

The burden of skin disease in the United States



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Since the publication of the last US national burden of skin disease report in 2006, there have been substantial changes in the practice of dermatology and the US health care system. These include the development of new treatment modalities, marked increases in the cost of medications, increasingly complex payer rules and regulations, and an aging of the US population. Recognizing the need for up-to-date data to inform researchers, policy makers, public stakeholders, and health care providers about the impact of skin disease on patients and US society, the American Academy of Dermatology produced a new national burden of skin disease report. Using 2013 claims data from private and governmental insurance providers, this report analyzed the prevalence, cost, and mortality attributable to 24 skin disease categories in the US population. In this first of 3 articles, the presented data demonstrate that nearly 85 million Americans were seen by a physician for at least 1 skin disease in 2013. This led to an estimated direct health care cost of \$75 billion and an indirect lost opportunity cost of \$11 billion. Further, mortality was noted in half of the 24 skin disease categories. (J Am Acad Dermatol 2017;76:958-72.)

Key words: burden of skin disease; burden of skin disease report; costs of skin disease; direct health care costs; health care economics; indirect health care costs; loss of productivity costs; over-the-counter drug costs; prescription drug costs.

Skin disease is one of the leading causes of global disease burden, affecting millions of people worldwide.¹ Aging, environmental and genetic factors, and trauma can result in the development of a diverse set of skin diseases, with over 3000 entities identified in the literature.^{2,3}

A limited number of studies have addressed the burden of skin disease (BSD) in the United States.⁴⁻⁶ The most comprehensive study was a 2006 publication by the American Academy of Dermatology (AAD) and the Society for Investigative Dermatology (SID), based on data before 2004.⁴

Since 2006, there have been substantial changes in the practice of dermatology and in the US health care system. These changes include the development of new treatment modalities, marked increases in the cost of medications, increasingly complex payer rules and regulations, and an aging US population. In response to these changes, the AAD developed this updated national BSD report to provide a comprehensive appraisal of skin disease prevalence, mortality, and current direct health care and indirect economic costs. This report analyzed information from the 2013 claims tabulations of the US

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population pertaining to 24 skin disease categories that broadly represent skin diseases relevant to both the practice of dermatology (medical, surgical, and pediatric) and to other health care providers treating the skin. Therefore, in this report, data are presented for patients with skin disease treated by dermatologists and/or by other physicians who are not dermatologists.

METHODS

In 2014, the AAD appointed a BSD Work Group* to develop a current BSD report. Milliman (New York, NY) was selected to work with the BSD Work Group. Detailed methodology can be found in the AAD BSD report.⁵

Skin disease categories

The work group identified 24 skin disease categories for inclusion in this report, and assigned the appropriate corresponding *International Classification of Diseases, Ninth Revision (ICD-9)* diagnosis codes, which were in use in 2013. The following principles for identifying and assigning *ICD-9* codes were established:

- Diseases of hair, nails, lips, eyelids, external genitalia, and external ear were included as skin disease.
- Skin damage from external causes (eg, thermal burns) and cutaneous manifestations of systemic diseases (eg, drug eruptions from chemotherapy) were included.
- Skin diseases that overlapped 2 or more categories were assigned to the most prevalent one (eg, eczema not otherwise specified was assigned to dermatitis not otherwise specified; ICD-9 692.9).

It should be noted that diagnosis codes pertaining to diseases that are remotely or rarely associated with skin manifestations were not included in this analysis; these included bone/skin neoplasms and other nonclassifiable diagnoses such as unspecified

disorder of skin and subcutaneous tissue (ICD-9 709.9). [Table I](#) shows the skin diseases assigned to the 24 categories. The list of *ICD-9* diagnoses for each category can be accessed in the full report.⁵

US population and insurance classifications

Medical Expenditure Panel Survey data were used to

estimate the US 2013 population by age and insurance status. Specifically, the participants' primary payer as of July 1, 2013, was used, with participants assigned to 1 of 4 insurance statuses: commercial, Medicare, Medicaid, and uninsured. The following insurance enrollment and claims databases were used for the development of 2013 prevalence and cost estimates: Truven Health Analytics MarketScan Commercial Database, Medicare 5% sample, Milliman Medicare Part D Claims Database, and Milliman Medicaid Consolidated Health Cost

Guidelines Sources Database. The databases were supplemented by information from the Medicare Part D Prescriber Public Use Files, the Kaiser Family Foundation (Medicaid and uninsured data), and Information Resource Inc. (over-the-counter [OTC] drug data).^{6,7}

A set of data selection rules for each database source was established to ensure representative and quality data.⁵

Prevalence measurement methodology

Prevalence in this report refers to the portion of the population having the diagnosis of at least 1 of the 24 skin disease categories recorded on a health insurance claim during the course of 2013. A skin disease diagnosis during 2013 may reflect both newly diagnosed skin disease and chronic skin disease requiring ongoing treatment (eg, acne, psoriasis). Prevalence by disease category was calculated as the number of single-counted individuals with a diagnosis in the category divided by the total population. This approach to prevalence, therefore, excludes people with skin disease who did not file insurance claims (ie, did not see a physician), regardless of reason, during 2013 ([Fig 1](#)). For the uninsured population, prevalence was estimated using the Medicaid population, adjusting for the

CAPSULE SUMMARY

- 85 Million Americans (ie, 1 in 4 individuals of all ages) were seen by a physician for at least 1 skin disease in 2013.
- In 2013, skin disease resulted in direct health care costs of \$75 billion, and indirect lost opportunity costs of \$11 billion.
- The costs and prevalence of skin disease are comparable with or exceed other diseases with significant public health concerns, such as cardiovascular disease and diabetes.

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Abbreviations used:

AAD:	American Academy of Dermatology
BSD:	burden of skin disease
CDC:	Centers for Disease Control and Prevention
ICD-9:	<i>International Classification of Diseases, Ninth Revision</i>
OTC:	over-the-counter
SID:	Society for Investigative Dermatology
YPLL:	years of potential life lost

age mix from Medical Expenditure Panel Survey population data.

Health care costs

Skin disease claims were identified using diagnosis codes, procedure codes, national drug codes, and physician specialty identifiers to select skin disease-associated claims. When a claim had diagnoses for skin and nonskin diseases, costs were divided among the conditions such that only the skin disease portion was included in tabulations.

Health care costs definitions. Costs are for services and prescription drugs typically paid for by commercial, Medicare, and Medicaid health insurance plans. Costs do not include long-term nursing home and community services and supports. Costs are the sum of the total cost paid by the insurance plan(s) and patient cost sharing (allowed costs). Patient cost sharing includes deductibles, coinsurance, and copayments. Costs were not reduced to reflect prescription drug rebates paid to insurance plans or to pharmacy benefit managers by drug companies.

Medical (nondrug) costs. Using the MarketScan, Milliman Medicare Part D Claims Database, and Milliman Consolidated Health Cost Guidelines Sources claims data sets, medical service claims falling into 1 (or more) of the following categories were included:

1. Services with a skin diagnosis code (any diagnosis position) provided by any health care provider.
2. Evaluation and management services provided by a dermatologist.
3. Skin procedures.
4. Skin disease vaccines (vaccines for zoster, human papillomavirus, measles/rubella, and varicella).

Categories 2 through 4 are included because some skin disease services do not have a skin diagnosis code (eg, category 3 includes skin [and nail] care for diabetic patients, and category 4 includes prophylactic vaccines that do not have disease diagnosis codes).

For category 1 claims, a skin percentage was assigned based on a formula that weights the total number and position of skin disease diagnoses on the claim. Medical services and costs identified in categories 2 to 4 were assigned 100% to skin disease. Services and costs for the 24 skin disease categories were assigned to the first skin diagnosis on the claim. Medical costs from claims were tabulated on various aspects of health care services, including inpatient services, outpatient therapies, emergency room and observation visits, surgeries, nonsurgical dermatology procedures (eg, phototherapy), office visits, and vaccines. For the uninsured population, commercial tabulated costs were used and the uninsured to commercial cost ratio by type of service was applied.

Prescription drug costs. Using the MarketScan, Milliman Medicare Part D Claims Database, and Milliman Consolidated Health Cost Guidelines Sources claims data sets, prescription drug claims falling into 1 (or more) of the following categories were identified:

1. Dermatologic drugs (as classified by the Medispan Therapeutic Classification System).
2. Skin disease vaccines.
3. The top-100 drugs prescribed by dermatologists (as defined by the 2013 Medicare Part D Prescriber Public Use Files) ([Supplemental Table I](#); available at <http://www.jaad.org>).

Drug use and costs identified in categories 1 and 2 were assigned 100% to skin disease. A skin percentage value of less than 100% that took into account the overall cost for each drug, and the percentage of prescriptions issued by specialty or nonspecialty providers, was assigned to drugs identified in category 3. The identified prescription drugs and costs were tabulated by insurance status, type of drug, specialty status, and therapeutic class.

