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The Burden of Skin and Subcutaneous Diseases in the United States From 1990 to 2017

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IMPORTANCE Skin and subcutaneous diseases affect the health of millions of individuals in the US. Data are needed that highlight the geographic trends and variations of skin disease burden across the country to guide health care decision-making.

OBJECTIVE To characterize trends and variations in the burden of skin and subcutaneous tissue diseases across the US from 1990 to 2017.

DESIGN, SETTING, AND PARTICIPANTS For this cohort study, data were obtained from the Global Burden of Disease (GBD), a study with an online database that incorporates current and previous epidemiological studies of disease burden, and from GBD 2017, which includes more than 90 000 data sources such as systematic reviews, surveys, population-based disease registries, hospital inpatient and outpatient data, cohort studies, and autopsy data. The GBD separated skin conditions into 15 subcategories according to incidence, prevalence, adequacy of data, and standardized disease definitions. GBD 2017 also estimated the burden from melanoma of the skin and keratinocyte carcinoma. Data analysis for the present study was conducted from September 9, 2019, to March 31, 2020.

MAIN OUTCOMES AND MEASURES Primary study outcomes included age-standardized disability-adjusted life-years (DALYs), incidence, and prevalence. The data were stratified by US states with the highest and lowest age-standardized DALY rate per 100 000 people, incidence, and prevalence of each skin condition. The percentage change in DALY rates in each state was calculated from 1990 to 2017.

RESULTS Overall, age-standardized DALY rates for skin and subcutaneous diseases increased from 1990 (821.6; 95% uncertainty interval [UI], 570.3-1124.9) to 2017 (884.2; 95% UI, 614.0-1207.9) in all 50 states and the District of Columbia. The degree of increase varied according to geographic location, with the largest percentage change of 0.12% (95% UI, 0.09%-0.15%) in New York and the smallest percentage change of 0.04% (95% UI, 0.02%-0.07%) in Colorado, 0.04% (95% UI, 0.01%-0.06%) in Nevada, 0.04% (95% UI, 0.02%-0.07%) in New Mexico, and 0.04% (95% UI, 0.02%-0.07%) in Utah. The age-standardized DALY rate, incidence, and prevalence of specific skin conditions differed among the states. New York had the highest age-standardized DALY rate for skin and subcutaneous disease in 2017 (1097.0 [95% UI, 764.9-1496.1]), whereas Wyoming had the lowest age-standardized DALY rate (672.9 [95% UI, 465.6-922.3]). In all 50 states and the District of Columbia, women had higher age-standardized DALY rates for overall skin and subcutaneous diseases than men (women: 971.20 [95% UI, 676.76-1334.59] vs men: 799.23 [95% UI, 559.62-1091.50]). However, men had higher DALY rates than women for malignant melanoma (men: 80.82 [95% UI, 51.68-123.18] vs women: 42.74 [95% UI, 34.05-70.66]) and keratinocyte carcinomas (men: 37.56 [95% UI, 29.35-49.52] vs women: 14.42 [95% UI, 10.01-20.66]).

CONCLUSIONS AND RELEVANCE Data from the GBD suggest that the burden of skin and subcutaneous disease was large and that DALY rate trends varied across the US; the age-standardized DALY rate for keratinocyte carcinoma appeared greater in men. These findings can be used by states to target interventions and meet the needs of their population.

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Supplemental content

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Skin disease is a leading cause of health burden, affecting millions of individuals in the US.[1] The Global Burden of Disease (GBD) study is an effort to quantify disability and mortality statistics from hundreds of diseases and risk factors stratified by age, sex, year, and location.[2] The GBD features both the prevalence of a health condition and its associated relative harm within a given population. The GBD is measured by disability-adjusted life-year (DALY), which represents the sum of years of life lost (YLLs) to a disease and the years living with disability (YLDs).[2,3] One DALY is equivalent to 1 year of healthy life lost.[3] The DALY rate allows for the consistent quantification of health burden and cross-comparison across diverse disease states.

