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Estimated Cost of Sunburn-Associated Visits to US Hospital Emergency Departments

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Sunburn, a clear indicator of overexposure to UV radiation, increases the risk of skin cancer. The estimated prevalence of sunburn in the United States is high; 37.1% of adults and 55.8% of youth reported 1 or more sunburns in the past 12 months.[1,2] Our study provides, to our knowledge, the first national estimates of sunburn-associated visits to US emergency departments, as well as their costs.

Methods |

We analyzed data from the 2013 Nationwide Emergency Department Sample (NEDS) from the Healthcare Costs and Utilization Project. The NEDS is the largest all-payer ED database in the United States, containing information on 30 million ED visits; after weighting, these data represent 135 million ED visits in 2013.[3] We identified sunburn-associated ED visits as those with a primary or secondary diagnosis of sunburn, using codes from the *International Classification of Diseases, Ninth Revision, Clinical Modification* (codes 692.71, 692.76, and 692.77).

We estimated the annual number of sunburn-associated ED visits and associated costs. Often, the charges reported in the NEDS are greater than the amount reimbursed by payers. We therefore converted charges to costs using cost-to-charge ratios (CCRs) from the National Inpatient Sample, based on hospital accounting reports from the Centers for Medicare & Medicaid Services.[4] Given inadequate sample sizes for sunburn-associated inpatient stays, we used CCRs from all burn-associated inpatient stays. We calculated the cost of a sunburn-associated ED visit by multiplying the ED visit charge by the mean CCR of burn-associated inpatient stays, accounting for the hospital region, urban or rural location, and teaching status of the hospital.

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Author Contributions: Dr Guy and Ms Berkowitz had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: All authors.

Acquisition, analysis, or interpretation of data: All authors.

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Sample weights were applied to provide national estimates. Data were analyzed using SUDAAN, version 10.1 (RTI International). Our analysis was exempted from the Centers for Disease Control and Prevention Institutional Review Board approval. Patient consent was not obtained as the data are from discharge information. Patient data are deidentified.

Results |

Sunburn-associated ED visits were most frequent among youth and young adults, were evenly distributed by sex, occurred most frequently during the spring and summer months, and occurred most commonly in the South (Table). In 2013, there were an estimated 33 826 sunburn-associated ED visits reported in the NEDS (after weighting), with an estimated total cost of $11.2 million ($5.5 million among males and $5.7 million among females). The largest number of visits and highest costs were among males younger than 18 years and females aged 18 to 29 years (Figure).

Discussion |

Sunburn, a clear indication of overexposure to UV radiation, is a preventable risk factor for skin cancer, resulting in a considerable number of ED visits and substantial treatment costs. Although sunburn-associated ED visits have decreased from an estimated 40 826 in 2006 to 33 826 in 2013 (a 17.1% decrease), additional efforts are needed to reduce overexposure to UV radiation. Such efforts have gained momentum following the 2014 Surgeon General's Call to Action to Prevent Skin Cancer.[5,6] Multicomponent community-wide interventions combining education and policy approaches to increase preventive behaviors (eg, seeking shade, using sunscreen, and wearing sun-protective clothing) have been demonstrated to reduce the incidence of sunburn.[5] In addition, for fair-skinned individuals aged 10 to 24 years, counseling about minimizing exposure to UV radiation is recommended by the US Preventive Services Task Force.[5]

This analysis has limitations. First, the NEDS includes hospital charges rather than costs; however, we used accepted methods for estimating hospital costs from hospital charges using CCRs. Second, using mean inpatient CCRs to estimate ED visit costs may introduce error. Third, data were not available for additional patient demographics such as race/ethnicity. Finally, our cost estimates are underestimated because the NEDS includes only hospital facility charges, excludes physician and professional fees, and does not capture sunburns treated in other health care settings.

These nationally representative estimates demonstrate the substantial burden of sunburn-associated injuries and highlight the importance of continued monitoring of sunburn and sun-protective behaviors. Efforts to reduce overexposure to UV radiation could help reduce the substantial costs associated with sunburn-associated ED visits, as well as future cases of skin cancer.