OTC products. OTC product costs were identified using 2013 US OTC product retail sales estimates from Information Resources Inc (Chicago, IL), which collects cash register scanner data from US drug stores, grocery stores, and mass merchandisers to produce national estimates of consumer purchases. Because skin-related OTC products may include cosmetic and other nondisease-oriented products, only product categories intended to help in the management of skin diseases were analyzed. In all, 22 OTC products categories were identified as related to skin care, such as sunscreens or antihistamines ([Supplemental Table II](#); available at <http://www.jaad.org>).

Indirect costs

Opportunity costs. Total patient-days of interaction with the health care system were calculated as

Table I. List of skin disease categories

	Disease category	Includes*
1	Acne	Acne
2	Actinic damage	Actinic keratosis; solar dermatitis; sunburn; actinic dermatitis
3	Atopic dermatitis/eczema	Atopic dermatitis; eczema; dyshidrosis
4	Noncancerous skin growths (benign neoplasms/keloids/scars/cysts)	Lipomas; benign neoplasms; hemangiomas; chalazions; cysts, including pilonidal, pilar, and sebaceous; corns, calluses, and keratoderma; keloids; scars and fibrosis
5	Bullous diseases	Dermatitis herpetiformis; pemphigus; pemphigoid; other bullous dermatoses; erythema multiforme
6	Congenital abnormalities	Various hereditary and congenital conditions and anomalies, including ichthyosis congenita, vascular hamartomas, and congenital ectodermal dysplasia
7	Connective tissue disorders	Lupus; dermatomyositis; scleroderma; diffuse connective tissue disease
8	Contact dermatitis	Contact dermatitis; diaper rash; nonspecified dermatitis
9	Cutaneous infections	Bacterial skin infections, including tuberculosis and leprosy; cellulitis; carbuncles; impetigo; onychia
10	Cutaneous lymphoma	Mycosis fungoides/Sézary syndrome; parapsoriasis
11	Drug eruptions	Drug dermatitis; Stevens-Johnson syndrome
12	Hair and nail disorders	Alopecia; telogen effluvium; hirsutism; hair and nail anomalies
13	HPV/warts/molluscum	Warts, including genital warts; molluscum contagiosum
14	Melanoma	Malignant melanoma
15	Nonmelanoma skin cancer	Basal cell carcinoma; squamous cell carcinoma; Kaposi sarcoma; carcinoma in situ
16	Pruritus	Pruritus not otherwise specified; psychogenic skin disease; lichenification
17	Psoriasis	Psoriasis
18	Rosacea	Rosacea
19	Seborrheic dermatitis	Seborrheic dermatitis; seborrhea; blepharitis
20	Ulcers	Ulcers, all stages and causes; pyoderma gangrenosum
21	Urticaria	Urticaria, any cause
22	Viral (HSV/HZV) and fungal diseases	Herpes simplex; herpes zoster; viral exanthemata; dermatophytosis; dermatomycosis; candidiasis
23	Vitiligo	Vitiligo
24	Wounds and burns	Burns, all degrees; lacerations; wounds; abrasions; bites; foreign bodies, eg, splinters

HPV, Human papillomavirus; HSV, herpes simplex virus; HZV, herpes zoster virus.

*Included conditions are for illustrative purposes, and categories may include other conditions. See burden of skin disease report (*International Classification of Diseases, Ninth Revision* diagnoses by skin disease category) for a complete list.

the product of the number of services and estimated interaction time. Full and partial day patient-time estimates were assigned to claims by the type of service (eg, inpatient, outpatient, office visit). If a claim had more than 1 procedure for the same type of service (eg, 2 surgery procedures) on the same day, patient-days of interaction were assigned to only 1 procedure. Similarly, the number of services included only the skin percentage portion of services as described previously. Patient-days of interaction were converted to opportunity cost using the 2013 average hourly wage data from the Bureau of Labor Statistics. Although not everyone is employed, everyone has an opportunity cost, and average wages are used as a proxy for that metric. For children, the opportunity cost was calculated as the parents' opportunity cost. The 2013 average hourly wage was \$23.97, or \$191.76 per 8-hour day.⁸

Literature searches. A search was conducted to identify peer-reviewed articles and government reports describing the indirect cost BSD, other than mortality and patient-time, for the US population. PubMed and Google Scholar were used to identify English-language literature meeting the inclusion criteria indicated below:

- Preferably studies based in the United States, or, alternately, those done in other advanced health care systems.
- Reports published between January 2005 and 2016, and data analysis done from 2000 or later.
- Subjects are an entire population or large sample (n > 1000).
- Data include several or most skin diseases, and include several disease acuties;
- Data are from meta-analyses.

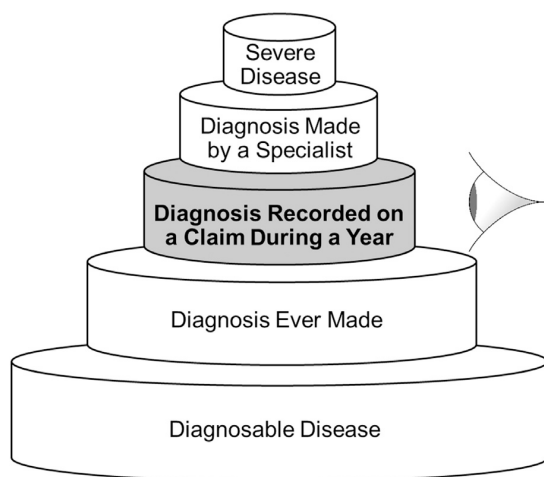


Fig 1. Calculation of disease prevalence across the 24 skin disease categories. The wedding cake graph indicates the relative population size included in each definition of prevalence, ranging from all affected individuals (diagnosable disease [bottom]) to a very restricted group with a particular severe form of the disease (top). This report defines prevalence as “the portion of the population having at least 1 skin disease diagnosis as recorded on a health insurance claim during the course of 2013” (grayed middle disk).

Data from clinical trials were excluded, as these studies select specific affected populations.

Mortality from skin disease

Data corresponding to 2013 deaths-by-cause from the Centers for Disease Control and Prevention (CDC) Wide-ranging Online Data for Epidemiologic Research System were used to determine the number of deaths as a result of skin disease in 2013. The CDC records causes of death using 4-digit *International Statistical Classification of Diseases, 10th Revision* codes. Skin diseases were mapped between the ICD-9 codes used in the claims analysis to the *International Statistical Classification of Diseases, 10th Revision* codes using the General Equivalence Mappings provided by the Centers for Medicare and Medicaid Services.

A well-accepted statistical method to estimate premature mortality as a result of a specific condition is to calculate years of potential life lost (YPLL). YPLL complements absolute number of mortality data, and takes into account the age at which deaths occur by giving greater weight to deaths at younger age and lower weight to deaths at older age.^{9,10} It is an estimation of the average years that a person would have lived had he/she not died prematurely; it is a measurement of premature mortality.¹¹ Total YPLL

was calculated for each skin disease by using 75 years as the reference age. Therefore, a person who died at 50 years of age would have a YPLL of 25 (=75, minus 50), whereas a person who died at 80 years of age would have a YPLL of 0 (age of death being greater than the reference age of 75 years).

RESULTS

US claims-based prevalence of skin disease in 2013

Nearly 85 million Americans (27% of population; 1 in 4 individuals) were seen by a physician for skin disease in 2013 (Fig 2, A). Overall, affected individuals averaged 1.6 skin diseases. Up to 64 years of age, the prevalence and average number of skin diseases per person was relatively similar for all age groups; however, the prevalence increased to nearly 50% for those age 65 years and older, with an average of 2.2 skin diseases diagnosed per person (Fig 2, B). Comparable prevalence and average number of skin diseases were observed for all age groups across the commercial, Medicaid, and uninsured populations (Fig 2, C). In contrast, for Medicare population, the prevalence of skin disease was 34% in the age group 18 to 44 years; the prevalence increased to 49.4% for those age 65 years and older, with a corresponding increase in the average number of skin diseases to 2.3. However, it should be noted that the group age 65 years and older only represents less than 1% of the commercial population.

Skin disease prevalence for the total population ranged widely across all 24 categories. Prevalence was highest for the categories of noncancerous skin growths (defined as benign neoplasms/keloids/scars/cysts), cutaneous infections and viral and fungal diseases, wounds and burns, contact dermatitis, and actinic damage. Prevalence was lowest for bullous diseases, cutaneous lymphoma, and vitiligo (Fig 3).