The GBD incorporates the most recent data and epidemiological studies as they become available, making it an ideal resource to understand health trends over time at the global, national, and local levels.[2] Tracking the incidence, prevalence, and disability of skin and subcutaneous diseases over time is essential for identifying modifiable risk factors that predispose individuals to certain dermatological conditions. This knowledge may represent an opportunity to aid in health care planning, identifying root causes, improving health disparities, and even initiating action at the policy-maker level.

To identify the burden of skin and subcutaneous diseases on US society, we examined the national and subnational data for variations and trends in incidence, prevalence, and DALY rates for skin diseases in the US from 1990 to 2017.

Key Points

Question Has the burden of skin and subcutaneous diseases varied across the US from 1990 to 2017?

Findings This cohort study of patients included in the Global Burden of Disease database from 1990 to 2017 evaluated skin and subcutaneous disease burden across the US, the disability-adjusted life-year rate, incidence, and prevalence of skin disease increased from 1990 to 2017, and disease burden varied by geographic location. The highest age-standardized disability-adjusted life-year rate was found in New York, whereas Wyoming had the lowest rate.

Meaning These epidemiological national data on disease burden can guide future research efforts, allocation of resources, prevention strategies, and targeted treatment of skin conditions.

Methods

This cohort study did not involve human subjects and used only a data review from GBD. Therefore, institutional review board approval was waived. GBD data review was approved by the University of Washington. Data analysis for the present study was conducted from September 9, 2019, to March 31, 2020.

Overview and Data Sources of GBD

For this analysis, we obtained data from the GBD, a study with an online database that incorporates current and previous epidemiological studies of disease burden. The data collection and estimation processes used in the GBD are explained in this section.

Detailed descriptions of the GBD methods, including the search and selection process, can be found in previous GBD publications.[4] Data collection and analysis followed the Guidelines for Accurate and Transparent Health Estimates Reporting (GATHER) recommendations.[5,6] Fifteen skin and subcutaneous disease categories were selected on the basis of disease incidence, prevalence, adequacy of data, and standardized disease definitions. These categories are as follows: acne vulgaris; alopecia areata; atopic dermatitis; cellulitis; contact dermatitis; decubitus ulcer; fungal skin diseases; pruritus; psoriasis; pyoderma; scabies; seborrheic dermatitis; urticaria; viral skin diseases; and other skin and subcutaneous diseases, which encompass miscellaneous skin conditions (eTable 3 in the Supplement).[7] In addition, GBD 2017[4] (which includes more than 90 000 data sources such as systematic reviews, surveys, population-based disease registries, hospital inpatient and outpatient data, cohort studies, and autopsy data) separately estimated the burden from melanoma of the skin and keratinocyte carcinoma, which included squamous cell carcinoma, keratoacanthoma, and basal cell carcinoma. The cumulative category of skin and subcutaneous diseases, however, does not include malignant melanoma of the skin and keratinocyte carcinoma. Each skin disease category is defined by *International Classification of Diseases, Ninth Revision* (*ICD-9*) codes and *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision* (*ICD-10*) codes.[4] The GBD 2017 included additional data sources and those used in previous GBD studies. New data for nonfatal estimations were added from scientific literature sources, disease registries, surveys, and epidemiological surveillance. New data for fatal estimations were added from verbal autopsy studies, cancer registries, and vital registries (record of deaths by age, sex, and location). More than 2500 data sources were used for estimates in the US. The state with the most representative data sources was California with 412, and the state with the least representative data sources was New Hampshire with 300. A complete list of data sources that GBD used for estimation can be found on the Global Health Data Exchange website.[8]

Estimation of Nonfatal Disease Burden

Nonfatal disease burden was estimated for each skin and subcutaneous disease to include disease-specific incidence, prevalence, and YLDs. All raw nonfatal data were modeled with DisMod-MR, version 2.1 (World Health Organization), a bayesian meta-regression tool. In brief, GBD estimation was done in 7 steps: (1) data compilation and extraction, (2) data adjustment, (3) estimation of incidence and prevalence using DisMod-MR 2.1 or additional modeling processes, (4) estimation of severity distributions, (5) disability weights, (6) comorbidity adjustment, and (7) estimation of YLDs.

