Does the Prevalence of Skin Cancer Differ by Metropolitan Status for Males and Females in the United States?

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Abstract

Purpose: Skin cancer is a major health concern in the general population, but there are conflicting findings regarding its relationship to where people live. The purpose of this study was to determine whether skin cancer differs by metropolitan status in the general population of U.S. adult males and females aged 18 and older.

Methods: This cross sectional analysis used 2015 data from the Behavioral Risk Factor Surveillance System (BRFSS) for males and females aged 18 years and older. Multiple logistic regression analysis was used to assess the relationship between skin cancer and metropolitan status separately by gender while controlling for other cancers, general health, educational level, employment status, income level, ethnicity, and age.

Results: Across states, 20% of males and 15% of females reported skin cancer and roughly 20% of both males and females lived in rural areas, 40% in suburban areas, and 40% in urban areas. After controlling for health, socioeconomic and demographic factors, skin cancer and metropolitan status were significantly related for both males and females. Skin cancer was also related to other cancers, income level, ethnicity/race, and age for both genders.

Conclusion: This study found that skin cancer significantly differed by metropolitan status with both males and females living in suburban areas reporting more cancer than those living in urban or rural areas. Limitations to this study include a broad definition of skin cancer and no lifestyle variables specific to sun exposure. It is recommended that general practitioners screen, educate, and provide referral services as necessary for both males and females, especially those who live in suburban areas, have a history of cancer, are 65 or older, and are white, non-Hispanic.

Keywords: Skin cancer; Metropolitan status; Suburban; Rural; Urban; Adults; Age Differences; Gender Differences

Introduction

Skin cancer is the most prevalent type of cancer in the United States [1], and its incidence has significantly increased by 45% since 1992 [2]. Among adolescents and young adults specifically, invasive skin cancer is the second most commonly diagnosed cancer, making up 15% of all cancer diagnoses in 15-29 year olds [3,4]. Moreover, numerous studies have shown skin cancer incidence significantly increasing in older adults [2,5,6]. The rise in skin cancer carries a burden of morbidity and cost in the United States, with 8,000 deaths and $3.5 billion lost in productivity each year [5,6]. Furthermore, while melanoma accounts for approximately 75% of all deaths from skin cancer, basal cell and squamous cell carcinomas can still lead to severe illness and disfigurement [7], placing significant stress on quality of life.

Several demographic factors have been related to an increased risk of skin cancer, but with varying results. For example, some research indicates that the incidence of melanoma was highest among high income households, counties with high education rates, and low unemployment rates [8]. Conversely, other research found that that individual from lower socioeconomic status groups had the largest increase in melanoma prevalence in the United States [2]. In addition, poverty status has also been cited as having an influence on skin cancer incidence, as counties with low poverty rates have an increased risk of skin cancer compared to counties with high poverty rates [8]. Despite these differences, most studies conclude that the incidence of melanoma is highest among non-Hispanic whites when compared to other races and ethnicities [2,8].

In addition, gender and age differences related to skin cancer vary. Many studies have shown skin cancer affects males more than females and is highly prevalent amongst the older population [2,6]. For melanoma, data from the National Program of Cancer Registries (NPCR) showed that women have a greater risk of being diagnosed with melanoma and increased incidence over time [4]. However, data from the Surveillance, Epidemiology, and End Results (SEER) program of the National Cancer Institute (NCI) reported males to have a greater diagnosis
incidence compared to the female incidence rate, as well as higher mortality rates in males younger than age 30 [3].

Furthermore, metropolitan status may be related to skin cancer, but research findings are conflicting. Some studies found a positive relationship between skin cancer incidence and population density, while others did not [9]. Numerous European studies have shown individuals living in urban regions have an increased incidence of skin cancer compared to individuals living in rural regions [6,10,11]. However, a study conducted in the United States suggested metropolitan status was not significantly related to incidence of invasive cutaneous melanoma [8]. Therefore, the purpose of this study was to determine whether skin cancer differs by metropolitan status in adults age 18 and older by gender in the general United States population when controlling for demographic factors that may be related to skin cancer.