Direct US health care costs of skin disease

The total estimated direct cost of skin disease in 2013 was nearly \$75 billion (Fig 4, A). Of this total cost, \$46 billion was attributable to medical costs (office visits, procedures, tests), \$15 billion to prescription drugs, and \$4 billion to vaccines (~58%), other skin procedures (~42%), and skin cancer screening (<0.1%). The total of these 3 categories of \$65 billion corresponded to 3.8% of 2013 total US health care costs. Cost corresponding to OTC products for skin disease was nearly \$10 billion.

Across skin disease categories, estimated medical costs ranged from over \$8 billion for cutaneous infections to \$49 million for vitiligo (Fig 4, B). The medical costs of the 10 skin disease categories with

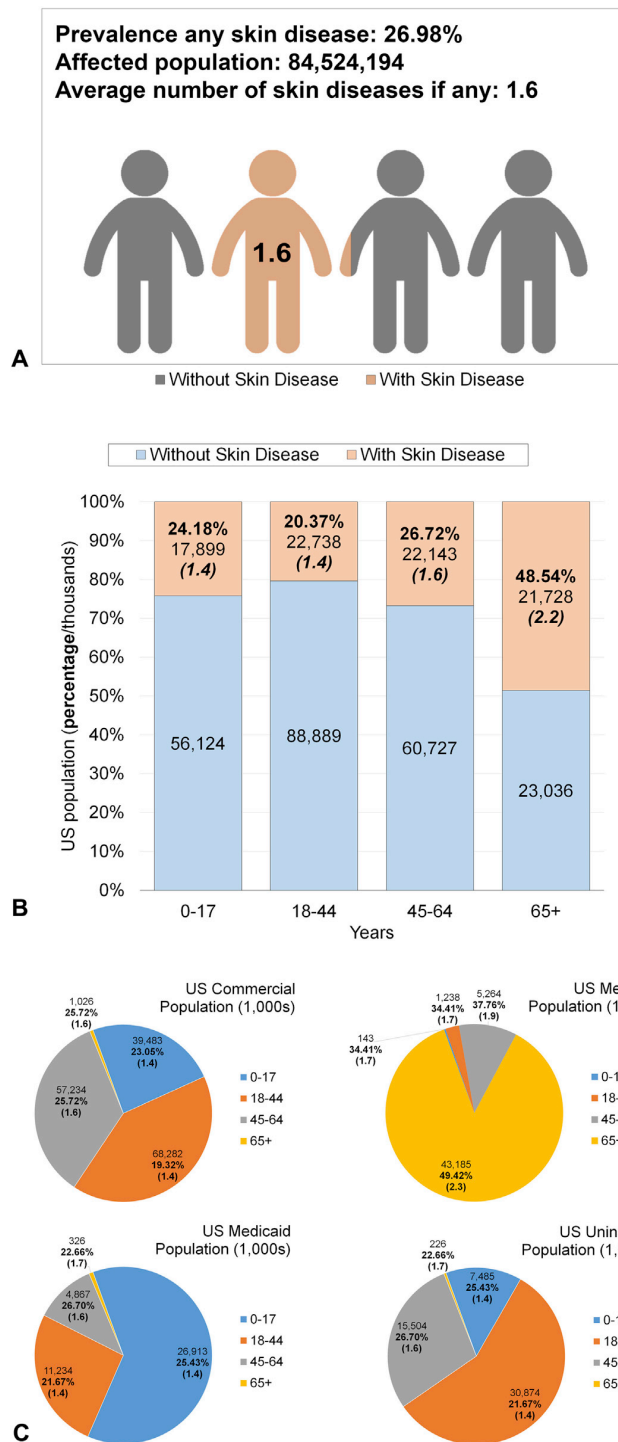


Fig 2. Prevalence of skin disease by age and insurance status in the US population. **A**, Graphic representation of the percentage of the US population with any skin disease (*tan shading*). **B**, The stacked column graph shows the relative US population with (*pink*) and without (*blue*) skin disease by age group. The prevalence for any skin disease (*pink columns*) is indicated as percentage, actual number of individuals (in millions), and the average number of skin diseases if any within parentheses. **C**, The pie charts represent the percentage of total US population by insurance status (commercial, Medicare, Medicaid, and uninsured), age group, and percentage of individuals affected with skin disease. The labels for each pie slice (age group) indicate the actual number of individuals (in millions), prevalence of skin disease (percentage; in bold), and the average number of skin disease (in parentheses).

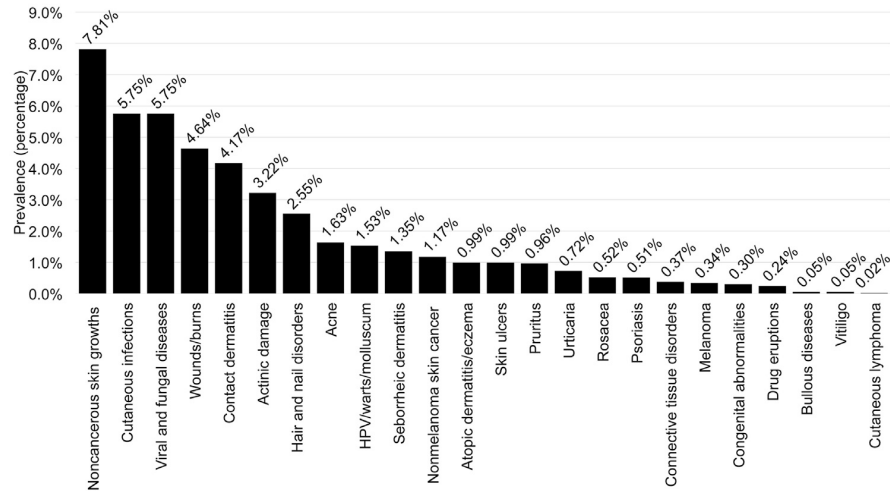


Fig 3. Claims-based prevalence of skin disease in 2013. The histogram shows the 24 skin disease categories sorted by claims-based prevalence for the US population in 2013.

the largest economic burden (ie, from cutaneous infections to connective tissue disease) (Fig 4, B) totaled nearly \$40 billion, constituting over 85% of the estimated total medical costs for all skin disease. The relative cost/prevalence ratio for each skin disease varied across the 24 skin disease categories. Cutaneous lymphoma, ulcers, and melanoma had high cost relative to their prevalence. Conversely, atopic dermatitis, pruritus, and seborrheic dermatitis had a lower cost relative to their prevalence (Fig 5).

Skin disease drug and vaccine costs

Of the \$15.6 billion for skin disease prescription drugs and vaccines covered by insurance in 2013, nonspecialty drugs (typically nonbiologic, long established drugs)¹² accounted for the majority of these costs (72%), whereas specialty drugs (typically biologic and/or injectable drugs)¹² and vaccines each accounted for 15% and 13% of the total, respectively (Fig 6, A).

As shown in Fig 6, B, the highest total sales of dermatology-related OTC products included acne treatments, body and facial antiaging products, depilatories, facial cleansers and moisturizers, fade/bleach products (eg, skin care category), hand and body lotion, first-aid treatments, and sunscreen. Dividing total US OTC sales costs by the total US population results in a 2013 OTC cost per capita of \$31.91.

Cost of skin disease per capita

Dividing the total skin disease health care costs of \$75 billion in 2013 by the total US population results in a cost of skin disease per capita of nearly \$240

(Fig 7). The average cost per person affected with skin disease was \$887 (data not shown). Of the \$240 per US capita, medical costs accounted for 61%, whereas 20% was for prescription drugs, 6% was for screening/vaccines/others, and 13% was for OTC products (Fig 7, left). The specific medical cost per capita for each of the 24 skin disease categories is shown in Fig 7, right. In general, skin diseases with high prevalence also had high medical costs per capita.

Comparison of the cost of skin disease between 2004 and 2013

The 2006 AAD/SID BSD report,⁴ which used data before 2004, estimated the total health care costs of skin disease at approximately \$29 billion. This current report, using claims data for 2013, estimates it to be nearly \$75 billion (Table II). It should be emphasized that these 2 reports use different methodologies and have variations in the skin disease categories analyzed, making direct dollar comparisons difficult. With these limitations in mind, adjusting the 2004 estimated cost for inflation¹³ to 2013 US\$ (\$29 billion, to \$44 billion), shows an increase in the BSD of 1.7-fold (Table II).

Skin disease opportunity cost

Having skin disease affects work and life productivity, both for patients and their caregivers. The 2013 estimated opportunity cost for skin disease approached \$11 billion (Fig 8). In general, the skin diseases with the highest prevalence also had the highest opportunity costs, although their relative position among the 24 studied diseases varied.