The YLDs were calculated by multiplying the prevalence of each disease or sequelae by the disability weight for that health state.[9] Disability weights represent the severity of health loss associated with a health state and are measured on a scale from 0 (full health) to 1 (a state equivalent to death). Online

and international population surveys were used to identify disability weights for 234 health states, including skin and subcutaneous diseases, by describing the experience of disease in lay language.[10] Health states for skin and subcutaneous diseases assess physical deformity, psychosocial well-being, itch, and pain.

Estimation of Fatal Disease Burden

The mortality burden of a disease was estimated by calculating YLLs attributable to a disease. The YLLs are the sum of each cause-specific death multiplied by the remaining life expectancy,[3,10] and each death is attributed to a single cause. The YLLs were calculated for the following skin conditions only: malignant melanoma of the skin, keratinocyte carcinoma, bacterial skin diseases, decubitus ulcers, and other skin and subcutaneous diseases. Detailed methods are available in the GBD 2017 causes-of-death publication and its appendices.[11]

Mortality data were processed in the Cause of Death Ensemble model, an analytical tool that combines a diverse set of plausible models with predictive covariates into the highest-quality projections for each cause-specific death. Mortality attributed to malignant melanoma of the skin was estimated through identifying and collecting available data, creating individual predictive models based on this data, and combining differently weighted predictive models to obtain the highest predictive validity. Additional details of this process are provided in the supplementary appendix of the GBD 2017 publication.[11]

Calculation of Disability-Adjusted Life-Years

As described, YLDs and YLLs were added to yield DALY rates are per 100 000. All estimates included uncertainty intervals (UIs), which were calculated by running 1000 draws from the posterior distribution of each estimate and identifying the 2.5 and 97.5 percentiles.

Statistical Analysis

All estimates were generated with 1000 draws from the posterior distribution of the quantity of interest. This process produced the 95% UIs.

Results

Change in Skin and Subcutaneous Disease Burden

In the US, including the District of Columbia, the age-standardized DALY rate per 100 000 people for skin and subcutaneous diseases ranked number 12 among all other conditions in 2017 compared with number 15 in 1990. The burden from total skin and subcutaneous diseases increased from 1990 (821.6; 95% UI, 570.3-1124.9) to 2017 (884.2; 95% UI, 614.0-1207.9), with a percentage change in age-standardized DALY rate of 0.08% (95% UI, 0.06%-0.09%) (**Table**). The regional increase in skin and subcutaneous disease burden varied by state, with the largest percentage change of 0.12% (95% UI, 0.09%-0.15%) in New York and the smallest percentage change of 0.04% (95% UI, 0.02%-0.07%) in Colorado, 0.04% (95% UI, 0.01%-0.06%) in Nevada, 0.04% (95% UI, 0.02%-0.07%) in New Mexico, and 0.04% (95% UI, 0.02%-0.07%) in Utah. These results are summarized in the Table.

Geographic Variation in Total and Cause-Specific Skin and Subcutaneous Diseases

The data show geographic variation in the incidence, prevalence, and DALY rate for skin and subcutaneous diseases among US states and the District of Columbia in 2017; however, the UIs of DALY rates for skin and subcutaneous diseases overlapped for all states, indicating no statistical difference. Thus, the differences discussed earlier represent potential trends and not statistical differences. The greatest burden of skin and subcutaneous diseases was concentrated along the coastal regions of the US, whereas the burden from melanoma was greatest in northern states and the burden from keratinocyte carcinoma was highest in southern states (**Figure**).