Methods

Design

This cross-sectional analysis used data from the 2015 Behavioral Risk Factor Surveillance System (BRFSS) conducted by the Centers for Disease Control and Prevention (CDC) [12]. BRFSS conducts annual national, population-based data collection using random digit dialing for health-related behaviors, conditions, and services acquired via telephone surveys in all 50 states and the District of Columbia. This study was given exempt status by The University of North Texas Health Science Center.

Sample

The sample for this study included males and females ages 18 years and older from Florida (N=4872), North Carolina (N=1793), and Tennessee (N=3127) with data for metropolitan status. This study includes multiple states in order to increase sample size and strengthen the generalizability of results to the general population. These states were identified as having higher percentages of skin cancer when compared all other states within the continental United States using the BRFSS 2015 prevalence map [13].

Data

The outcome, skin cancer, was measured as ever/never diagnosed with skin cancer in the person’s lifetime. The factor of interest, metropolitan status, was categorized as rural, suburban, or urban based on the defined metropolitan statistical area, which is determined by the United States Office of Management and Budgets to organize geographic regions by population density and zip code analysis [14].

The control variables included other cancers, general health, educational level, employment status, income level, ethnicity/race, age, and gender. Other cancers was measured as ever/never diagnosed with “any form of cancer, except skin cancer.” General health was dichotomized as “good or better” versus “fair or poor.”

Table 1: Sample characteristics separately for males and females.

| Variable            | Male (N=3729, 38%) | Female (N=6063, 62%) |
|---------------------|--------------------|-----------------------|
|                     | N                  | %                     | N                  | %                     |
| Skin Cancer         |                    |                       |                     |                       |
| Ever diagnosed      | 737                | 20                    | 889                | 15                    |
| Never diagnosed     | 2992               | 80                    | 5174               | 85                    |
| Total               | 3729               | 100                   | 6063               | 100                   |
| Metropolitan Status |                    |                       |                     |                       |
| Suburban            | 1501               | 40                    | 2416               | 40                    |
| Urban               | 1544               | 41                    | 2569               | 42                    |
| Rural               | 684                | 18                    | 1078               | 18                    |
| Total               | 3729               | 100                   | 6063               | 100                   |
| Other Cancer        |                    |                       |                     |                       |
| Ever                | 471                | 13                    | 822                | 14                    |
| Never               | 3258               | 87                    | 5241               | 86                    |
| Total               | 3729               | 100                   | 6063               | 100                   |
| General Health      |                    |                       |                     |                       |
Good or better | 2901 | 78 | 4662 | 77
Less than good | 828 | 22 | 1401 | 23
Total | 3729 | 100 | 6063 | 100

Educational Level
Graduated | 1564 | 42 | 2005 | 33
Did not graduate | 2165 | 58 | 4058 | 67
Total | 3729 | 100 | 6063 | 100

Employment Status
Employed | 1462 | 39 | 1965 | 32
Not employed | 2267 | 61 | 4098 | 68
Total | 3729 | 100 | 6063 | 100

Income Level
$0 to less than $25,000 | 894 | 24 | 2187 | 36
$25,000 to less than $50,000 | 984 | 26 | 1654 | 27
$50,000 or more | 1851 | 50 | 2222 | 37
Total | 3729 | 100 | 6063 | 100

Ethnicity/Race
White, non-Hispanic | 3026 | 81 | 4727 | 78
Other | 703 | 19 | 1336 | 22
Total | 3729 | 100 | 6063 | 100

Age
65 or older | 1896 | 51 | 2966 | 49
Less than 65 | 1833 | 49 | 3097 | 51
Total | 3729 | 100 | 6063 | 100

Note: Ref=referent group; AOR= adjusted odds ratio; 95% CI= 95% confidence interval; Bolded results are significant (AORs with 95% CI that do NOT include 1.0 are significant)

Educational level was measured by ever/never graduated from college or technical school. Employment status was dichotomized as “employed” or “not employed” (which includes retired) at the time of survey completion.

Income level was measured as an annual income “$0 to less than $25,000,” “$25,000 to less than $50,000,” and “$50,000 or more.” Because there were low frequencies for races other than White, race/ethnicity was dichotomized as “white, non-Hispanic” versus “other.” Age was dichotomized “65 years or older” versus “Less than 65 years of age.”

