Prevalence and Costs of Skin Cancer Treatment in the U.S., 2002–2006 and 2007–2011

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Abstract

Background—Skin cancer, the most common cancer in the U.S., is a major public health problem. The incidence of nonmelanoma and melanoma skin cancer is increasing; however, little is known about the economic burden of treatment.

Purpose—To examine trends in the treated prevalence and treatment costs of nonmelanoma and melanoma skin cancers.

Methods—This study used data on adults from the 2002–2011 Medical Expenditure Panel Survey full-year consolidated files and information from corresponding medical conditions and medical event files to estimate the treated prevalence and treatment cost of nonmelanoma skin cancer, melanoma skin cancer, and all other cancer sites. Analyses were conducted in January 2014.

Results—The average annual number of adults treated for skin cancer increased from 3.4 million in 2002–2006 to 4.9 million in 2007–2011 (*p*<0.001). During this period, the average annual total cost for skin cancer increased from $3.6 billion to $8.1 billion (*p*=0.001), representing an increase of 126.2%, while the average annual total cost for all other cancers increased by 25.1%. During 2007–2011, nearly 5 million adults were treated for skin cancer annually, with average treatment costs of $8.1 billion each year.

Conclusions—These findings demonstrate that the health and economic burden of skin cancer treatment is substantial and increasing. Such findings highlight the importance of skin cancer prevention efforts, which may result in future savings to the healthcare system.

Introduction

Skin cancer, the most commonly diagnosed cancer in the U.S., is increasingly a major public health problem. An estimated 3.5 million cases of nonmelanoma skin cancer (NMSC) were treated in 2006,[1] and more than 60,000 melanomas were diagnosed in 2010.[2] The incidence

of NMSC and melanoma is increasing,[3,4] although little is known about the economic burden of treatment. The purpose of this study is to examine trends in the number of adults treated for NMSC and melanoma, as well as the associated annual costs of treatment.

Methods

Data on adults from the 2002–2011 Medical Expenditure Panel Survey (MEPS) full-year consolidated files were used, as well as information from corresponding medical conditions and medical event files. The MEPS combines household-reported data on use and costs, and provider-reported data on costs, to provide nationally representative estimates among the U.S. civilian noninstitutionalized population. Because data used in these analyses cannot be used to personally identify individuals, this study was exempt from IRB review. The Clinical Classification Software (CCS) category was used to classify types of cancer as nonepithelial cancer of the skin (code 23), melanomas of the skin (code 22), or other cancers (codes 11–21 and 24–25).[5] Owing to the relatively small number of people reported in MEPS as receiving treatment for melanoma (unweighted average of about 150 annually) and the skewed distribution of healthcare expenditures, annual estimates among population subgroups (e.g., age/gender categories) in general were subject to less statistical precision. To allow for a comparison over time and improve the statistical precision of the estimates, two 5-year periods of data were created (2002–2006 and 2007–2011). SAS, version 9.2, complex survey analysis procedures were used to produce average annual national estimates that properly accounted for the MEPS sample design and survey nonresponse. Reported p-values in the tables are based on simple t-tests of differences between estimates for the two time periods.

Individuals were classified as being treated for NMSC, melanoma, or other cancers if they had any ambulatory visits (office-based and hospital outpatient), inpatient stays, home health visits, or prescribed medication purchases associated with the corresponding CCS code. Costs were defined as expenditures from all sources for healthcare services reported in the survey, including out of pocket, private insurance, Medicare, Medicaid, and other miscellaneous sources. Costs by source of payment and type of service are not reported for melanoma because of small sample sizes. All costs were adjusted to 2011 U.S. dollars using the Personal Health Care Expenditure Price Index.[6] Analyses were conducted in January 2014.

Results

The average annual number of adults treated for any skin cancer (NMSC or melanoma) increased from 3.4 to 4.9 million between 2002–2006 and 2007–2011 ($p<0.001$), while the average number treated for all other cancers increased from 7.8 to 10.3 million ($p<0.001$, Table 1). Subgroup analyses indicated increases among adults aged 65 years and older for NMSC ($p<0.001$) and melanoma ($p<0.001$), and women aged 18–64 years for melanoma ($p=0.006$).

Between 2002–2006 and 2007–2011, the average annual total cost for skin cancer increased by 126.2%, from $3.6 billion to $8.1 billion ($p=0.001$), while the average annual total cost

for all other cancers increased by 25.1%, from $63.7 billion to $79.7 billion (*p*=0.005, Table 2). Average annual total treatment costs during 2007–2011 were $4.8 billion for NMSC and $3.3 billion for melanoma. During 2007–2011, nearly three quarters of annual NMSC costs were attributable to office-based visits compared to one third among all other cancer sites (excluding skin cancers). During the same period, private health insurance paid for 43.4% of all skin cancer treatment costs while Medicare paid for 41.1%. Among all other cancer sites (excluding skin cancer), private health insurance paid for 45.2% of treatment costs, while Medicare paid for 36.1%.

