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# An Insight into the Global Burden of Skin Diseases

Loes M. Hollestein<sup>1</sup> and Tamar Nijsten<sup>1</sup>

The skin conditions expert group of the Global Burden of Disease 2010 study estimated the global burden of skin conditions worldwide. Health loss due to 15 skin diseases between 1990 and 2010 for 187 countries was quantified. All skin conditions combined were the fourth leading cause of non-fatal disease burden at the global level. The burden of skin conditions was high in both high- and low-income countries, indicating that prevention of skin diseases should be prioritized.

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## The Global Burden of Disease (GBD) 2010 study

The results of the Global Burden of Disease 2010 (GBD 2010) study, a collaborative effort by 486 scientist from 50 countries, have been published in the *Lancet* in December 2012. The goal of the GBD 2010 study is to provide an evidence-based assessment and ranking of people's health problems around the world. The GBD estimates are important for developing population health policies, health care planning and allocation of research funding. The challenge in this effort is to agree upon a common denominator that allows for comparisons between diseases. The impact of a disease on the patient and societal level is a combination of its prevalence, its morbidity and mortality, the impact on patient's lives, available treatments and associated costs. To compare health loss across different diseases the Disability Adjusted Life Year (DALY) was developed. This measure describes the fatal as well as the non-fatal health loss (i.e., Years of Life lived with Disability (YLD) + Years of Life Lost (YLL))(Table 1). For the DALY calculation, the disability weights for each disease needs to be assessed. The GBD 2010 study identified 1160 sequelae of 289 diseases and injuries, which were subsequently reduced to 220 unique health states. People from

the general population were asked to compare brief lay descriptions of these

health states, from which new disability weights were calculated (Murray *et al.*, 2012). In this issue of the *Journal of Investigative Dermatology*, an expert group focused on the global burden of skin conditions (Hay *et al.*, 2014).

## Global burden of skin conditions

The methodology to answer a relatively simple question "what is the global burden of a specific skin disease" is highly complex (Figure 1). First, a systematic review to collect epidemiological data on 15 common skin diseases was performed. To harmonize discordant data and fill in possible gaps, DISMOD-MR was used to provide estimates of prevalence and mortality worldwide for all skin conditions.

**Table 1. Abbreviations and descriptions of concepts used in the Global Burden of Disease 2010 study (Salomon *et al.*, 2012)**

Abbreviation	Concept	Description
	Disability	Disability refers to any short-term or long-term health loss.
	Sequelae	In the GBD 2010 list, there are 291 diseases and injuries, of which 289 cause disability. In total, 1,160 sequelae of these diseases and injuries have been identified. Example: viral warts is a sequela of viral skin diseases.
	Health state	Across the 1,160 sequelae, 220 unique health states have been identified. The list of unique health states serves two purposes: to allow assessment of the total burden of some health states such as disfigurement across various causes and to simplify the task of measuring disability weights for sequelae. Example: disfigurement level 1 with itch/pain is an unique health state, which can be a consequence of eczema, psoriasis, and cellulitis, as well as urticaria.
	Disability weight	A quantification of the severity of health loss associated with the 220 health states on a scale from 0 to 1, where 0 represents perfect health and 1 represents death. Example: the health state "disfigurement level 1" has the disability weight 0.013. Interpretation: on average, society prefers a person to live 3 years with disfigurement level 1 ( $3 \text{ years} \times 0.013 = 0.039$ ) than 1 year with disfigurement level 3 ( $1 \text{ year} \times 0.398 = 0.398$ ).
YLD	Years of life lived with disability	Non-fatal health loss: YLD represents the years of life lived in less than ideal health. Calculation: number of prevalent cases $\times$ disability weight $\times$ average duration of the disease until remission or death.
YLL	Years of life lost	Fatal health loss: YLL represents the lost life years in a population, because of premature mortality. Calculation: number of deaths $\times$ standard life expectancy at age of death in years.
DALY	Disability adjusted life years	One DALY can be interpreted as the loss of one year of life lived in full health. Calculation: YLD + YLL.

<sup>1</sup>Department of Dermatology, Erasmus MC University Medical Center, Rotterdam, The Netherlands

Correspondence: Tamar Nijsten, Erasmus MC University Medical Center, Department of Dermatology, PO Box 2040, Rotterdam 3000 CA, The Netherlands. E-mail: [t.nijsten@erasmusmc.nl](mailto:t.nijsten@erasmusmc.nl)

## Clinical Implications

- Skin conditions put a large burden on health care systems worldwide.
- Prevention of skin conditions should be prioritized.
- Highly prevalent skin conditions with a small individual burden may lead to a high burden on a population level.

