Jamin Kim

# *FACT OR FICTION?*
## "Skin diseases are the fourth largest cause of disability worldwide"

Skin diseases represent a much larger burden of disease than commonly believed in wider society. The Global Burden of Disease (GBD) project found that skin diseases were the fourth leading cause of disability worldwide in 2010 and 2013.[1] The GBD project remains the main source of global disease burden estimates, and accordingly, the results are used to establish research priorities, set health policies, monitor international health goals, and more. The accuracy of their findings is therefore paramount to achieving equity in global health, especially in terms of appropriate resource allocation. To discuss the veracity of the statement: "Skin diseases are the fourth largest cause of disability worldwide," we will first explore the concept of disability in the context of skin disease, discuss how disability should most accurately be measured, and finally, analyse how the GBD study came to this conclusion in order to explore the validity and implications of such a finding.

Firstly, what is disability? According to WHO, a disability is "Any condition of the body or mind that makes it more difficult for a person to do certain activities and/or interact with the world around them,"[2] i.e. an impairment leading to activity limitation and/or participation restriction. This leads on to the next question, how do skin diseases cause disability? For common skin conditions, the basic answers such as itch, pain, and embarrassment, are of course - obvious - but the multi-dimensional aspect as well as immense magnitude of impact is perhaps less well appreciated. The myriad effects span across physical, psychological, social, and financial domains of life, all to differing extents depending on the patient and the disease. In particular, the highly visible nature of the majority of skin diseases contributes significantly to social and emotional difficulties, often in forms of embarrassment, social withdrawal, and fear of rejection based on public misunderstanding. Bearing this in mind, the prevalence of mental illnesses (mainly depression and anxiety) was found to range between 25-43% across dermatologic patients.[3]

But mental illness is only one of many ways in which skin disease contributes to disability so how should the overall level of disability be measured? There is no perfect methodology, especially in the context of a global study as will be discussed later, but some methods may confer greater accuracy and representation than others. Disability is a subjective phenomenon, so one way to measure it may be through measuring one's perceived quality of life (QoL), as it is directly influenced by the 3 constituents of disability (impairment, activity limitation, and participation restriction). Although the countless adverse effects of skin conditions on physical and mental health are relatively well known; how these diverse manifestations culminate to truly alter one's overall quality of life is still a matter of great interest. A study in 1999 investigating the health-related QoL in 317 psoriasis patients found that their levels of reduction in physical and mental wellbeing were comparable to that of depression, diabetes, hypertension, heart disease, arthritis, and cancer patients.[4] Moreover, these severely negative effects on QoL are not a phenomenon exclusively observed in adults; a 2006 study found that the health-related QoL impairment caused by chronic skin disease in children was at least equal to that experienced by children with other chronic diseases.[5] This demonstrates that although a large majority of skin

diseases may not be as physically harmful as other conditions such as diabetes, they affect QoL just as much - if not more - and are therefore comparably disabling. Another factor which complicates measuring disability for skin diseases, is that skin diseases do not always follow a predictable correlation pattern in terms of the clinical severity of disease and expected QoL. For example, clinical severity of acne (as rated by dermatologists) was not found to correlate with patients' levels of distress and perceived severity, reflecting the high level of psychosocial distress that conditions such as acne are known to afflict.[6] In contrast, diseases that directly impact physical ability or other easily measurable domains tend to have severity levels which have greater correlation with that of patient perception.[6] This shows that gathering of mere clinical data is less reliable for determining QoL or level of true disability for skin diseases.

The veracity of the statement "Skin diseases are the fourth largest cause of disability worldwide" may now be explored by examining the study that led to this conclusion. The GBD project is funded by the Bill and Melinda Gates Foundation and involves hundreds of scientists worldwide who collaborate to systematically define the epidemiology of a variety of conditions including diseases, injuries, and risk factors. In the context of skin diseases, data were gathered from over 4000 sources including systematic literature reviews, hospital data, surveys, and more. A Bayesian meta-regression tool was then used to analyse the extracted data and form estimates around morbidity and mortality. Disability was measured using Disability-Adjusted Life Years (DALYs) and Years Lost to Disability (YLDs) which were calculated using GBD disability weights to represent the disability attributable to each disease and thus determine overall non-fatal disease burden. The study was an extremely comprehensive and valuable measure of global population health, however, the finding that skin diseases are the fourth largest cause of disability worldwide, may, in fact be an underestimation of the global burden of skin disease.