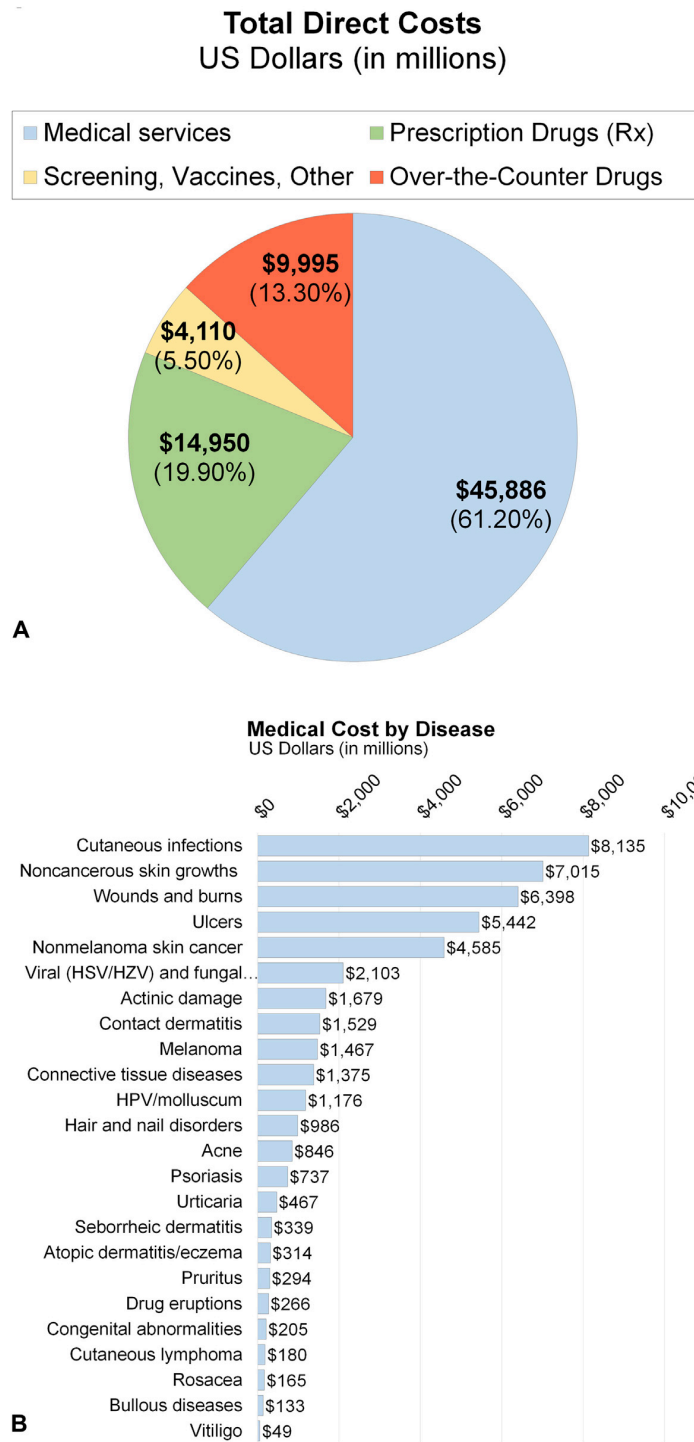


Fig 4. 2013 Direct US health care costs of skin disease. **A**, The pie chart represents the percentage of total 2013 health care (direct) costs (almost \$75 billion) for the combined 24 skin diseases broken down by medical services (*blue*); prescription drugs (*green*) screening, vaccines, and others (*yellow*); and over-the-counter (OTC) drugs (*red*). The percentage of total direct costs is shown in parentheses. **B**, Total population medical costs (in US\$ millions) for each of the skin disease categories analyzed. Note that these figures do not include prescription or OTC drugs, or screening, vaccines, and other related services. *HPV*, Human papillomavirus; *HSV*, herpes simplex virus; *HZV*, herpes zoster virus.

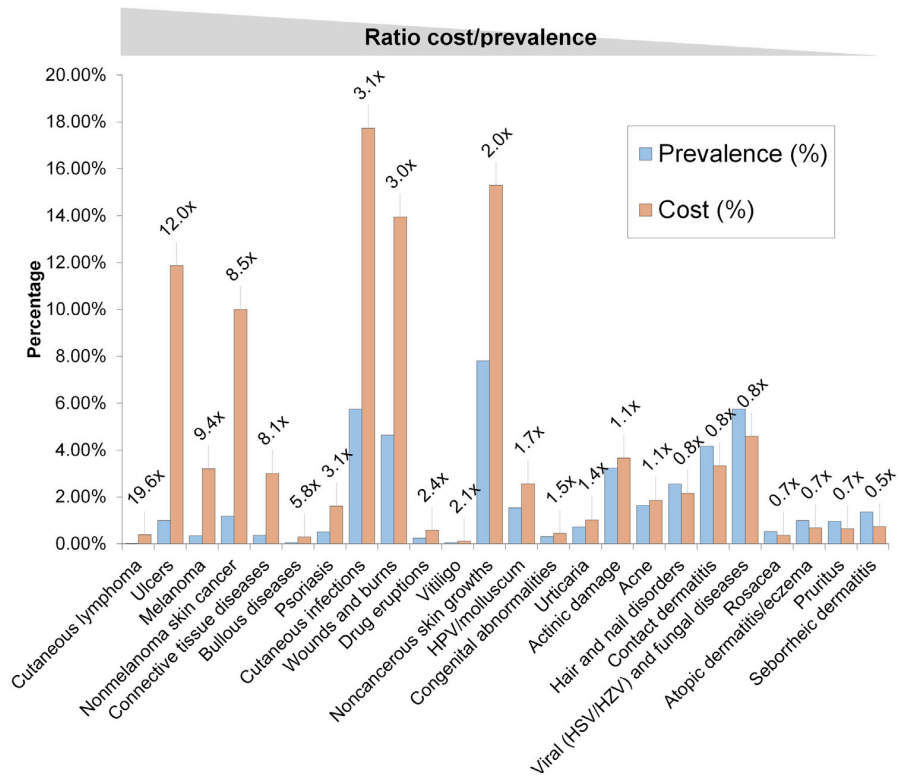


Fig 5. Skin disease medical costs versus prevalence. Comparison of prevalence for each skin disease category (blue histogram) with their corresponding percentage of total medical costs (tan histogram). The skin disease categories are sorted by decreasing ratio cost/prevalence (indicated on top of each column). HPV, Human papillomavirus; HSV, herpes simplex virus; HZV, herpes zoster virus.

Cutaneous infections, noncancerous skin growths, wounds and burns, and viral and fungal diseases led the list of skin diseases with opportunity costs nearing or exceeding \$1 billion.

Impact of skin disease on US life expectancy

Skin disease directly caused 22,953 deaths (0.9% of the total number of deaths) in 2013 (Fig 9, A). On average, death from skin disease occurred at age 68.2 years, 5 years younger than the average age of death (for all causes) during 2013. One half of the 24 skin disease categories had deaths associated in 2013. Skin cancer (melanoma, nonmelanoma, and cutaneous lymphoma) accounted for over 60% of all skin disease-related deaths. Melanoma accounted for the most skin disease-related deaths (41%). Wounds and burns (15%) and cutaneous infections (10%) had the highest number of skin disease deaths not related to skin cancer (Fig 9, B).

Fatal skin disease leads to mortality at younger ages compared with other causes of death. Assuming a potential life expectancy of 75 years, the YPLL as a

result of fatal skin disease was nearly 11, 2.9 years greater than the YPLL for all causes of death.

Other indirect costs attributable to skin disease

Only 2 governmental reports and 2 published articles (both analyzed non-US populations) were identified that provided population-level, multiskin disease indirect cost assessments.¹⁴⁻¹⁷ Although extensive literature was noted on the indirect BSD, it was most often associated with a specific disease, and further limited to a specific subset of the population with the disease, precluding a cohesive multidisease assessment of the indirect costs of skin disease. Examples of the single-disease literature are shown in the full report.^{5,18-37}

DISCUSSION

The last AAD/SID US BSD report was developed using data that are now more than 12 years old. Since then, the national health care landscape has rapidly and significantly changed.³⁸⁻⁴⁰ These changes include the Affordable Care Act, Medicare Access

