

## FROM THE ACADEMY

# A risk adjustment approach to estimating the burden of skin disease in the United States

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Direct insurance claims tabulation and risk adjustment statistical methods can be used to estimate health care costs associated with various diseases. In this third manuscript derived from the new national Burden of Skin Disease Report from the American Academy of Dermatology, a risk adjustment method that was based on modeling the average annual costs of individuals with or without specific diseases, and specifically tailored for 24 skin disease categories, was used to estimate the economic burden of skin disease. The results were compared with the claims tabulation method used in the first 2 parts of this project. The risk adjustment method estimated the direct health care costs of skin diseases to be \$46 billion in 2013, approximately \$15 billion less than estimates using claims tabulation. For individual skin diseases, the risk adjustment cost estimates ranged from 11% to 297% of those obtained using claims tabulation for the 10 most costly skin disease categories. Although either method may be used for purposes of estimating the costs of skin disease, the choice of method will affect the end result. These findings serve as an important reference for future discussions about the method chosen in health care payment models to estimate both the cost of skin disease and the potential cost impact of care changes. (J Am Acad Dermatol <https://doi.org/10.1016/j.jaad.2017.08.060>.)

**Key words:** burden; claims; dermatology; direct cost; health care economics; incremental cost; insurer; marginal cost; medical cost; risk adjustment; payment model; prescription cost; prescription drug.

In the United States, skin diseases vary greatly in their prevalence and health care costs, as shown in 2 published papers that included data from the recent Burden of Skin Diseases (BSD) Report<sup>1</sup> produced by the American Academy of Dermatology (AAD), in which costs were estimated using a claims tabulation method.<sup>2,3</sup> The 2013 total cost of skin disease was \$75 billion, of which approximately \$61 billion corresponded to medical and prescription drug costs.<sup>4,5</sup>

#### Abbreviations used:

AAD: American Academy of Dermatology  
 BSD: burden of skin disease

There are 2 commonly used methods for estimating costs of disease: claims tabulation and risk adjustment. The claims tabulation method involves analyzing millions of medical claims for various cost attributes

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associated with a specific disease, and risk adjustment is an actuarial approach using statistical, predictive modeling techniques to determine whether patient characteristics (both demographic and clinical) are associated with higher utilization of health care services.<sup>4-7</sup> Risk adjustment is also used to estimate the incremental (or marginal) cost for medical conditions relative to the base cost for individuals with no medical conditions.<sup>8</sup> As with any other predictive statistical tool, risk adjustment produces an estimate, an estimate that might sometimes be counterintuitive.<sup>9-11</sup> For example, if people with a particular disease are otherwise in good health, it is possible that those with the disease could be associated with lower average per capita costs than those without the disease. This does not mean that the disease has no associated absolute costs; rather, the disease is associated with lower relative costs on average for a large population. If the results of studies estimating the national cost of skin disease are used to inform payment rates for either health plans or provider groups (eg, health insurance companies adjusting premium payments for patients with a given skin disease), the choice of method could substantially affect whether payments made to a health plan or provider organization under a given payment arrangement will be considered adequate.<sup>9,12,13</sup>

In this third manuscript, cost estimates made by using a novel risk adjustment methodology designed to concurrently estimate the total direct, per-disease, per-person, and incremental costs of 24 skin disease categories are presented. The estimates made by using this statistical approach are compared with those estimated previously by claims tabulation.

## METHODS

In 2014, the AAD appointed a BSD Work Group\* to develop a current BSD Report.<sup>1</sup> Milliman (New York, NY) was selected to work with the BSD

Work Group. Milliman conducted the analyses reported here, using a novel risk adjustment method. The definitions for skin disease categories, population data, prevalence measurement methodology, exclusion and inclusion criteria for diagnosis codes for certain claims, and health care costs are the same as those described in the first 2 manuscripts of this series.<sup>2,3</sup> The detailed methodology can be found in the full report.<sup>1</sup>

## CAPSULE SUMMARY

- Risk adjustment and claims tabulation methods can be used for cost modeling purposes, but the choice of method will affect the end result.
- Medical costs for skin disease estimated by risk adjustment were approximately \$46 billion in 2013, 24% lower than those estimated by claims tabulation.
- Ulcers, noncancerous skin growths, psoriasis, acne, nonmelanoma skin cancer, and wounds and burns, were among the most costly skin diseases when using risk adjustment for estimating cost, and represent 74% of total skin disease costs.

## Databases used

The data sources, disease prevalences, and health care cost definitions as in the 2 previous manuscripts and full report are the same as previously described.<sup>1-3</sup> The following databases were used: Truven Health Analytics MarketScan Commercial Database for commercial populations, Medicare 5% Sample and Milliman Medicare Part D Claims Database for total costs for Medicare, Milliman Consolidated Health Cost Guidelines Sources

Database for allocation of costs by service category, the Kaiser Family Foundation Report for total costs for Medicaid, and the Kaiser Family Foundation Report for total costs for the uninsured population.

## Modified, single-level Clinical Classifications Software

A single-level Clinical Classifications Software (CCS),<sup>14</sup> a classifications system developed by the Healthcare Cost and Utilization Project under the sponsorship of the Agency for Healthcare Research and Quality, was modified to identify the 24 skin disease categories of interest, as explained in the BSD Report.<sup>1</sup>

## Risk adjustment flags

For each individual in the analysis data sets, a flag (a variable representing either present or absent) indicating the presence of each modified CCS disease category was assigned. A present flag was added if the individual had at least 1 health insurance claim in 2013 with a diagnosis code (any position) assigned to the category. Another flag was set for each age band and sex combination (eg, age 0-17 years and female). The flags and the costs by type of service were the inputs to the risk adjustment calculations.

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