Discussion

The number of adults treated for skin cancer increased between 2002–2006 and 2007–2011 to nearly 5 million adults annually. Average annual total treatment costs for skin cancer also increased substantially between these periods to $8.1 billion annually. Increased skin cancer treatment costs resulted from an increase in the number of people treated for skin cancer and an increase in per person treatment costs. Annual spending increased more rapidly for skin cancers than for other cancers, suggesting that the economic burden of skin cancer is a particular cause for concern. These findings underscore the importance of prevention and early detection of skin cancer.

Although this study demonstrates the substantial costs of skin cancer treatment, it also highlights the potential for savings through prevention efforts. Primary prevention efforts have been shown to reduce skin cancer incidence, mortality, and healthcare expenditures.[7–9] For example, the Sunwise Program, a health and environmental education program that teaches children and their caregivers how to protect themselves from overexposure to the sun, could avert nearly 11,000 skin cancer cases, while saving $2–$4 in medical care costs and lost productivity for each dollar invested in the program.[7] Similarly, in Australia, the SunSmart public education program promoting sun protection and skin cancer prevention messages through structural, environmental, and legislative initiatives was estimated to save 22,000 life years, while saving approximately $2 for every dollar invested.[8] Reducing indoor tanning, which is associated with an increased risk of NMSC and melanoma,[10,11] is also an important strategy for decreasing the burden of skin cancer.[9] In Australia, it was estimated that stricter indoor tanning regulations, including age restrictions among minors aged   18 years, could prevent approximately 24 melanoma cases, 226 squamous cell carcinoma cases, and save $256,000 in medical costs per 100,000 persons.[9] According to the U.S. Preventive Services Task Force,[12] there is currently insufficient evidence to recommend for or against regular skin cancer screening, including self-examination for early detection of skin cancer in the adult general population. However, screening among individuals at increased risk for melanoma may be cost-effective. For example, one-time screening among high-risk individuals in the U.S. was associated with a small increase in life expectancy and was reasonably cost-effective.[13]

Limitations of this study include its reliance on self- or household-reported survey data, which are subject to measurement errors. In addition, because institutionalized adults and adults in the military are not sampled in the MEPS, the results only apply to the

noninstitutionalized civilian adult population, which may result in an underestimation of the treated prevalence and treatment costs of skin cancer among adults.

In summary, this study demonstrates that the health and economic burden of skin cancer treatment is substantial and increasing. These findings highlight the importance of skin cancer prevention and early detection efforts. Such efforts are needed to reduce the increasing burden of skin cancer in the U.S.

Acknowledgments

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Table 1

Annual Estimated Number of Adults with Treatment for Skin Cancer and Other Cancers in the U.S.

	All skin cancer (melanoma or nonmelanoma)			Nonmelanoma skin cancer			Melanoma skin cancer			All cancer sites (excluding skin cancer)		
	2002–2006, n (SE)	2007–2011, n (SE)	p-value[a]	2002–2006, n (SE)	2007–2011, n (SE)	p-value[a]	2002–2006, n (SE)	2007–2011, n (SE)	p-value[a]	2002–2006, n (SE)	2007–2011, n (SE)	p-value[a]
Persons with cancer treatment	3,419,507 (170,507)	4,914,910 (243,528)	<0.001	3,090,442 (154,887)	4,301,338 (224,361)	<0.001	372,536 (44,081)	700,647 (59,659)	<0.001	7,809,643 (236,563)	10,345,779 (311,917)	<0.001
	% (SE)	% (SE)		% (SE)	% (SE)		% (SE)	% (SE)		% (SE)	% (SE)	
PERCENT WITH CANCER TREATMENT												
Aged 18 years												
Male and female	1.55 (0.07)	2.12 (0.09)	**<0.001**	1.40 (0.06)	1.85 (0.09)	**<0.001**	0.17 (0.02)	0.30 (0.03)	**<0.001**	3.55 (0.08)	4.46 (0.10)	**<0.001**
Male	1.76 (0.10)	2.40 (0.12)	**<0.001**	1.58 (0.09)	2.12 (0.12)	**<0.001**	0.21 (0.03)	0.32 (0.04)	**0.019**	3.14 (0.12)	4.07 (0.15)	**<0.001**
Female	1.36 (0.08)	1.85 (0.11)	**<0.001**	1.24 (0.08)	1.60 (0.10)	**0.003**	0.13 (0.02)	0.28 (0.03)	**<0.001**	3.92 (0.11)	4.83 (0.13)	**<0.001**
Age 18–64 years												
Male and female	0.81 (0.05)	0.94 (0.06)	0.081	0.70 (0.04)	0.79 (0.05)	0.202	0.11 (0.02)	0.17 (0.02)	0.068	2.26 (0.06)	2.74 (0.08)	**<0.001**
Male	0.84 (0.07)	0.89 (0.08)	0.617	0.72 (0.05)	0.77 (0.07)	0.56	0.13 (0.03)	0.12 (0.02)	0.874	1.55 (0.08)	1.97 (0.10)	**0.001**
Female	0.78 (0.07)	0.99 (0.08)	**0.042**	0.68 (0.06)	0.80 (0.07)	0.194	0.10 (0.02)	0.21 (0.03)	**0.006**	2.96 (0.10)	3.48 (0.13)	**0.001**
Aged 65 years												
Male and female	5.23 (0.27)	7.66 (0.35)	**<0.001**	4.87 (0.26)	6.86 (0.32)	**<0.001**	0.44 (0.06)	0.94 (0.11)	**<0.001**	9.87 (0.31)	12.56 (0.37)	**<0.001**
Male	7.01 (0.47)	10.53 (0.53)	**<0.001**	6.46 (0.45)	9.34 (0.49)	**<0.001**	0.67 (0.11)	1.38 (0.20)	**0.002**	12.17 (0.53)	15.31 (0.70)	**<0.001**
Female	3.89 (0.31)	5.46 (0.36)	**0.001**	3.67 (0.30)	4.97 (0.35)	**0.004**	0.26 (0.06)	0.61 (0.12)	**0.011**	8.15 (0.41)	10.46 (0.40)	**<0.001**