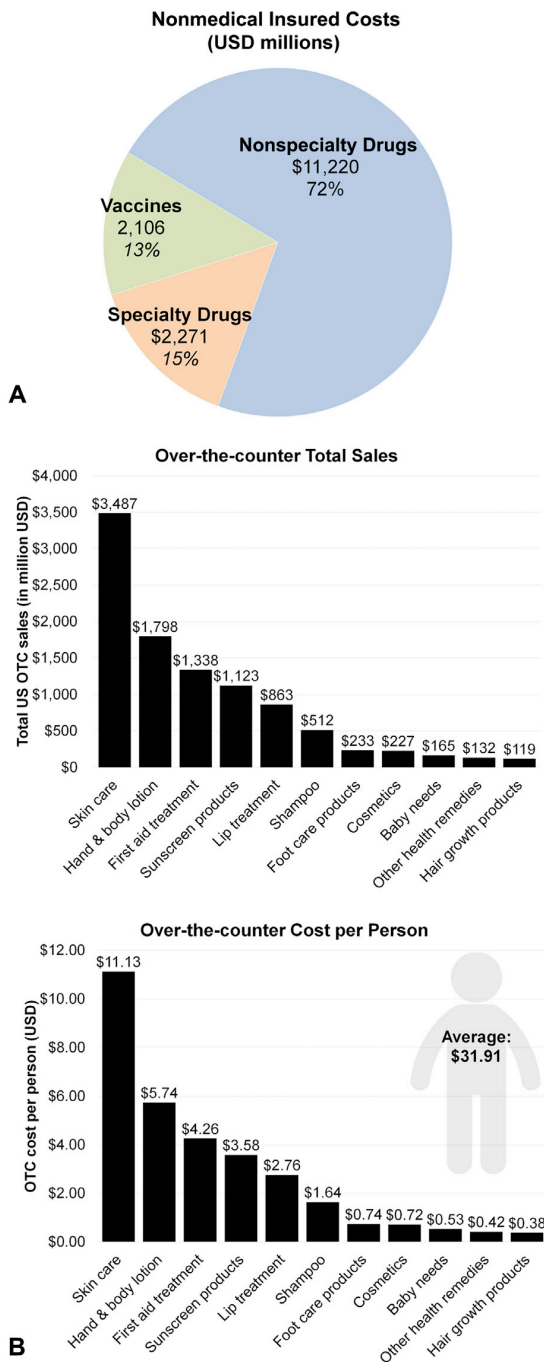


Fig 6. 2013 Nonmedical costs of skin disease. **A**, The pie chart represents the estimated total insured cost in US\$ (USD) (in millions) for prescription drugs and vaccines for skin disease prevention and treatment (percentage represents the percentage of total nonmedical service cost for each category). **B**, The histogram in the upper panel shows total over-the-counter (OTC) drug sales intended to care for skin disease in USD (in millions) for 2013 by categories as defined by the Information Resources Inc database (Chicago, IL). The histogram in the lower panel shows the average OTC cost per person in 2013 by categories.

and Children’s Health Insurance Program Reauthorization Act of 2015, evolving US demographic trends, a vast array of new drugs and treatment options, and new technologies to facilitate remote diagnosis and treatment.³⁸⁻⁴²

The number of Americans that were seen by a physician for some form of skin disease in 2013 was nearly 85 million, slightly over one quarter of the entire US population. This combined prevalence exceeds current annual estimates for all cardiovascular diseases and diabetes,⁴³⁻⁴⁵ making skin disease an important public health consideration. The analysis used in this report reflected only the economic burden for those who received care and had medical claims made in 2013, therefore, these calculations likely underestimate the true population burden and the prevalence of disease in the population. For instance, this report estimates the prevalence of psoriasis to be 0.5% and vitiligo to be 0.05%, whereas other studies estimate the population prevalence to be 2.2% to 4.7% and 0.5% to 2%, respectively.⁴⁶⁻⁴⁹ Despite the limitations of claims-based prevalence, this approach resulted in a consistent calculation and cross-comparison of results across all 24 skin disease categories for the US population.

Importantly, those seen with skin disease tended to have more than 1 skin disease during the year, averaging 1.6 skin diseases. This average increased to 2.2 skin diseases for individuals 65 years and older, indicating a trend of more skin disease with age. Although skin disease in general infrequently caused death, it is noteworthy that 12 of the 24 skin disease categories had associated deaths in 2013. Skin cancers (melanoma, nonmelanoma, and cutaneous lymphoma) resulted in over 60% of all skin-related deaths in 2013. This finding underscores the importance of early detection and treatment.

Many skin diseases in the population aged 65 years old and older are related to lifelong cumulative sun exposure (eg, actinic damage and skin cancer), and increasing susceptibility to bacterial, viral, and fungal diseases. By 2030, the US population aged 65 years and older is estimated to grow by 30 million individuals, and to steadily increase through 2050, with a projected total population aged 65 years and older of 85 million.⁵⁰ Growth in national health expenditures is projected to double between 2013 and 2020.⁴² With the physician workforce projected to remain relatively flat, the specific ratio of dermatologists to population will decrease over time, especially in rural areas.⁵¹ These projections indicate a current and future challenge to ensure patient access to appropriate dermatologic care.⁵¹⁻⁵³

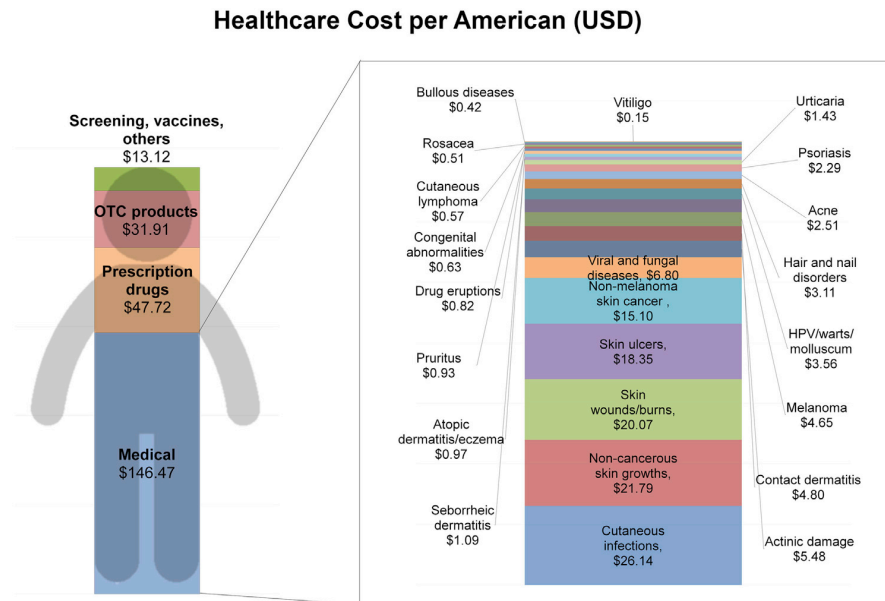


Fig 7. Estimated 2013 medical cost per US capita by skin disease. The stacked bar graph on the left panel represents the relative cost per American in 2013 by type of health care—related expense (medical, prescription drugs, over-the-counter [OTC] drugs, and screening, vaccines, and others) for all combined skin disease (total cost per person: \$239.21). The inset on the right breaks down total medical costs in US\$ per capita by skin disease category, sorted by increasing cost (top to bottom).

Table II. Comparison of US skin disease health care cost: Estimates from 2004 and 2013

Cost	2004 Estimate, US\$ millions		2013 Estimate, US\$ millions	Ratio of 2013 estimate/2004 estimate (adjusted for inflation)
	2004	Projected to 2013	By tabulation	
Total health care	28,755	44,201	74,942	170%
OTC products	2113	3248	9998	308%
Total insured	26,642	40,953	64,947	159%
Prescription drugs	7400	11,375	14,950	131%
Medical	19,242	29,578	45,886	155%
Screening, vaccines, other	-	-	4111	N/A
US total health care: projection factor 2004-2013			1.54	

N/A, Not available; OTC, over-the-counter.

The cost for individual skin diseases varied widely, partially because of differences in prevalence, but also because of the cost of medical and surgical treatment options. Distributed across the entire US population, the total 2013 health care cost of skin disease was approximately \$240 per capita. Other diseases, such as cardiovascular disease, diabetes, and end-stage renal disease have significantly higher direct and per affected person costs than skin disease.^{43,44,54-57} However, the per capita costs for these 3 diseases are, similar to skin disease,

less than \$1000 (ie, \$950 for cardiovascular disease, \$785 for diabetes, and \$147 for end-stage renal disease).