The findings confirmed the importance of dermatology on a regional and a global level. Fungal diseases, acne vulgaris and other skin diseases combined were in the top-10 of most prevalent diseases. All skin conditions combined were fourth leading cause of non-fatal disease burden on a global level. Other key findings were that skin infections accounted for a large proportion of YLD in tropical and resource-poor regions, whereas eczema accounted for a large part of YLD in all regions. Across age groups, eczema put a heavy burden on children, acne on teenagers and a mix of eczema,

ulceration, non-melanoma skin cancer (NMSC), infections and pruritus on the elderly.

### Selection of 15 common skin conditions

The selection of skin conditions reflects the prevalence, the case definition and the availability of the data. This list may be more in line with skin diseases treated by general practitioners (GP) than the daily practice of most dermatologists (especially in countries where the GP is the first point of medical contact for persons with skin conditions). Some of the frequently seen conditions in dermatological practices such

as melanoma, benign skin tumors, and varicose veins and its complications are missing, because they have been classified elsewhere in the GBD 2010 study. For example, 13% of all visits to a dermatologist in the Netherlands is related to varicose veins and 7% to benign skin tumors (De Vries, 2013). In the United Kingdom, approximately one third of all GP consults related to skin conditions were classified elsewhere in the International Classification of Disease (ICD)-9 (rather than chapter 12 “Diseases of the skin and subcutaneous tissue”), indicating that these missing skin conditions in the current analyses lead to a substantial underestimation of the true burden attributable to skin conditions (Schofield *et al.*, 2011).

The category “other skin diseases” included skin conditions which are less frequent or lacked data availability. This combination category also includes skin conditions with high individual burden,