The states with the highest and lowest age-standardized DALY rate (New York [1097.0] and Wyoming [672.9]), incidence (New York [44 821.8] and Wyoming [30 486.1]), and prevalence (New York [33 360.6] and Wyoming [22 353.2]) cumulatively and individually for each of the 15 skin and subcutaneous diseases, other skin and subcutaneous diseases, malignant melanoma of the skin, and keratinocyte carcinoma are shown in eTable 1 in the Supplement. Cumulatively, the highest DALY rate, incidence, and prevalence were found in New York, and the lowest rates were found in Wyoming. The greatest DALY rate for melanoma was found in Kentucky (76.6), whereas the greatest prevalence (189.8) and incidence (22.7) of melanoma were found in Massachusetts. For keratinocyte carcinoma (basal cell carcinoma and squamous cell carcinoma), the highest DALY rate (0.3), prevalence (83.1), and incidence (943.9) were found in Florida.

The 10 most prevalent skin diseases in the US in 2017, excluding keratinocyte carcinoma and malignant melanoma, are listed in eTable 4 in the Supplement. The District of Columbia had a higher prevalence of atopic dermatitis (6332.1), seborrheic dermatitis (714.3), and alopecia areata (504.9). New York had the highest prevalence of acne vulgaris (5568.1), fungal skin diseases (3585.8), and psoriasis (3516.4). Louisiana had a higher prevalence of cellulitis (152.0).

Sex Differences in Cause-Specific Skin and Subcutaneous Diseases in 2017

The age-standardized DALY rates for total skin and subcutaneous diseases, malignant melanoma, and keratinocyte carcinoma were compared in men vs women in 2017 (eTable 2 in the Supplement). For each state, no significant difference was found in DALY rates in men and women for age-standardized skin and subcutaneous diseases (men: 799.23 [95% UI, 559.62-1091.50] vs women: 971.20 [95% UI, 676.76-1334.59]). Similarly, for all states, no significant difference was found between men and women for age-standardized malignant melanoma DALY rates (men: 80.82 [95% UI, 51.68-123.18] vs women: 42.74 [95% UI, 34.05-70.66]). In contrast, each state showed a significant difference between men and women for age-standardized keratinocyte carcinoma DALY rate (men: 37.56 [95% UI, 29.35-49.52] vs women: 14.42 [95% UI, 10.01-20.66]). Florida had the largest difference in age-

Table. Total Rate and Percentage Change of Disability-Adjusted Life-years (DALYs) by US State, 1990-2017[a]