Although there are limitations on direct comparison of the previous AAD/SID BSD report and this current report, it reveals that from 2004 to 2013 there has been a roughly 1.7-fold increase in skin disease health care costs. Of note, many new and more effective drugs and treatment options for skin disease were introduced between 2004 and 2013, albeit at higher costs than older treatments. Examples

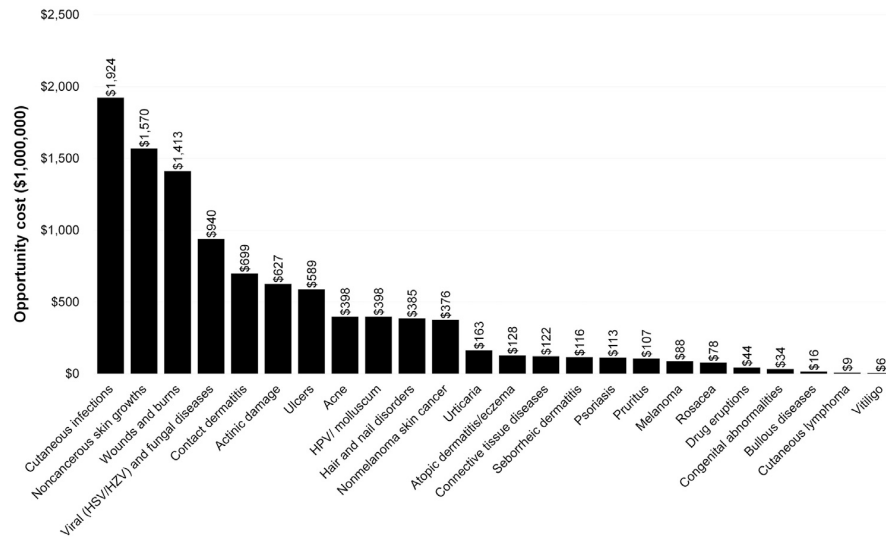


Fig 8. 2013 US skin disease opportunity cost (a measure of cost of the time interacting with the health care system that could have been used for work or other activities) was estimated based on a 2013 hourly average wage of \$23.97. The histogram shows the skin disease categories ranked by decreasing opportunity cost in US\$.

include new topical medications for acne, biologics and excimer laser for psoriasis, checkpoint inhibitors for melanoma, and oral and systemic treatments for cutaneous lymphoma.^{49,58-62} Since 2013, costs of many widely used dermatologic medications have increased significantly, and better understanding of the pathophysiology of diseases has led to development of new medications. Therefore, the health care cost of skin disease at the time of writing this article most likely surpasses this 2013 estimation.

This report estimates that the 2013 opportunity cost as a result of skin disease was nearly \$11 billion. Similar to the prevalence and economic BSD, it is also likely that the opportunity cost may be underestimated, as these estimates are calculated using claims-based methods. Although it is well recognized that skin diseases can inflict an enormous toll on the physical and psychosocial well-being of patients and their families,⁶³⁻⁶⁵ there is currently a lack of adequate studies on quality-of-life measures to systematically estimate the costs on a population level across all skin diseases.

There are limitations to this study. The use of 2013 claims-based prevalence provides a snapshot in time of the actual health care landscape; however, it does underestimate the true prevalence of the disease, as it only accounted those who filed insurance claims in 2013. Furthermore, it limits direct comparisons with other reports that use differing assessments of prevalence and disease costs. The health care

landscape has rapidly evolved since 2013; therefore, the true burden at the time of this writing is most likely higher.

In summary, this article presents an up-to-date US national BSD report that addresses 24 skin disease categories. Skin disease is a significant and serious public health consideration for the US population, costing at least \$75 billion to treat in a single year. Although this study's approach likely underestimates overall burden, it ensures consistency in comparing prevalence, economic, and mortality data across the 24 skin disease categories. With the projected increase in the age group 65 years and older in the US population, combined with the increased costs of currently in-use and newly developed dermatologic treatment options, the economic BSD will continue to grow. The increased number of individuals older than 65 years, who have higher skin disease burden, needs to be addressed by an appropriate increase in dermatologic care providers.

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	Deaths	Average Age at Death (years)	YPLL 75	
			Average	Total
All causes of death	2,596,993	73.2	7.9	20,391,598
Skin disease	22,953	68.2	10.8	248,656
Percentage	0.90%			1.20%

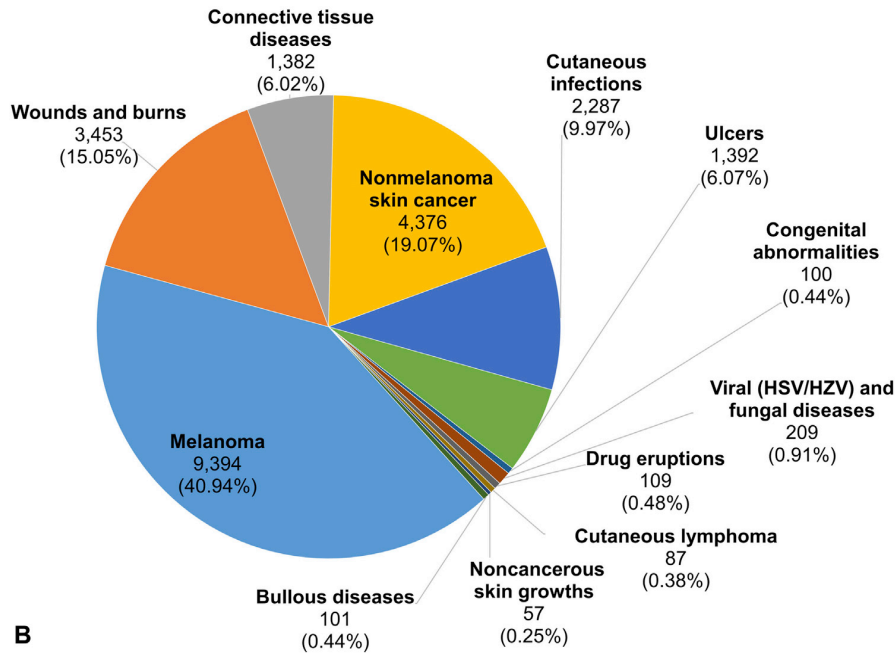


Fig 9. Impact of skin disease on 2013 US life expectancy. **A**, The left portion of the table shows the actual number and average age of deaths related to skin disease compared with all causes of death for 2013, whereas the right portion of the table indicates the average and total (aggregated) years of potential life lost (YPLL) as a result of skin disease and to all causes of death. **B**, The pie chart represents the totality of 2013 deaths related to skin disease in actual numbers and percentage (in parentheses) by skin disease category. *HSV*, Herpes simplex virus; *HZV*, herpes zoster virus.