Firstly, underreporting of skin conditions is a major contributing factor to global disease burden underestimation. One example is a 2016 cross-sectional study at Munich Oktoberfest which randomly screened attending individuals for skin abnormalities and found 64.5% (1662/2701) of participants had at least 1 skin abnormality, with the top 3 most common abnormalities being actinic keratoses, rosacea, and eczema.[7] Almost ⅔ of those affected were unaware of their abnormal skin findings. While this study would have been prone to some selection bias, it demonstrates the extraordinary point prevalence of skin disease within an unreferred population. Although it is safe to say all diseases are underreported to some extent, skin conditions are likely to have a comparatively higher rate of underreporting due to a multitude of factors. Many high-risk groups for certain dermatologic conditions (e.g. outdoor workers for actinic keratoses or melanoma) are less likely to undergo skin examinations.[8] Also, many skin conditions such as acne are often self-treated without patients seeking out medical care, and this means studies relying on secondary data to determine prevalence of skin conditions (such as the GBD study) will underestimate the true burden of disease.

Another contributing factor to underestimation in the GBD study is the fact that the ICD classification system was used to categorize diseases in a mutually exclusive manner. This led to some dermatological conditions being wholly classed under other disease headings, for example, melanoma was classed under "cancer" only. Similarly, the burden of lupus

erythematosus was confined to the musculoskeletal disease category as were the cutaneous manifestations of multiple other systemic diseases.[9] Also, due to the overwhelming number and complex nature of skin diseases, the study (reasonably) focused on the more common conditions, however, this meant that some diseases that were rare but had significant individual disease burden e.g. bullous diseases, were excluded.

Next, it is worth examining how the use of DALYs to represent disease burden/disability contrasts with the earlier discussion involving the ideal methodologies and nuances of measuring such complexity in the context of skin disease. DALYs are calculated using Years Lost to Disability (YLDs) + Years of Life Lost (YLLs). The calculation of YLDs involves using a numerical representation of disability called a "disability weight" which is determined using public opinion through methods such as surveys, thus enabling standardization and cross-comparison of different disease states. The GBD study determined their disability weights by showing respondents 2 individuals in 2 different illness states and asking whom they considered "healthier". The disability weights were intended to estimate mere functional loss of health with a disclaimer that they were not intended to quantify loss of QoL or wellbeing. Although this was intentionally done to standardize and simplify the data, it would have led to a greater underestimation of disability attributable to skin disease compared to other diseases because of the disproportionately high psychosocial burden that skin diseases carry.[10] This biased flaw has led some to argue that disability weights should be ascertained in terms of undesirability, or value of the health loss (which may better represent the concept of disability), as opposed to judging the degree of health loss itself.[11] However, one can appreciate that something as broad and subjective as overall wellbeing is very difficult to encompass in a survey that aims for standardization. But ultimately, the DALY fails to capture the true extent of disability, moreso in the context of skin diseases than other diseases, because of these disability weights.

In short, while it is clear the burden of skin disease was underestimated in the GBD study, it is unclear what the cumulative effect these factors have had on the extent of underestimation, and whether a more accurate measurement would allow it to surpass any of the reigning causes of disability. Nonetheless, the fact that skin diseases were still found to be the fourth largest cause of disability worldwide in spite of these factors demonstrates the truly impressive magnitude of their burden. However, they receive comparably little attention in global health; there is a significant need for development of novel treatment and prevention strategies, along with more standardised best-practice guidelines to optimise the ability of health professionals to treat such conditions. In addition, it is important to consider the variation in distribution of different skin disease burdens according to factors such as geographical location and economic status of a country/region. Naturally, the burden was found to be enormous across both high and low income countries but there was significant geographic and age-related variation - more studies should be performed to ascertain the dermatologic needs of different populations/communities to ensure targeted and equitable resource allocation.

So, is it possible to measure global skin disease burden in a way that is more accurate than the GBD project but still feasible? An exciting research initiative arose in 2018 named Global Research on the Impact of Dermatological Diseases (GRIDD) which aims to do just this.[12] In

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short, GRIDD is developing a new methodology called Global Research of Impact on Patients (GRIP) which proposes a novel way of measuring skin disease burden using questions co-designed with patients internationally. This will address some of the limitations in the GBD study, including the use of DALYs as a flawed measurement for skin disease, and will hopefully accurately capture the true extent of illness burden. The study is still in its early phases but holds much promise for global future health studies in this area.

The substantial contribution of skin conditions to the overall global burden of disease is continuing to become more recognised within the health sector as well as wider society. The true contribution has yet to be elucidated but the GRIDD is an exciting development that may accelerate this change in how skin conditions are perceived in the context of global health. The GBD study's finding that "Skin diseases are the fourth largest cause of disability worldwide" may be an oversimplified, rough estimate at best, but it has successfully cast the spotlight on skin disease by contextualizing its impact with that of other chronic and disabling diseases, demonstrating it to be a significant source of loss of healthy life. The next step is to use this information to propel further public health research and explore innovative ways to reduce this disease burden through prevention, accurate diagnosis, and effective treatment.

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