State	Age-standardized DALYs, (95% UI)		
	Rate per 100 000		Percentage change
	1990	2017	1990-2017
All states plus DC	821.6 (570.3-1124.9)	884.2 (614.0-1207.9)	0.08 (0.06-0.09)
Alabama	745.6 (518.0-1022.5)	796.5 (551.8-1094.4)	0.07 (0.04-0.09)
Alaska	691.7 (481.2-947.1)	735.4 (516.2-1005.2)	0.06 (0.04-0.09)
Arizona	814.2 (554.3-1122.8)	856.9 (593.7-1178.4)	0.05 (0.03-0.08)
Arkansas	675.9 (472.1-926.2)	724.0 (506.9-990.3)	0.07 (0.05-0.10)
California	856.9 (581.4-1178.0)	911.9 (629.9-1245.4)	0.06 (0.04-0.09)
Colorado	733.1 (505.1-1007.9)	765.6 (533.6-1050.8)	0.04 (0.02-0.07)
Connecticut	931.3 (646.8-1274.0)	1009.3 (703.9-1375.4)	0.08 (0.06-0.11)
Delaware	801.2 (557.2-1099.1)	859.4 (599.9-1174.0)	0.07 (0.05-0.10)
District of Columbia	991.8 (685.4-1371.7)	1052.8 (728.6-1450.4)	0.06 (0.04-0.09)
Florida	847.7 (587.1-1167.5)	924.3 (643.7-1268.0)	0.09 (0.07-0.12)
Georgia	831.5 (576.3-1143.4)	909.4 (629.3-1248.6)	0.09 (0.07-0.12)
Hawaii	915.6 (631.7-1264.3)	977.7 (677.4-1338.4)	0.07 (0.05-0.09)
Idaho	723.1 (502.3-990.1)	760.8 (528.1-1042.3)	0.05 (0.03-0.08)
Illinois	765.2 (533.6-1048.3)	829.3 (578.7-1134.0)	0.08 (0.06-0.11)
Indiana	758.0 (522.2-1037.0)	808.2 (562.6-1105.9)	0.07 (0.04-0.10)
Iowa	718.1 (499.1-987.2)	763.4 (531.3-1041.8)	0.06 (0.04-0.09)
Kansas	721.7 (498.4-987.2)	772.0 (538.2-1053.1)	0.07 (0.05-0.10)
Kentucky	787.3 (544.3-1077.4)	854.8 (597.8-1177.5)	0.09 (0.06-0.11)
Louisiana	848.8 (593.5-1168.3)	924.8 (645.3-1271.2)	0.09 (0.07-0.12)
Maine	720.7 (508.4-982.1)	774.6 (541.6-1049.0)	0.07 (0.05-0.10)
Maryland	866.0 (597.2-1185.1)	940.0 (648.8-1284.4)	0.09 (0.06-0.11)
Massachusetts	890.7 (620.6-1222.3)	967.4 (676.7-1317.9)	0.09 (0.06-0.11)
Michigan	839.8 (581.6-1153.8)	893.5 (622.9-1226.8)	0.06 (0.04-0.09)
Minnesota	731.9 (509.4-1006.1)	787.0 (549.9-1073.5)	0.08 (0.05-0.10)
Mississippi	663.9 (461.6-905.6)	708.9 (496.7-971.1)	0.07 (0.04-0.10)
Missouri	733.1 (508.3-1002.1)	781.9 (549.9-1074.2)	0.07 (0.04-0.09)
Montana	696.3 (484.3-953.4)	731.8 (514.5-1004.8)	0.05 (0.03-0.08)
Nebraska	714.4 (493.2-978.7)	757.8 (529.4-1036.0)	0.06 (0.04-0.08)
Nevada	744.4 (510.5-1023.4)	772.3 (534.9-1056.5)	0.04 (0.01-0.06)
New Hampshire	766.8 (536.2-1047.7)	825.2 (582.8-1122.5)	0.08 (0.05-0.10)
New Jersey	924.1 (641.1-1271.4)	1014.9 (703.1-1396.3)	0.10 (0.08-0.13)
New Mexico	696.7 (478.4-957.4)	725.3 (499.9-999.7)	0.04 (0.02-0.07)
New York	983.3 (675.0-1349.9)	1097.0 (764.9-1496.1)	0.12 (0.09-0.15)
North Carolina	782.2 (542.6-1070.8)	844.2 (591.6-1157.0)	0.08 (0.06-0.11)
North Dakota	673.7 (469.4-924.9)	719.1 (501.3-979.4)	0.07 (0.04-0.09)
Ohio	805.9 (556.9-1111.1)	860.4 (600.5-1173.3)	0.07 (0.04-0.10)
Oklahoma	756.8 (525.3-1036.5)	805.5 (558.9-1104.0)	0.06 (0.04-0.09)
Oregon	836.2 (575.8-1147.0)	907.9 (629.0-1243.9)	0.09 (0.06-0.11)
Pennsylvania	817.6 (570.5-1119.2)	898.7 (626.1-1226.7)	0.10 (0.07-0.13)
Rhode Island	834.5 (578.9-1146.8)	894.8 (629.2-1228.8)	0.07 (0.05-0.10)
South Carolina	844.5 (590.0-1158.6)	920.3 (642.3-1264.6)	0.09 (0.07-0.12)
South Dakota	704.5 (487.4-969.4)	751.1 (526.5-1030.5)	0.07 (0.04-0.09)
Tennessee	757.1 (525.5-1037.8)	807.8 (560.5-1109.5)	0.07 (0.04-0.10)
Texas	819.4 (564.4-1126.7)	888.3 (617.6-1215.5)	0.08 (0.06-0.11)
Utah	722.8 (495.9-1003.8)	754.2 (521.8-1046.8)	0.04 (0.02-0.07)
Vermont	702.3 (492.1-963.1)	744.7 (521.9-1014.9)	0.06 (0.04-0.09)
Virginia	837.2 (573.7-1150.0)	906.9 (626.9-1241.9)	0.08 (0.06-0.11)
Washington	836.9 (577.0-1141.3)	905.0 (631.8-1232.3)	0.08 (0.06-0.11)

