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Commentary

Comparing burden of dermatologic disease to search interest on google trends

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Abstract

Google Trends is a publicly available resource for comparing Internet search query frequency and trends interest in queries over time. The tool provides country, region, and city-specific data for term search volume on Google Search. Our study sought to compare the relative search interest to the burden of disease for the fifteen skin conditions studied by the Global Burden of Disease (GBD) 2010 project. Searches on Google Trends were conducted by using the most inclusive terms and true ICD code definitions as possible for the skin conditions studied. We report that relative interest on Google Trends did largely correlate to burden of disease reported by the GBD 2010 study, though some conditions were either underrepresented or overrepresented. Acne and herpes were the most Googled skin disease terms. This study provides further insight into what may be the most burdensome skin diseases because those with more burdensome diseases likely sought out information on their condition.

Keywords: dermatology, global burden of disease, skin disease, Google Trends, Internet

Introduction:

The Global Burden of Disease (GBD) 2010 project estimated mortality, morbidity, and risk factors for 291 diseases and injuries in 187 countries from 1990 to 2010 and has been well described in prior studies [1, 2, 3]. The GBD database has been used to compare the most burdensome skin diseases based on disability-adjusted life years (DALYs) estimates with representation in the Cochrane Database of Systematic Reviews (CDSR) and the National Institute of Arthritis, Musculoskeletal, and Skin Diseases [4, 5]. This allows a glimpse into factors affecting the complex priority setting process for major research databases.

Google Trends is a publicly available resource for comparing Internet search query frequency and trends interest in queries over time. The tool provides country, region, and city-specific data for term search volume on Google Search. Google Trends also allows for trend comparison between multiple search terms. Each search term is given a number from 0-100, which indicates normalization of the particular search term frequency relative to the total number of Google searches over time [6]. This study sought to compare disability metrics for 15 skin diseases studied by GBD 2010 with the respective search frequency from Google Trends. We hypothesized that search interest would positively correlate with disease burden, as measured by DALYs, since more affected individuals would presumably seek out more information regarding their disease.

Methods

The 15 skin diseases studied by GBD 2010 are: bacterial skin diseases excluding cellulitis, viral skin diseases, fungal skin diseases, cellulitis, leprosy, scabies, acne vulgaris, alopecia areata, decubitus ulcer, dermatitis including eczema, pruritus, psoriasis, urticaria, malignant melanoma of the skin, and non-melanoma skin cancer. Search terms for each disease category, which are based on GBD 2010 ICD-9 and -10 codes, have been previously published (eTable 1) [4, 5]. These search terms were input into www.google.com/trends using the following filters: “Worldwide,” from “2010-present”, in “All Categories,” for “Web Searches.” The searches were all completed August 10, 2014. Google Trends presents data as relative values on a normalized scale from 0-100 with up to five terms compared at one time. The normalized scale is determined by the most popular of the five search terms. To assure a consistent scale for all search terms, the skin disease with the highest relative value was identified and was used as one of the five search terms in every search. The most frequently searched term under each disease category was chosen to be representative for that category of disease.

Results

The highest average search interest over time was for acne (n=86) followed closely by herpes (representing the viral skin diseases) (n=77) (Table 1, Figure 1). Search volume for the remaining 13 skin diseases in decreasing order is as follows: psoriasis (n=23), eczema (22), itch (19), scabies (13), and melanoma (12). All other diseases had scores of less than 10. Figure 1 plots 2010 DALY rates per 100,000 persons versus the average search interest with line of best fit (r^2 value: 0.1166).

Table 1: Search Interest of most burdensome diseases by DALY from 2010-2014

Search Term	Percentage of 2010 DALYs	Relative Interest 0-100	DALY Rank (of 176)
Search Term	2010 DALY Rates	Relative Interest 0-100	DALY Rank (of 176)
Acne	58.22	86	110
Herpes	40.31	77	90
Psoriasis	15.25	23	144
Eczema	128.05	22	58
Itch	30.6	19	119
Scabies	22.86	13	138
Melanoma	16.98	12	130
Cellulitis	18.78	9	134
Alopecia	19.34	9	137
Impetigo	41.63	7	107
Urticaria	37.54	6	112
Tinea	33.52	5	117
Leprosy	0.088	4	175
Basal/Squamous Ce	11.61	2	150
Pressure Ulcer	17.55	1	136