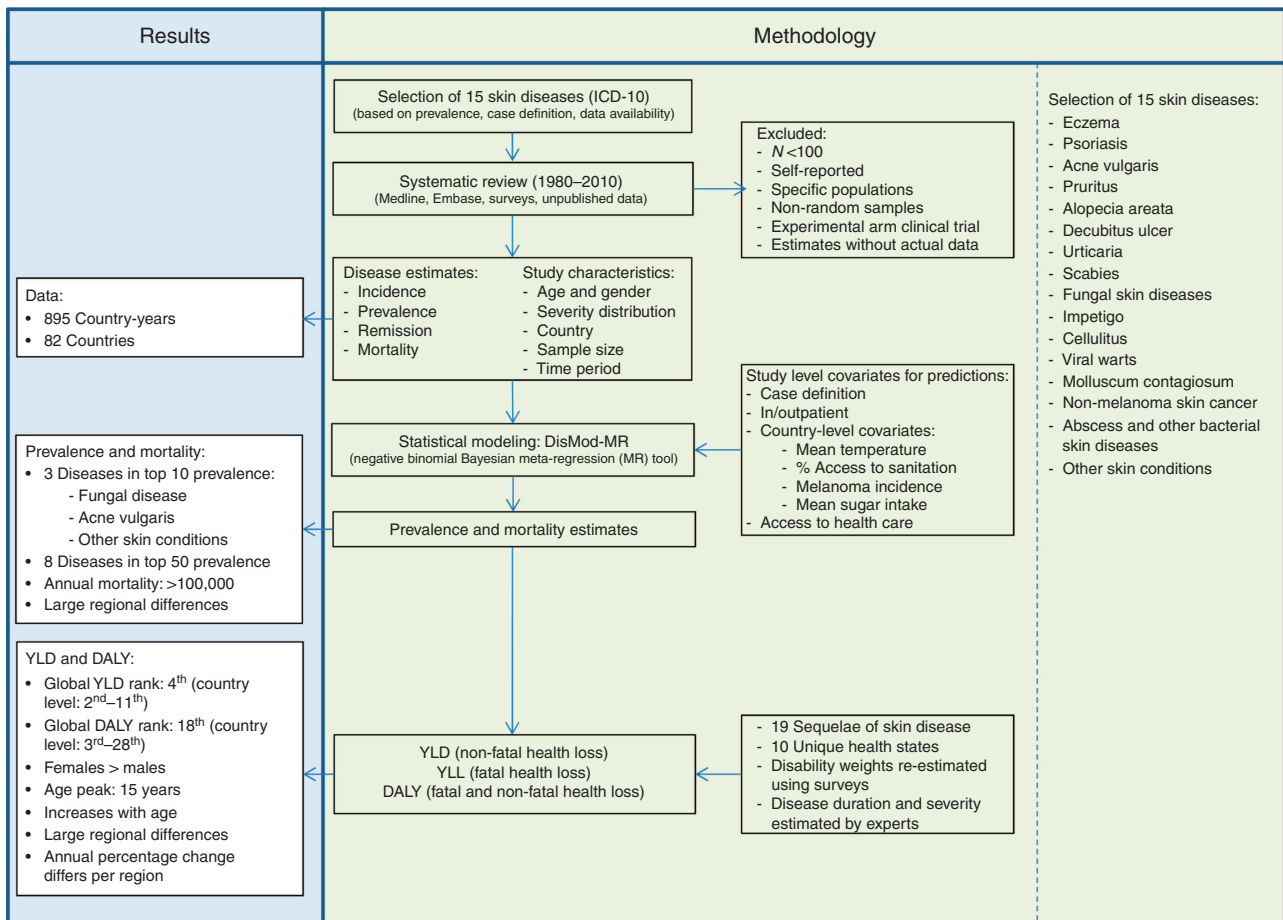


Figure 1. Methodology and Results of the Global Burden of Skin Disease Study 2010. DALY, disability adjusted life years; ICD, International Classification of Diseases; N, number; YLD, years of life lived with disability; YLL, years of life lost.

such as bulleous diseases, connective tissue diseases and severe cutaneous drug reactions. This category was assigned the health state “disfigurement level 1,” which has the disability weight 0.013 indicating that the true loss of YLD in the population is even higher.

### Functional health loss and psychological impact of skin conditions

In the GBD 2010 study, the disability weights of the 220 unique health states were re-estimated using face-to-face or telephone surveys among 13,000 individuals in five different countries and an open-access web-based survey among 16,000 individuals (Salomon *et al.*, 2012). This is a huge improvement compared to the previous “one size, fits all” disability weight of 0.056, which was estimated by a small panel of health experts (World Health Organization, 2004). In the GBD 2010 study, seven different weights (ranging from 0.013 to 0.562, excluding skin cancer), which were depend on disease severity, were included. The current disability weights quantify functional health loss to make a clear distinction between health and wellbeing. Although this approach was chosen to explicitly quantify health loss rather than welfare loss, the exclusion of the psychological burden leads to an underestimation of the true non-fatal burden in the population. This underestimation is especially true for skin conditions because the psychological burden of skin diseases can be substantial (Ahmed *et al.*, 2013). Also, the reduction of 1,160 sequelae to 220 unique health states was needed to for feasibility reasons, but may have led to an oversimplification. For example, melanoma and NMSC were assigned the same disability weights as well as all other cancers, while the psychological impact is likely to be very different.

### Individual burden versus population burden

The estimation of the YLD of a disease depends on the prevalence and the severity of a disease. Many of the selected skin conditions have a relatively mild impact on patient’s lives in the majority of all patients, such as eczema and acne vulgaris. However, due to the

very high prevalence of these skin diseases, the burden (YLD) on a population level is enormous. From a public health perspective, these diseases are of interest because they represent a high YLD, but many clinicians may argue that a focus on disease with a higher individual disease burden, but low YLD, require more attention (e.g., bulleous diseases, connective tissue diseases and severe cutaneous drug reactions). This potential conflict between population and individual perspective, and thus prioritization, is in line with what is often seen in cost-effectiveness evaluations of health care interventions. As a society we should answer the question if we would we like to treat many people who can cope with their skin condition or if we would like to treat a small number of people who experience a high disability due to their skin disease?

### Conclusion

What physicians who treat patients with skin diseases have known for a long time (i.e., “you hardly ever die from a skin disease, but it can be truly bothersome”) has now been empirically confirmed: skin diseases are an important cause of health loss on a global level. The findings of this beautiful study stimulates

researchers to further assess and refine the specific impact of skin diseases in order to monitor (reductions) of health loss due to skin conditions in the future.

### CONFLICT OF INTEREST

The authors state no conflict of interest.

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## 22 Again: IL-22 as a Risk Gene and Important Mediator in Psoriasis

Andrew Johnston<sup>1</sup> and Johann E. Gudjonsson<sup>1</sup>

**IL-22 targets our external epithelial barriers, bolstering our defenses, and has long been implicated in the pathogenesis of psoriasis. Nikamo and colleagues (2014) identify a haplotype in the *IL22* promoter with a strong association to juvenile-onset psoriasis and demonstrate that this risk variant is associated with increased IL-22 production by T cells. We explore the implications of this work.**

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IL-22 is a cytokine that targets our external epithelial barriers such as those of the lungs, gastrointestinal (GI) tract, and the skin, bolstering our defenses against external insults. Moreover, IL-22 has long been implicated in the

<sup>1</sup>Department of Dermatology, University of Michigan, Ann Arbor, Michigan, USA

Correspondence: Johann E. Gudjonsson, Department of Dermatology, University of Michigan, 6427C Medical Sciences I, 1301 E. Catherine Street, Ann Arbor, Michigan 48109-5609, USA.  
E-mail: [johanng@med.umich.edu](mailto:johanng@med.umich.edu)