(continued)

Table. Total Rate and Percentage Change of Disability-Adjusted Life-years (DALYs) by US State, 1990-2017[a] (continued)

	Age-standardized DALYs, (95% UI)		
	Rate per 100 000		Percentage change
State	1990	2017	1990-2017
West Virginia	757.6 (526.4-1034.8)	820.2 (573.2-1119.2)	0.08 (0.06-0.11)
Wisconsin	735.7 (510.6-1007.5)	783.3 (547.7-1070.6)	0.06 (0.04-0.09)
Wyoming	641.9 (442.5-879.1)	672.9 (465.6-922.3)	0.05 (0.02-0.08)

Abbreviations: DC, District of Columbia; UI, uncertainty interval.

[a] The categories of skin and subcutaneous disease conditions selected for monitoring by the Global Burden of Disease study were dermatitis (atopic, seborrheic, and contact), psoriasis, cellulitis, pyoderma, scabies, fungal skin diseases, viral skin diseases, acne vulgaris, alopecia areata, pruritus, urticaria, decubitus ulcer, and other skin and subcutaneous diseases. Malignant melanoma of the skin and keratinocyte carcinoma were not included.

standardized DALY rate for keratinocyte carcinoma between men (52.73; 95% UI, 38.36-75.45) and women (21.04; 95% UI, 13.19-32.82), whereas North Dakota had the smallest difference between men (25.23; 95% UI, 20.06-32.78) and women (10.95; 95% UI, 7.88- 15.28).

Discussion

This cohort study reported on the skin and subcutaneous disease burden in the US and the marked variations at the state level. The overall skin and subcutaneous disease burden across the US slightly increased from 1990 (821.6) to 2017 (884.2) (Table). The reported variation in DALY rates at state levels may point out factors that are unique to each state and may be associated with the disparities in DALY rates. Many reasons may explain the DALY rate variation, including socioeconomic status, access to and quality of dermatological care, insurance coverage, public health screening and prevention programs, demographic characteristics (eg, age, sex, educational level, income level, and occupation), migration patterns, weather and climate, environmental exposures, types of dermatology practice, and billing patterns of individual states. Moreover, data reporting and consistency, adequate *ICD-9* or *ICD-10* codes, and the health care database used may also alter the DALY rates in states.

In contrast, a study that evaluated cardiovascular diseases across the US reported a decrease in DALY rates from 1990 to 2016 in all states,[12] thereby raising the possibility that other dermatological factors may be associated with the burden of skin and subcutaneous diseases across the US. Such dermatological factors may include greater screening for skin conditions, increase in disease prevalence, and geographic distribution of dermatologists over time.

