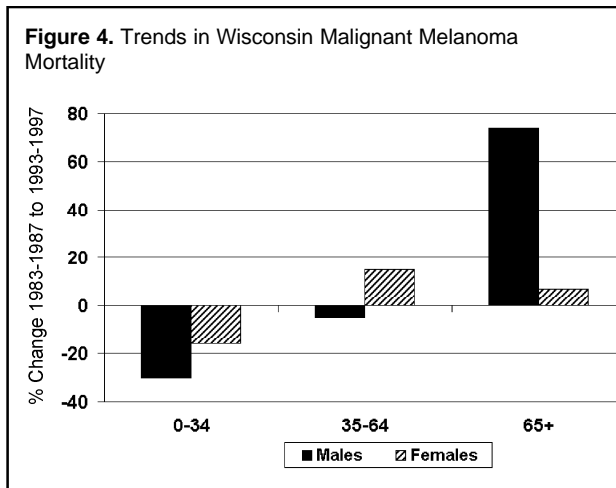
Mortality—Age-adjusted malignant melanoma mortality rates for Wisconsin and the United States for 1979-1998 are presented in Figure 2. While US rates rose 15% over this span, Wisconsin rates increased by 22%. Thus, although Wisconsin rates were below US rates for much of the period, this advantage has now nearly disappeared. This contrasts sharply with the data on incidence, where Wisconsin rates are well below those for the US. Overall, however, mortality from malignant melanoma remains rare, with rates of roughly 2 deaths per 100,000 population.

Incidence—Wisconsin malignant melanoma incidence and mortality rates, stratified by age and gender for the 1983-1987 and 1993-1997 periods, are presented in Table 1. To permit comparability across time, Wisconsin incidence rates are for hospital cases only, and have been adjusted to reflect the under-detection of hospital cases prior to 1995. Wisconsin incidence rates declined by over 40% among males age 0-34 over this 10-year span. This trend gradually reverses itself with advancing age, with rates rising over 80% among males over age 65. A different pattern emerges for females. Rates were virtually unchanged

Figure 3. Trends in Wisconsin Malignant Melanoma Incidence*



for younger females, while there was a 42% increase in incidence among the elderly group. These trends are summarized in Figure 3. Wisconsin incidence rates are now 46% higher among males than females; a gap that has widened over time. Wisconsin and US rates in this table are not directly comparable because cases diagnosed exclusively at clinics are excluded from the Wisconsin data. Nevertheless, it is still possible to make rough comparisons of trends over time. Overall, increases in incidence rates among US males (61%) and females (43%) have outstripped Wisconsin increases of 25% and 11% respectively.



Thus, Wisconsin’s advantage in malignant melanoma incidence appears to have widened.

Mortality—In Wisconsin, mortality rates declined 30% among males under age 35, but increased by over 70% among males over age 65. These results are consistent with trends in incidence. Mortality rates for females were fairly stable over this period. These trends are summarized in Figure 4. In contrast to trends in incidence, Wisconsin malignant melanoma mortality increased somewhat more rapidly than for the United States as a whole. In absolute terms, each year in Wisconsin there were approximately 30 more cases of malignant melanoma, and 20 more deaths, during the 1993-1997 period than occurred a decade earlier.

DISCUSSION

From 1985 to 1995, overall rates of malignant melanoma incidence and mortality increased in both Wisconsin and the United States. Two interesting questions emerge from our analysis that may be addressed in future research. First, why have Wisconsin mortality levels almost “caught up” to the US, despite the fact that Wisconsin incidence remains far below US rates? Second, why is mortality increasing at a faster pace in Wisconsin than for the United States, given that incidence is increasing more rapidly in the United States?

It is clear that Wisconsin and United States results are similar in that males and individuals over age 65 face: 1) a higher risk of malignant melanoma diagnosis, and 2) a more rapid increase in the rate of diagnosis than other groups. Previous research suggests that males are more likely than females to downplay the dangers of sun exposure and less likely to protect themselves from prolonged exposure to ultraviolet radiation.⁹ These trends may be changing in

Wisconsin, however, as evidenced by a substantial decrease in incidence among males age 0-34 over the past decade, at a time when female rates remained constant. Some studies also report that increasing age is predictive of protective behaviors.^{10,11} However, because early childhood exposure to ultraviolet radiation appears to be important etiologically, higher incidence rates among the elderly may be the result of cumulative exposure.^{3,4,9} Also, within older age groups in Wisconsin (e.g., 65+), the average age of the population has increased slightly over time.¹² Thus, a small portion of the rise in elderly incidence may be due to slightly higher average ages within elderly age groups.

When mortality is examined by age and gender, males over age 65 are found to be: 1) at greatest risk of dying from malignant melanoma, and 2) experiencing the sharpest mortality rate increase. This is consistent with incidence data. Explanations for higher mortality among elderly males may be similar to those noted previously in the discussion of incidence. For instance, some studies have suggested that elderly males are less likely to engage in protective behaviors than elderly females.^{4,13} Males have also been found to be less likely than females to participate in malignant melanoma screening activities aimed at secondary prevention.¹⁴

Malignant melanoma data collection procedures in Wisconsin have changed significantly over the past two decades. Although we have attempted to identify and account for these changes, our analysis bears several limitations. First, comparisons between Wisconsin and US (SEER) incidence rates may be influenced by variations in the completeness of case ascertainment between the two registries. Furthermore, estimates from both registries should be considered as lower bounds for true incidence, as a portion of cases are never reported. Second, although the proportion of late-reported cases in Wisconsin has declined over time, it has not been fully eliminated. Thus, additional cases may continue to be reported for the 1993-1997 period. Based on previous reporting trends, however, these additional cases should not change estimates for this period from this analysis by more than 5%. Third, incidence trends are based upon the roughly 75% of cases diagnosed at hospitals, because data from clinics are largely unavailable prior to 1992. It is possible, however, that the trend in clinic cases differed over this period. Because data are not available to substantiate this, we have assumed in this analysis that there has not been a major shift from hospitals to clinics in the diagnosis of malignant melanoma. Furthermore,

since less than one-fourth of cases in the 1990s were reported solely from clinics, even a fairly substantial shift between reporting sites would exert a relatively modest influence on our results. Finally, estimates have been adjusted to reflect the incorporation of improved hospital case finding procedures, beginning in 1995. It is possible that other more subtle changes in case finding occurred over this time period as well.

Both these findings, and their associated limitations, highlight the importance of careful monitoring of malignant melanoma. In Wisconsin, incidence and mortality appear to have increased sharply among the elderly in recent years, which should be a source of concern for clinicians and policy makers alike. Because current evidence on the effectiveness of screening programs is inconclusive, it is especially important to take preventive measures now.^{4,5} Community-based programs which disseminate information on strategies to limit exposure to ultraviolet radiation—such as media campaigns, advertisements at high-risk public use areas (e.g., swimming pools), and educational programs at schools and workplaces, have generally proven effective in modifying attitudes and behaviors.¹² Because excess exposure to ultraviolet radiation through outdoor and indoor activities (e.g. tanning devices)^{15,16} is paramount in causing malignant melanoma, programs encouraging behavior modification may be an effective means for limiting the future incidence of malignant melanoma in Wisconsin.

ACKNOWLEDGMENTS

The authors thank Indiana Strombom of the University of Wisconsin-Madison Department of Preventive Medicine for sharing her expertise in cancer registry data collection.

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