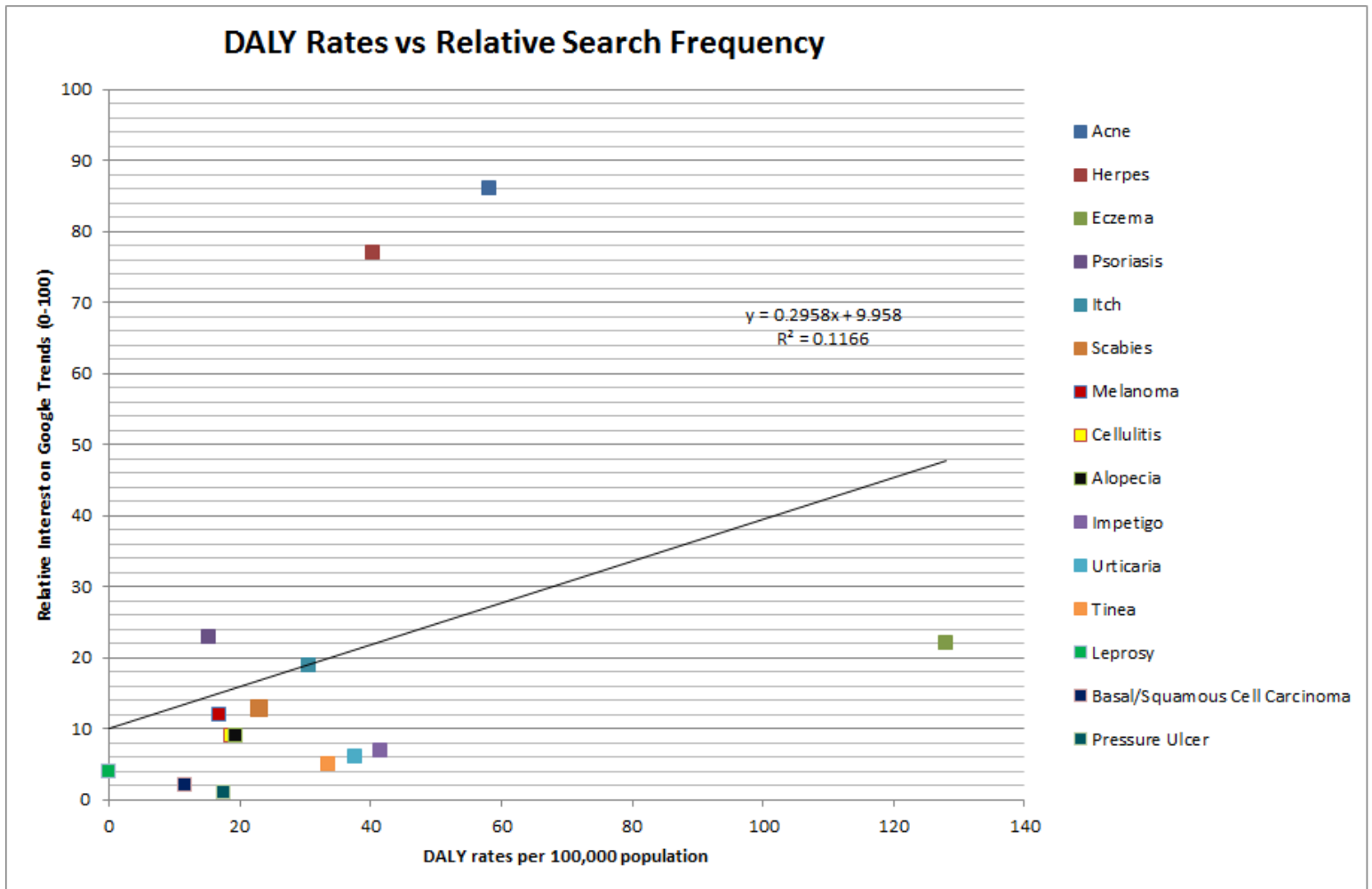


Figure 1. DALY rates per 100,000 compared to Google Trends search frequency (0-100) for 15 skin conditions

Discussion

Comparing search interest to disease burden, acne and herpes had substantially more interest than all other skin diseases. This is consistent with their high disease burden by DALY of 58.22 and 40.31 per 100,000, respectively. Of the DALYs for the 15 skin diseases, acne ranks second and viral skin diseases ranks fourth. Moreover, those with intermediate DALY rankings that correlated with intermediate search interest were itch, cellulitis, alopecia, and scabies. Conditions generating little interest consistent with their relative lower DALY burden were leprosy, basal and squamous cell carcinoma, and pressure ulcer.