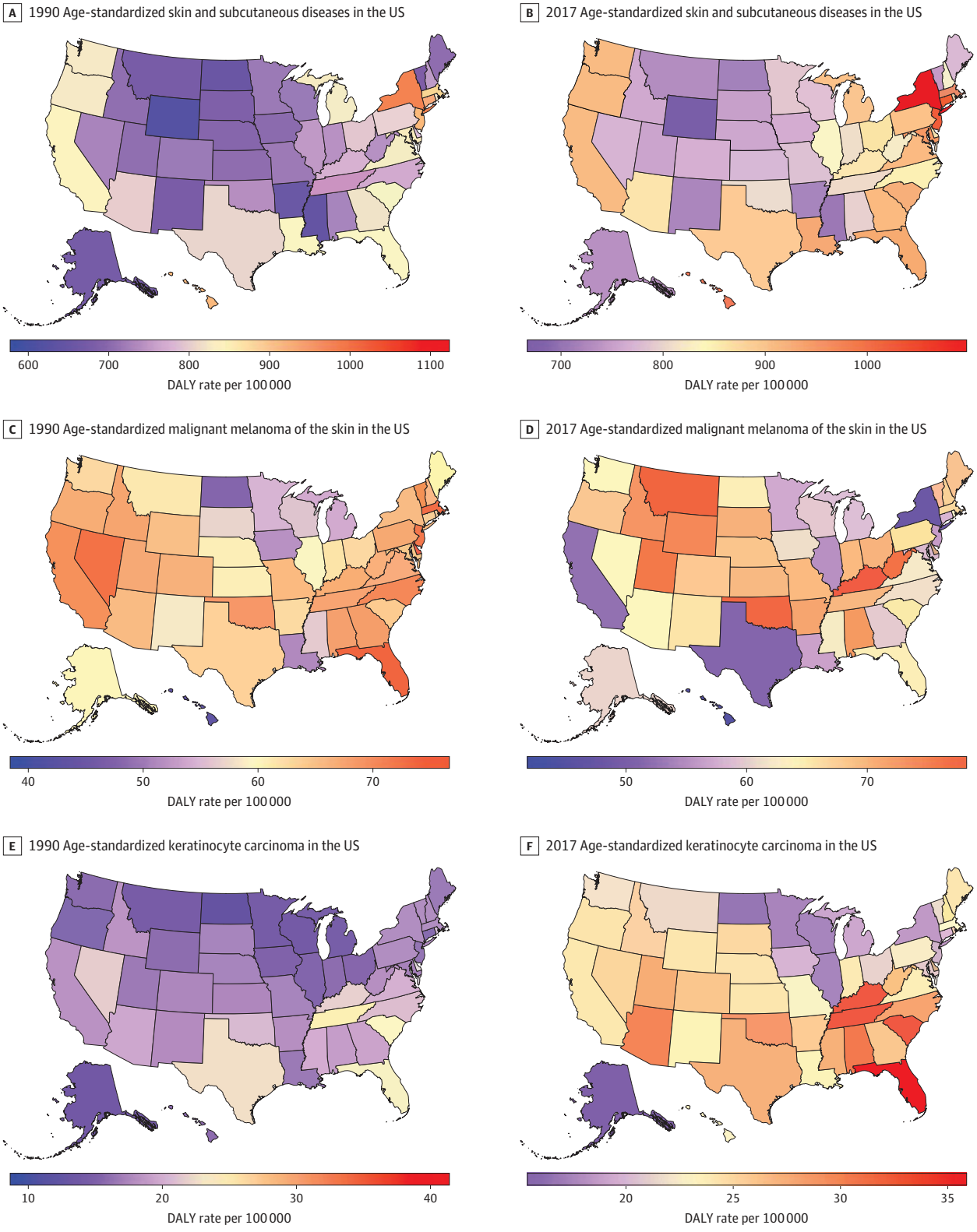
The highest DALY rate for skin and subcutaneous disease burden was observed in New York, whereas Wyoming had the lowest value, yet no significant differences between the states were found. Florida had the greatest burden from keratinocyte carcinoma, which is concordant with Florida's moderate to very high UV index and the known key role of UV radiation in keratinocyte carcinomas.[13] Not surprisingly, the lowest DALY rate of keratinocyte carcinoma was observed in Alaska. This information may be used to guide health care allocation, optimize skin cancer screening, and promote preventive efforts to reduce keratinocyte carcinoma burden in higher-risk states.