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REFERENCES

1. Hay RJ, Johns NE, Williams HC, et al. The global burden of skin disease in 2010: an analysis of the prevalence and impact of skin conditions. *J Invest Dermatol*. 2014;134:1527-1534.
2. Segre JA. Epidermal barrier formation and recovery in skin disorders. *J Clin Invest*. 2006;116:1150-1158.
3. Lynch PJ. *Dermatology (House Officer Series)*. Philadelphia, PA: Williams & Wilkins; 1994.
4. Bickers DR, Lim HW, Margolis D, et al. The burden of skin diseases: 2004 a joint project of the American Academy of Dermatology Association and the Society for Investigative Dermatology. *J Am Acad Dermatol*. 2006;55:490-500.
5. American Academy of Dermatology/Milliman. Burden of skin disease. Available from: www.aad.org/BSD. 2016. Accessed August 19, 2016.
6. Young K, Rudowitz R, Rouhani S, Garfield R. Medicaid per enrollee spending: variation across states. Kaiser Family Foundation 2015. Available from: <http://kff.org/report-section/medicaid-per-enrollee-spending-appendices/>. Accessed March 29, 2016.
7. Coughlin TA, Holahan J, Caswell K, McGrath M. Uncompensated care for the uninsured in 2013: a detailed examination. Kaiser Family Foundation 2014. Available from: <http://kff.org/report-section/uncompensated-care-for-the-uninsured-in-2013-a-detailed-examination-the-cost-of-uncompensated-care/>. Accessed March 29, 2016.
8. US Department of Labor - Bureau of Labor Statistics. Employment, hours, and earnings from the current employment statistics survey (national). Available at: <https://www.bls.gov/ces/>. Accessed November 11, 2016.
9. Gardner JW, Sanborn JS. Years of potential life lost (YPLL)—what does it measure? *Epidemiology (Cambridge, Mass)*. 1990;1:322-329.
10. World Health Organization - Statistical Information System. Years of life lost (percentage of total). Available from: <http://www.who.int/whosis/whostat2006YearsOfLifeLostpdf>. 2006. Accessed November 7, 2016.
11. Wikipedia. Years of potential life lost. Available at: https://en.wikipedia.org/wiki/Years_of_potential_life_lost. Accessed December 18, 2016.
12. Milliman. Health cost guidelines - grouper. Available from: <http://usmilliman.com/Solutions/Products/Resources/Health-Cost-Guidelines/Health-Cost-Guidelines--Grouper/>. Accessed April 23, 2016.
13. Centers for Medicare & Medicaid Services. National health expenditure data: Historical: NHE Tables: Table 1. Available from <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NationalHealthAccountsHistorical.html>. Accessed May 23, 2016.
14. Bureau of Labor Statistics US Department of Labor. Employer-reported workplace injuries and illnesses - 2014. Available at: https://www.bls.gov/news.release/archives/osh_10292015.pdf. Accessed January 24, 2017.
15. Bureau of Labor Statistics US Department of Labor. Nonfatal occupational injuries and illnesses requiring days away from work, 2014. Available at: <http://www.bls.gov/news.release/pdf/osh2.pdf>. Accessed January 24, 2017.
16. Vinding GR, Knudsen KM, Ellervik C, Olesen AB, Jemec GBE. Self-reported skin morbidities and health-related quality of life: a population-based nested case-control study. *Dermatology (Basel, Switzerland)*. 2014;228:261-268.
17. Lindberg M, Isacson D, Binge K. Self-reported skin diseases, quality of life and medication use: a nationwide pharmaco-epidemiological survey in Sweden. *Acta dermatovenerologica*. 2014;94:188-191.
18. Brettertklieber A, Painsi C, Avian A, Wutte N, Aberer E. Impaired quality of life in patients with systemic sclerosis compared to the general population and chronic dermatoses. *BMC research notes*. 2014;7:594.
19. Wohl Y, Mashiah J, Kutz A, Hadj-Rabia S, Cohen AD. Pemphigus and depression comorbidity: a case control study. *Eur J Dermatol*. 2015;25:602-605.
20. Shi Q, Duvic M, Osei JS, et al. Health-related quality of life (HRQoL) in alopecia areata patients—a secondary analysis of the National Alopecia Areata Registry data. *J Invest Dermatol Symp Proc*. 2013;16:S49-S50.
21. Racine M, Hudson M, Baron M, Nielson WR. The impact of pain and itch on functioning and health-related quality of life in systemic sclerosis: an exploratory study. *J Pain Symptom Manage*. 2016;52:43-53.
22. Cvetkovski RS, Rothman KJ, Olsen J, et al. Relation between diagnoses on severity, sick leave and loss of job among patients with occupational hand eczema. *Br J Dermatol*. 2005;152:93-98.
23. Ongena K, Van Geel N, De Schepper S, Naeyaert JM. Effect of vitiligo on self-reported health-related quality of life. *Br J Dermatol*. 2005;152:1165-1172.
24. Demierre M-F, Gan S, Jones J, Miller DR. Significant impact of cutaneous T-cell lymphoma on patients' quality of life: results of a 2005 National Cutaneous Lymphoma Foundation Survey. *Cancer*. 2006;107:2504-2511.
25. Radtke MA, Schäfer I, Gajur A, Langenbruch A, Augustin M. Willingness-to-pay and quality of life in patients with vitiligo. *Br J Dermatol*. 2009;161:134-139.
26. Beikert FC, Langenbruch AK, Radtke MA, Augustin M. Willingness to pay and quality of life in patients with rosacea. *J Eur Acad Dermatol Venereol*. 2013;27:734-738.
27. Beikert FC, Langenbruch AK, Radtke MA, Kornek T, Purwins S, Augustin M. Willingness to pay and quality of life in patients with atopic dermatitis. *Arch Dermatol Res*. 2014;306:279-286.
28. Schmitt JM, Ford DE. Work limitations and productivity loss are associated with health-related quality of life but not with clinical severity in patients with psoriasis. *Dermatology (Basel, Switzerland)*. 2006;213:102-110.
29. Vietri J, Turner SJ, Tian H, Isherwood G, Balp M-M, Gabriel S. Effect of chronic urticaria on US patients: analysis of the National Health and Wellness Survey. *Ann Allergy Asthma Immunol*. 2015;115:306-311.
30. Halvorsen JA, Stern RS, Dalgard F, Thoresen M, Bjertness E, Lien L. Suicidal ideation, mental health problems, and social impairment are increased in adolescents with acne: a population-based study. *J Invest Dermatol*. 2011;131:363-370.
31. Sætterstrøm B, Olsen J, Johansen JD. Cost-of-illness of patients with contact dermatitis in Denmark. *Contact Dermatitis*. 2014;71:154-161.

32. Malinowski KP, Kawalec PP, Moćko P. Indirect costs of absenteeism due to rheumatoid arthritis, psoriasis, multiple sclerosis, insulin-dependent diabetes mellitus, and ulcerative colitis in 2012: a study based on real-life data from the Social Insurance Institution in Poland. *Expert Rev Pharmacoecon Outcomes Res.* 2016;16:295-303.
33. Yu SH, Attarian H, Zee P, Silverberg JL. Burden of sleep and fatigue in US adults with atopic dermatitis. *Dermatitis.* 2016; 27:50-58.
34. Kopyciok MER, Ständer HF, Osada N, Steinke S, Ständer S. Prevalence and characteristics of pruritus: a one-week cross-sectional study in a German dermatology practice. *Acta Derm Venereol.* 2016;96:50-55.
35. Fowler JF, Duh MS, Rovba L, et al. The impact of psoriasis on health care costs and patient work loss. *J Am Acad Dermatol.* 2008;59:772-780.
36. Allen H, Bunn WB, Naim AB. The self-reported health and productivity burden of autoimmune disorders at a major self-insured employer. *J Occup Environ Med.* 2012;54: 1049-1063.
37. Burzykowski T, Molenberghs G, Abeck D, et al. High prevalence of foot diseases in Europe: results of the Achilles Project. *Mycoses.* 2003;46:496-505.
38. Obama B. United States health care reform: progress to date and next steps. *JAMA.* 2016;316:525-532.
39. Arrowsmith J. A decade of change. *Nat Rev Drug Discov.* 2012;11:17-18.
40. Tensen E, van der Heijden JP, Jaspers MWM, Witkamp L. Two decades of teledermatology: current status and integration in national healthcare systems. *Curr Dermatol Rep.* 2016;5: 96-104.
41. Colby SL, Ortman JM. Projections of the size and composition of the US population: 2014 to 2060. Available at: <https://www.census.gov/content/dam/Census/library/publications/2015/demo/p25-1143.pdf>. Accessed January 24, 2017.
42. Barnes K, Thompson M, Judy R, Connolly C. Medical cost trend: behind the numbers 2015. Available at: <https://www.pwc.com/us/en/health-industries/top-health-industry-issues/assets/pwc-hri-medical-cost-trend-2015.pdf>. Accessed January 24, 2017.
43. American Diabetes Association. Economic costs of diabetes in the U.S. in 2012. *Diabetes Care.* 2013;36:1033-46.
44. Mensah GA, Brown DW. An overview of cardiovascular disease burden in the United States. *Health Affairs.* 2007;26: 38-48.
45. Thom T, Haase N, Rosamond W, et al. Heart disease and stroke statistics—2006 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. *Circulation.* 2006;113: e85-e151.
46. Helmick CG, Lee-Han H, Hirsch SC, Baird TL, Bartlett CL. Prevalence of psoriasis among adults in the US: 2003-2006 and 2009-2010 National Health and Nutrition Examination Surveys. *Am J Preventive Med.* 2014;47:37-45.
47. Lebwohl MG, Bachelez H, Barker J, et al. Patient perspectives in the management of psoriasis: results from the population-based Multinational Assessment of Psoriasis and Psoriatic Arthritis Survey. *J Am Acad Dermatol.* 2014;70:871-881.e30.
48. Silverberg NB. The epidemiology of vitiligo. *Curr Dermatol Rep.* 2015;4:36-43.
49. Whitton ME, Pinart M, Batchelor J, et al. Interventions for vitiligo. *The Cochrane database of systematic reviews.* 2015: CD003263.
50. Ortman JM, Velkoff VA, Hogan H; US Census Bureau. An aging nation: the older population in the United States. Available at: <http://www.census.gov/library/publications/2014/demo/p25-1140.html>. Accessed October 6, 2016.
51. Resneck J Jr, Kimball AB. The dermatology workforce shortage. *J Am Acad Dermatol.* 2004;50:50-54.
52. Kimball AB, Resneck JS Jr. The US dermatology workforce: a specialty remains in shortage. *J Am Acad Dermatol.* 2008;59: 741-745.
53. Craiglow BG, Resneck JS Jr, Lucky AW, et al. Pediatric dermatology workforce shortage: perspectives from academia. *J Am Acad Dermatol.* 2008;59:986-989.
54. Bahadori K, Doyle-Waters MM, Marra C, et al. Economic burden of asthma: a systematic review. *BMC Pulm Med.* 2009; 9:24.
55. Barnett SB, Nurmagambetov TA. Costs of asthma in the United States: 2002-2007. *J All Clin Immunol.* 2011;127: 145-152.
56. Heidenreich PA, Trogon JG, Khavjou OA, et al. Forecasting the future of cardiovascular disease in the United States. A policy statement from the American Heart Association. *Circulation.* 2011;123:933-944.
57. National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). Available at: <https://www.niddk.nih.gov/health-information/health-statistics/Pages/kidney-disease-statistics-united-states.aspx>. Accessed October 23, 2016.
58. Beggs S, Short J, Rengifo-Pardo M, Ehrlich A. Applications of the excimer laser: a review. *Dermatol Surg.* 2015;41:1201-1211.
59. Leong SP, Mihm MC Jr, Murphy GF, et al. Progression of cutaneous melanoma: implications for treatment. *Clin Exp Metastasis.* 2012;29:775-796.
60. Lens M. Current clinical overview of cutaneous melanoma. *Br J Nursing (Mark Allen Publishing).* 2008;17:300-305.
61. Goldenberg G, Lanoue J, Dong J. New oral therapies for psoriasis: a comprehensive review. *J Clin Aesthet Dermatol.* 2016;9:25-28.
62. Strohal R, Prinz JC, Girolomoni G, Nast A. A patient-centered approach to biological treatment decision making for psoriasis: an expert consensus. *J Eur Acad Dermatol Venereol.* 2015;29:2390-2398.
63. Ahmed A, Leon A, Butler DC, Reichenberg J. Quality-of-life effects of common dermatological diseases. *Semin Cutan Med Surg.* 2013;32:101-109.
64. Chamlin SL, Chren M-M. Quality-of-life outcomes and measurement in childhood atopic dermatitis. *Immunol Allergy Clin North Am.* 2010;30:281-288.
65. Whiteley J, Emir B, Seitzman R, Makinson G. The burden of atopic dermatitis in US adults: results from the 2013 National Health and Wellness Survey. *Curr Med Res Opin.* 2016;21:1-7.