Conditions with which search frequency did not correlate with DALY rankings were also found. Although eczema has the highest DALY of all 15 skin conditions, it ranks fourth for search frequency (n=22). Bacterial skin diseases, represented by the search term, “impetigo,” has the third highest DALY and a low Google Trend score of n=7. Similarly, fungal skin diseases, represented by the search term, “tinea,” has the sixth greatest DALY but a relatively low search frequency (n=5). Finally, urticaria ranks with the fifth highest DALY and search frequency score of n=6.

Two conditions with higher search interest than predicted by DALY rankings were psoriasis and melanoma. Melanoma generated the seventh highest interest (n=12) despite being ranking twelfth by DALY. Psoriasis was highly overrepresented with the third highest search interest (n=23) despite being ranked thirteenth by DALY of the fifteen skin conditions.

The line of best fit models support the correlation discussed above. The r^2 value of 0.1166 is consistent with a positive correlation between DALY and overall search interest on Google Trends. Eczema is an apparent outlier; excluding it from the data sets yields an r^2 value of 0.3856. This is largely related to eczema’s overall higher percentage of 2010 DALYs (128.05 per 100,000), which is greater than double the next closest DALY value of the 15 skin diseases.

Limitations

This study is limited by several factors. Google Trends only provides data on search terms that the researchers chose. Although we chose search terms as inclusive and true to the ICD code definitions as possible, people searching for diseases on Google may

have chosen other terms. This is particularly true for broad categories of disease such as viral skin diseases or bacterial skin diseases. Furthermore, the lay public may use different terminology to search the same diseases, such as “hives” for urticaria or “athlete’s foot” for fungal skin disease. However, these terms are not restrictive enough within Google trends to only provide results for diseases. For example, someone searching for beehives would be included in the search interest for hives.

As discussed in prior research by our group, GBD skin disease disability estimates account solely for disability in the skin, including itch and disfigurement related to the disease. DALYs for skin diseases do not take into effect other organ systems. Psoriasis, for example, is a multisystem disease, which could very well explain the increased search frequency on Google Trends discovered here. Furthermore, Internet access restricts access to Google Trends and could bias the results toward particular diseases.

Conclusions

Our results suggest that disease burden is often reflected in search interest generated on Google Trends. This would suggest that the data provided by GBD does largely correlate to public interest in information, with the highest interest in the most burdensome diseases and decreased interest for those causing less disability. Our study contributes to a growing body of data suggesting that readily available information, such as that provided by Google Trends, can guide a discussion of the most epidemiologically important diseases to promote further research.

eTable 1. Search terms generated for 15 skin conditions studied by GBD 2010*

Skin Condition (ICD-10 codes)	Grant Title or Abstract Terms
Dermatitis including eczema (L20-L27)	“eczema” “dermatitis” “atopic dermatitis” “contact dermatitis” “irritant contact dermatitis” “allergic contact dermatitis” “exfoliative dermatitis” “diaper dermatitis” “seborrheic dermatitis”
Acne vulgaris (L70)	“acne vulgaris” “acne”
Bacterial skin diseases (L00,L01, L02, L04, L08, L88,L97, L98.0-L98.4)	“staphylococcal scalded skin syndrome” “impetigo” “cutaneous abscess/furuncle/ carbuncle” “lymphadenitis” “pyoderma” “erythrasma” “bacteria” and “skin”
Viral skin diseases (B00, B07-B09)	“herpes” “viral warts” “molluscum contagiosum” “exanthema subitum” “viral” and “skin”
Urticaria (L50)	“urticaria”
Fungal skin diseases (B35, B36.0, B36.1, B36.2, B36.3, B36.8, B36.9)	“fungal” and “skin” “tinea”
Pruritus (L29)	“pruritus” “itch”
Scabies (B66)	“scabies”
Alopecia areata (L63.0, L63.1, L63.8, L63.9)	“alopecia areata”
Cellulitis (L03.0, L03.1, L03.2-L03.9)	“cellulitis”
Decubitus ulcer (L89)	“decubitus ulcer” “pressure wound”
Melanoma (C43)	“melanoma”
Psoriasis (L40, L41)	“psoriasis”
Non-melanoma skin cancer (C44, D04)	“non-melanoma skin cancer” “basal cell carcinoma” “squamous cell carcinoma”
Leprosy (A30)	“leprosy”

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