Many factors may explain the difference in prevalence in skin diseases, including local weather, climate change, diet, characteristics of the state population, and data reporting. The states with the highest prevalence also had the highest incidence of each respective disease. Interestingly, Kentucky had the highest age-standardized DALY rate for malignant melanoma of the skin despite the higher disease prevalence and incidence being reported in the state of Massachusetts. As both states have similar race/ethnicity demographics, with white individuals composing more than 80% of the population,[14] health care–based factors, including dermatologist density and health insurance coverage, might be associated with the higher observed DALY rate.[15]

Although no significant sex difference was observed for the age-standardized DALY rates for skin and subcutaneous diseases and malignant melanoma, men had the highest rate for keratinocyte carcinoma. Previous studies have elucidated sex differences, revealing men to be more susceptible to infectious skin disease and melanoma and women to be more susceptible to pigmentary disorders, autoimmune diseases, and allergic skin diseases.[16] Sex-based differences may be affected by skin structure and function, sex hormones, immune responses, work exposures, and sociocultural backgrounds.[16] The higher observed age-standardized DALY rate for keratinocyte carcinomas in men may be associated with poor sun-protective behaviors (eg, sunscreen application, wearing wide brim hats, limiting outdoor activity, and seeking shade), outdoor work, delayed screening and diagnosis, and less worry about recurrence.[17-20]

We believe that the diversity of state-level burden is dependent on a collection of factors, including socioeconomic status, demographic characteristics, environmental exposures, climate and weather patterns, access to and quality of dermatological care, dermatology practice types available, and local health care policy and budget. Furthermore, the burden of skin disease across the US may reflect the development of new treatments, access to health care, and an aging US population.[21] Stratifying individual state burden according to the GBD data may help with allocation of health resources, prioritization of prevention strategies, development of public health policy, expansion of health care coverage to skin disease treatment, and guidance of future research efforts. Given the comorbidities associated with skin diseases, these findings can be used by primary care physicians and other medical specialties to meet patient needs, provide education, and

Figure. Maps of Age-Standardized Disability-Adjusted Life-Year (DALY) Rate for Total Skin and Subcutaneous Conditions in 1990 and 2017.



The conditions selected for monitoring by the Global Burden of Disease study were skin and subcutaneous diseases (A and B): dermatitis (atopic, seborrheic, and contact), psoriasis, cellulitis, pyoderma, scabies, fungal skin diseases, viral skin diseases, acne vulgaris, alopecia areata, pruritus, urticaria, decubitus ulcer, and other skin and subcutaneous diseases. Malignant melanoma of the skin (C and D) and keratinocyte carcinoma (E and F) were not included in the conditions selected for monitoring by the Global Burden of Disease study.[4]

develop communication strategies to reduce stigma and social disability associated with skin diseases. Future studies should investigate state-specific differences across the 15 disease categories (with analysis stratified by age and race/ethnicity), direct vs indirect costs of skin diseases, and the factors that may be associated with these variations, including sociodemographic index, insurance coverage, and dermatologist density.

Limitations

This study has several limitations. First, the GBD provides estimates only for 15 of the most common skin and subcutaneous disease categories. Less common skin conditions, such as bullous and connective tissue disorders, were grouped under the category of other skin and subcutaneous disease. Second, inconsistency and underreporting may occur in various US states, leading to possibly flawed burden-of-disease estimates, such as underreporting because of improper *ICD-9* or *ICD-10* coding or grouping of heterogeneous skin disease as well as selection bias from detecting disease in persons who have more propensity to seek health care. Inconsistencies in the data may also stem from changes in sources over time. Third, DALY rate measures the overall disease burden and may not account for social disability and stigma associated with skin disease. In addition, the reported GBD data lacked information on race/ethnicity for each geographic area, which might affect the prevalence and incidence of certain skin and subcutaneous diseases.

Conclusions

The burden of skin and subcutaneous diseases appeared to be large, and the DALY rate per 100 000 people appeared to vary across the US. The age-standardized DALY rate for keratinocyte carcinoma was found to be higher in men than in women. We believe that data from the GBD study can be used to improve the ability of states to meet the health needs of their population. The results of this cohort study and future research may inform states' recommendations and targeted interventions for skin and subcutaneous disease in their populations.

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