Supplemental Table I. Top-100 drug list

No.	Generic name	Skin
1	ACITRETIN	86.6%
2	ACYCLOVIR	14.2%
3	ADALIMUMAB	10.5%
4	ALCLOMETASONE DIPROPIONATE	94.8%
5	AMCINONIDE	90.0%
6	AMMONIUM LACTATE	89.3%
7	AZELAIC ACID	99.0%
8	AZITHROMYCIN	1.2%
9	BETAMETHASONE DIPROPIONATE	72.0%
10	BETAMETHASONE VALERATE	79.1%
11	BETAMETHASONE/PROPYLENE GLYC*	87.3%
12	BEXAROTENE	60.6%
13	C1 ESTERASE INHIBITOR	1.2%
14	CALCIPOTRIENE	76.3%
15	CALCIPOTRIENE/BETAMETHASONE*	94.6%
16	CALCITRIOL	3.1%
17	CEPHALEXIN	31.1%
18	CICLOPIROX	95.2%
19	CICLOPIROX OLAMINE	96.2%
20	CLINDAMYCIN PHOS/BENZOYL PEROX*	88.5%
21	CLINDAMYCIN PHOSPHATE	93.0%
22	CLOBETASOL PROPIONATE	92.8%
23	CLOBETASOL PROPIONATE/EMOLL*	93.6%
24	CLOTRIMAZOLE	47.6%
25	CLOTRIMAZOLE/BETAMETHASONE DIP*	29.7%
26	CYCLOSPORINE, MODIFIED	5.2%
27	DAPSONE	49.7%
28	DESONIDE	94.8%
29	DESOXIMETASONE	88.7%
30	DICLOFENAC SODIUM	14.7%
31	DIFLORASONE DIACETATE	86.1%
32	DOXEPIN HCL	8.1%
33	DOXYCYCLINE HYCLATE	43.2%
34	DOXYCYCLINE MONOHYDRATE	81.4%
35	ECONAZOLE NITRATE	96.2%
36	ERYTHROMYCIN BASE	2.8%
37	ETANERCEPT	11.1%
38	FAMCICLOVIR	15.4%
39	FLUCONAZOLE	10.4%
40	FLUOCINOLONE ACETONIDE	79.5%
41	FLUOCINOLONE/SHOWER CAP*	97.1%
42	FLUOCINONIDE	91.6%
43	FLUOCINONIDE/EMOLLIENT BASE*	92.8%
44	FLUOROURACIL	98.1%
45	FLURANDRENOLIDE	93.9%
46	FLUTICASONE PROPIONATE	1.6%
47	FLUTICASONE/SALMETEROL	0.1%
48	GABAPENTIN	2.1%
49	GENTAMICIN SULFATE	40.9%
50	HALCINONIDE	94.7%
51	HALOBETASOL PROPIONATE	94.7%
52	HYDROCODONE/ACETAMINOPHEN	1.9%
53	HYDROCORTISONE	19.8%
54	HYDROCORTISONE BUTYRATE	95.2%
55	HYDROCORTISONE BUTYRATE/EMOLL*	100.0%

Supplemental Table I. Cont'd

No.	Generic name	Skin
56	HYDROCORTISONE VALERATE	92.2%
57	HYDROXYCHLOROQUINE SULFATE	1.5%
58	HYDROXYZINE HCL	24.9%
59	IMIQUIMOD	96.3%
60	IMMUNE GLOB,GAM CAPRYLATE(IGG)	2.3%
61	IMMUNE GLOBULIN,GAMMA(IGG)	2.0%
62	INFLIXIMAB	1.1%
63	INGENOL MEBUTATE	99.1%
64	INTERFERON ALFA-2B,RECOMB.	13.8%
65	INTERFERON GAMMA-1B,RECOMB.	11.8%
66	ISOTRETINOIN	68.9%
67	KETOCONAZOLE	86.0%
68	LEVOCETIRIZINE DIHYDROCHLORIDE	7.9%
69	LIDOCAINE	2.5%
70	METHOTREXATE SODIUM	3.5%
71	METHOXSALEN, RAPID	100.0%
72	METRONIDAZOLE	88.7%
73	MINOCYCLINE HCL	66.2%
74	MOMETASONE FUROATE	2.6%
75	MUPIROCIN	63.9%
76	MUPIROCIN CALCIUM	50.2%
77	MYCOPHENOLATE MOFETIL	5.2%
78	NAFTIFINE HCL	86.2%
79	NYSTATIN	24.1%
80	NYSTATIN/TRIAMCIN	35.0%
81	OXICONAZOLE NITRATE	93.8%
82	PERMETHRIN	56.9%
83	PIMECROLIMUS	90.0%
84	PREDNISONE	2.3%
85	SELENIUM SULFIDE	85.0%
86	SILVER SULFADIAZINE	32.0%
87	SPIRONOLACTONE	2.6%
88	SULFACETAMIDE SODIUM	66.4%
89	SULFAMETHOXAZOLE/TRIMETHOPRIM	8.7%
90	TACROLIMUS	10.1%
91	TAZAROTENE	87.3%
92	TERBINAFINE HCL	92.0%
93	THALIDOMIDE	1.8%
94	TRETINOIN	66.8%
95	TRIAMCINOLONE ACETONIDE	61.5%
96	USTEKINUMAB	97.7%
97	VALACYCLOVIR HCL	29.6%
98	VISMODEGIB	63.2%
99	VORINOSTAT	47.9%
100	ZOSTER VACCINE LIVE/PF	0.8%

EMOLL, Emollient; GLOB, globulin; GLYC, glycol; HCL, hydrochloride; IGG, immunoglobulin gamma; PEROX, peroxide; PF, preservative free; PHOS, phosphate; RECOMB, recombinant; TRIAMCIN, triamcinolone.

*Topical dermatologic drug; therefore 100% skin.

Continued

Supplemental Table II. Over-the-counter products

Category name	Subcategory name
BABY NEEDS	BABY OINTMENTS/CREAMS
COSMETICS - LIP	LIP TREATMENT
COSMETICS - NAIL	NAIL TREATMENT
FIRST AID TREATMENT	ANTI ITCH TREATMENTS (INC CALAMINE)
FIRST AID TREATMENT	FIRST AID OINTMENTS/ANTISEPTICS
FIRST AID TREATMENT	INSECT FIRST AID PRODUCTS
FOOT CARE PRODUCTS	ATHLETES FOOT MEDICATION
HAIR GROWTH PRODUCTS	HAIR GROWTH PRODUCTS
HAND and BODY LOTION	HAND and BODY LOTION
LIP TREATMENT	COLD SORE MEDICATION
LIP TREATMENT	LIP BALM/TREATMENT
OTHER HEALTH REMEDIES	SKIN GROWTH REMOVER SOLUTIONS
SHAMPOO	DANDRUFF SHAMPOO
SKIN CARE	ACNE TREATMENTS
SKIN CARE	BODY ANTIAGING
SKIN CARE	DEPILATORIES
SKIN CARE	FACIAL ANTIAGING
SKIN CARE	FACIAL CLEANSERS
SKIN CARE	FACIAL MOISTURIZERS
SKIN CARE	FADE/BLEACH
SUNTAN PRODUCTS	SUNSCREEN/INSECT REPELLENT
SUNTAN PRODUCTS	SUNTAN LOTION and OIL