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Disclaimer: The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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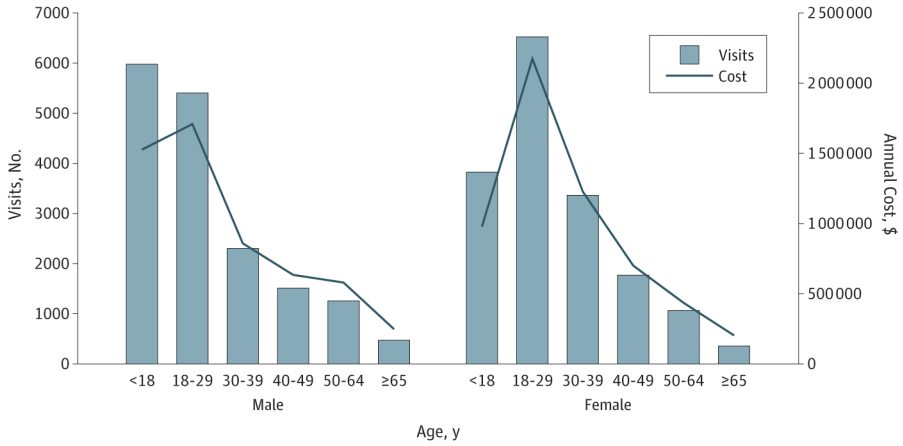

Figure.

Estimated Costs of Sunburn-Associated Visits to Emergency Departments in the United States, 2013 Nationwide Emergency Department Sample

Sunburn-associated visits were identified as emergency department visits with a primary or secondary diagnosis of sunburn (*International Classification of Diseases, Ninth Revision, Clinical Modification*, codes 692.71, 692.76, and 692.77). Numbers of visits are based on weighted population estimates. Costs are in 2013 US dollars.

Table.

Characteristics of Sunburn-Associated Visits to Emergency Departments in the United States, 2013 Nationwide Emergency Department Sample[a]

Characteristic	No.	% (95% CI)
Patient characteristics		
Age, y		
<18	2155	29.0 (27.4-30.6)
18-29	2599	35.3 (33.9-36.7)
30-39	1232	16.7 (15.8-17.8)
40-49	707	9.7 (9.0-10.4)
50-64	503	6.9 (6.2-7.6)
≥65	187	2.4 (2.1-2.8)
Sex		
Male	3676	50.0 (48.8-51.3)
Female	3707	50.0 (48.7-51.2)
Annual household income		
Lowest quartile	2348	30.5 (28.1-32.9)
All other quartiles	4775	65.6 (63.1-68.1)
Patient residence		
Large central metropolitan area	1236	17.1 (14.8-19.7)
Large fringe metropolitan area (suburbs)	1588	20.0 (17.7-22.6)
Medium and small metropolitan area	2538	33.9 (31.4-36.6)
Micropolitan and noncore (rural)	1870	26.7 (24.6-28.9)
Visit characteristics		
Expected primary payer		
Medicare	508	6.9 (6.2-7.7)
Medicaid	2431	32.3 (30.6-34.1)
Private	2381	33.5 (31.2-35.6)
Self-pay	1713	22.6 (21.1-24.1)
Other	338	4.5 (3.6-5.6)
Day of week		
Weekday	5068	68.1 (66.9-69.1)
Weekend	2315	31.9 (30.9-33.1)
Month of visit		
April-August	5223	73.5 (69.0-77.5)
September-March	383	5.9 (5.2-6.6)
Hospital characteristics		
Region		
Northeast	1220	18.4 (16.3-20.8)

Characteristic	No.	% (95% CI)
Midwest	1452	21.4 (19.0-24.1)
South	3811	45.9 (42.6-49.2)
West	900	14.3 (12.6-16.2)
Location and teaching status		
Metropolitan, nonteaching	3341	40.5 (37.4-43.6)
Metropolitan, teaching	2208	31.5 (28.2-35.0)
Nonmetropolitan	1834	28.1 (25.5-30.8)

[a]Sunburn-associated visits were identified as emergency department visits with a primary or secondary diagnosis of sunburn (*International Classification of Diseases, Ninth Revision, Clinical Modification* codes 692.71,692.76, 692.77). Sample sizes are unweighted and may not sum to the total owing to missing data. Percentages and 95% CIs are based on weighted population estimates.