Note: Boldface indicates statistical significance (*p*<0.05). Estimates are based on weighted data from the 2002–2011 Medical Expenditure Panel Survey. Estimates of persons treated for "all skin cancers" are slightly lower than the sum of nonmelanoma and melanoma because a small number of persons were reported as treated for both types.

[a] Difference from 2002–2006 and 2007–2011.

Table 2

Annual Estimated Treatment Costs for Skin Cancer and Other Cancer Sites in the U.S.

	All skin cancer (melanoma or nonmelanoma)			Nonmelanoma skin cancer			Melanoma skin cancer			All cancer sites (excluding skin cancer)		
	2002–2006	2007–2011	p-value[a]	2002–2006	2007–2011	p-value[a]	2002–2006	2007–2011	p-value[a]	2002–2006	2007–2011	p-value[a]
Total annual national costs ($) in millions[b]	3570 (354)	8075 (1357)	**0.001**	2726 (243)	4752 (382)	**<0.001**	864 (223)	3349 (1317)	0.063	63,720 (3,513)	79,713 (4,431)	**0.005**
Average annual costs per person ($)[b]	1044 (95)	1643 (280)	**0.043**	882 (68)	1105 (84)	**0.04**	2320 (540)	4780[c] (1840)	0.2	8,159 (391)	7,705 (379)	0.405
Median annual costs per person ($)[b]	307 (15)	325 (16)	0.409	309 (16)	323 (17)	0.547	285 (51)	347 (40)	0.339	814 (51)	755 (48)	0.399
	% (SE)	% (SE)		% (SE)	% (SE)					% (SE)	% (SE)	
Costs by source of payment												
Private health insurance	35.8 (3.1)	43.4 (8.4)	0.396	33.8 (2.9)	37.1 (4.0)	0.508				46.3 (2.5)	45.2 (2.6)	0.761
Medicare	35.5 (3.9)	41.1 (8.5)	0.551	34.8 (3.4)	41.8 (4.0)	0.182				35.7(2.3)	36.1 (2.2)	0.898
Out-of-pocket	13.2 (1.8)	6.7 (1.3)	**0.003**	14.2 (2.1)	9.6 (1.4)	0.076				7.2 (1.3)	4.9 (0.3)	0.086
Medicaid/CHIP	4.4[c](2.0)	1.9[c](0.7)	0.248	3.2[c](1.5)	2.4[c](0.9)	0.621				5.0 (0.6)	5.6 (1.0)	0.603
Other	11.1 (2.6)	7.0 (1.9)	0.192	14.0 (3.4)	9.1 (2.7)	0.256				5.9 (0.8)	8.3 (1.1)	0.095
Costs by type of service												
Office-based medical provider	67.7 (3.6)	52.1 (7.3)	0.054	71.9 (3.7)	73.2 (4.1)	0.806				27.2 (1.5)	32.7 (2.0)	**0.029**
Outpatient department	19.9 (2.7)	10.5[c](4.2)	0.060	17.6 (2.8)	10.7[c](3.6)	0.122				19.1 (1.6)	17.4 (1.1)	0.387
Hospital inpatient	8.0[c](2.7)	32.3 (9.4)	**0.014**	6.7[c](2.9)	10.1[c](3.3)	0.438				44.8 (2.1)	36.1 (2.0)	**0.002**
Prescription medication	3.7 (0.9)	3.3[c](1.0)	0.730	3.1 (0.4)	3.4 (0.9)	0.812				4.4 (0.7)	9.5 (1.1)	**<0.001**
Other	0.7[c](0.3)	1.9[c](0.9)	0.196	0.7[c](0.4)	2.7[c](1.1)	0.095				4.5 (0.5)	4.3 (0.6)	0.805

Note: Boldface indicates statistical significance (*p*<0.05). Estimates are based on weighted data from the 2002–2011 Medical Expenditure Panel Survey. All costs are in 2011 U.S. dollars. Other type of service includes home health and emergency room. Costs by source of payment and type of service are not available for melanoma due to small sample size and unreliable estimates.

[a]Difference from 2002–2006 and 2007–2011.

[b]Values in parentheses are SEs.

[c]Estimates with a relative SE >0.30 are considered unreliable.

CHIP, Children's Health Insurance Program.