Analysis

Frequency distributions were used to describe the sample and determine any issues with distributions of variables. Multiple logistic regression analysis was used to assess the relationship between skin cancer and metropolitan status separately by gender while controlling for health and demographic factors.

There was no missing data for any variable. The data responses for sample characteristics are listed in Table 1 and the results of multivariable analysis are recorded in Table 2.

All analyses were conducted in R, a free statistical analysis shareware program created by the CDC that is now publicly available (R version 3.3.3, Copyright 2017, The R Foundation for Statistical Computing).

Table 2: Results of multiple logistic regressions separately for males and females.
Skin Cancer (Ever vs. never diagnosed) | Males | | | Females | | | | | | | | | AOR | 95% CI | AOR | 95% CI | Low | High | Low | High |
|------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Metropolitan Status | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Suburban | Ref | - | - | Ref | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Urban | 0.77 | 0.63 | 0.93 | 0.84 | 0.71 | 0.99 | - | - | - | - | - | - | - | - | - | - | - |
| Rural | 0.73 | 0.57 | 0.94 | 0.74 | 0.59 | 0.92 | - | - | - | - | - | - | - | - | - | - | - |
| Other Cancer | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ever | 2.02 | 1.61 | 2.52 | 1.67 | 1.38 | 2.02 | - | - | - | - | - | - | - | - | - | - | - |
| General Health | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Good or better | 0.85 | 0.68 | 1.06 | 0.87 | 0.72 | 1.05 | - | - | - | - | - | - | - | - | - | - | - |
| Educational Level | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Graduated | 0.99 | 0.82 | 1.21 | 1.2 | 1.01 | 1.43 | - | - | - | - | - | - | - | - | - | - | - |
| Employment Status | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Employed | 0.69 | 0.54 | 0.88 | 0.81 | 0.66 | 1 | - | - | - | - | - | - | - | - | - | - | - |
| Income Level | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| $0 to less than $25,000 | Ref | - | - | Ref | - | - | - | - | - | - | - | - | - | - | - | - | - |
| $25,000 to less than $50,000 | 1.13 | 0.87 | 1.47 | 1.17 | 0.96 | 1.43 | - | - | - | - | - | - | - | - | - | - | - |
| $50,000 or more | 1.32 | 1.02 | 1.71 | 1.3 | 1.06 | 1.6 | - | - | - | - | - | - | - | - | - | - | - |
| Ethnicity/Race | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| White, non-Hispanic | 5.64 | 3.79 | 8.4 | 8.76 | 5.88 | 13.1 | - | - | - | - | - | - | - | - | - | - | - |
| Age | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 65 or older | 3.57 | 2.83 | 4.51 | 2.69 | 2.24 | 3.23 | - | - | - | - | - | - | - | - | - | - | - |

Note: Ref=referent group; AOR= adjusted odds ratio; 95% CI= 95% confidence interval; Bolded results are significant (AORs with 95% CI that do NOT include 1.0 are significant)

Results

Descriptive

Overall, this combined sample consisted of mostly white, non-Hispanic participants who have never been diagnosed with skin cancer, and report good or better health. As shown in Table 1, there were low percentages of participants who reported ever being diagnosed with skin cancer (20% for males and 15% for females) across states. For both males and females, about 20% reported living in rural areas, while about 40% reported living in suburban areas and 40% in urban areas. Compared to females, males had higher education and income levels; however, similar amounts of males and females were employed (about one-third) and were age 65 or older (about one-half). Over 75% of males and females reported good or better health and over 85% reported having no other cancer diagnosis.

Adjusted

The results of multiple logistic regression indicated that after controlling for health and demographic variables, skin cancer differed by metropolitan status for both males and females. Compared to those living in suburban areas, skin cancer was 1.37 times less likely to be reported by males and 1.35 times less likely to be reported by females living in rural areas; and 1.30 times less likely to be reported by males and 1.19 times less likely to be reported by females living in urban areas. In addition, skin cancer was related to other cancers, income level, ethnicity/race, and age for both males and females. Skin cancer was about 2 times more likely in males and females ever diagnosed with other cancers; about 1.5 times more likely in those of higher income levels ($50,000 or more); about 6 to 9 times more likely in males and females who reported white race; and about 3 to 4 times more likely in males and females aged 65 or older.

Discussion

The purpose of this study was to determine whether skin cancer differed by metropolitan status in a general population of U.S. male and female adults 18 years and older when controlling for other demographic factors that may be related to skin cancer. In this study, 15-20% females and males reported skin cancer and most lived in suburban (about 40%) and urban
(about 40%) areas. The results of adjusted analysis indicated that skin cancer was significantly related to metropolitan status. Our findings conflict with other studies that did not find a significant relationship between any defined metropolitan status and skin cancer [6,8,9,11] and those that found a significant relationship between skin cancer and living in rural versus non-rural areas [9]. The results of this study found a significant relationship between skin cancer and suburban versus rural areas as well as suburban versus urban areas.

Compared to those living in suburban areas, males and females in rural areas and males in urban areas were about 35% less likely to report skin cancer, and females living in urban areas were about 20% less likely to report skin cancer. The relationship between skin cancer and suburban status may be related to socioeconomic or lifestyle factors related to expendable income in rural areas [9]. The results of this study found a 35% increased risk for skin cancer in the clinical setting. Different results may be found in dermatology or oncology specialty clinics where skin cancer may be more prevalent. In primary care settings, providers should be aware of the low prevalence of skin cancer amongst patients 18 years and older as well as the increased risk for skin cancer in those living in suburban areas, having been diagnosed with any other form of cancer, having white, non-Hispanic race/ethnicity, and being 65 years and older. Providers should have elevated concern for patients in these groups, and continue to provide annual skin screening as well as screening for specific skin-related cancers, and provide education, screening, and referral to dermatology or oncology as appropriate.

Conflict of Interest
None of the authors have any conflicts of interest

Sources of Support
None

References
1. (2016) Centers for Disease Control and Prevention (CDC). Skin Cancer Statistics.
2. Linos E, Swetter SM, Cockburn MG, Colditz GA, Clarke CA (2009) Increasing burden of melanoma in the United States. J Investig Dermatol 129: 1666-1674.
3. Bleyer A, Viny A, Barr R (2006) Cancer in 15-to 29-year-olds by primary site. Oncologist 11: 590-601.
4. Weir HK, Marrett LD, Cokkinides V, Barnholtz-Sloan J, Patel P, et al. (2011) Melanoma in adolescents and young adults (ages 15-39 years): United States, 1999-2006. J Am Acad Dermatol 65: 538-549.
5. Centers for Disease Control and Prevention (CDC). Melanoma Surveillance in the United States.
6. Deady S, Sharp L, Comber H (2014) Increasing skin cancer incidence in young affluent urban populations: A challenge for prevention. Br J Dermatol 171: 324-331.
7. (2002) Centers for Disease Control and Prevention (CDC). Skin Cancer: Preventing America’s Most Common Cancer Fact Sheet.
8. Singh SD, Ajani UA, Johnson CJ, Roland KB, Eide M, et al. (2011) Association of cutaneous melanoma incidence with area-based socioeconomic indicators – United States, 2004-2006. J Am Acad Dermatol 65: 558-568.
9. Monroe AC, Ricketts TC, Savitz LA (1992) Cancer in rural versus urban populations: A review. J Rural Health 8: 212-220.
10. Carsin AE, Sharp L, Comber H (2011) Geographical, urban/rural and socioeconomic variations in nonmelanoma skin cancer incidence: A population-based study in Ireland. Br J Dermatol 164: 822-829.
11. Sharp L, Donnelly D, Hegarty A, Carsin AE, Deady S, et al. (2014) Risk of several cancers is higher in urban areas after adjusting for socioeconomic status. Results from a two-country population-based study of 18 common cancers. J Urban Health 91: 510-525.
12. Centers for Disease Control and Prevention (CDC) (2017) About BRFSS.
13. Centers for Disease Control and Prevention (CDC) (2017) BRFFS Prevalence & Trends Data.

14. Centers for Disease Control and Prevention (CDC) (2017) SMART: BRFFS City and County Data and Documentation.

15. Levine JA, Sorace M, Spencer J, Siegel DM (2005) The indoor UV tanning industry: A review of skin cancer risk, health benefit claims, and regulation. J Am Acad Dermatol 53: 1038-1044.