

# Prevalence and Increase over Time of Twelve Self-reported Skin Symptoms: Data from Two Representative Samples from 1998 and 2015\*

Hanna REICH<sup>1,2</sup>, Elmar BRÄHLER<sup>3-5</sup>, Uwe GIELER<sup>6</sup>, and Jörg KUPFER<sup>1</sup>

<sup>1</sup>Institute of Medical Psychology, Justus Liebig University of Giessen, Giessen, <sup>2</sup>Depression Research Centre of the German Depression Foundation, Department for Psychiatry, Psychosomatics and Psychotherapy, Goethe University, Frankfurt, <sup>3</sup>Department of Psychosomatic Medicine and Psychotherapy, University Medical Centre of Mainz, Mainz, <sup>4</sup>Department of Psychosomatic Medicine and Psychotherapy, University of Leipzig, <sup>5</sup>Integrated Research and Treatment Centre Adiposity Diseases, Behavioural Medicine Research Unit, University of Leipzig Medical Centre, Leipzig and <sup>6</sup>Department of Dermatology, Justus Liebig University of Giessen, Giessen, Germany

**Point prevalence estimates for common skin symptoms vary widely. Most research has focussed on a few symptoms and a single point of observation. The aim of this study is to determine point prevalence rates for 12 self-reported skin symptoms in 1998 and 2015 and to assess changes in the reporting of skin symptoms over time. Symptoms were assessed by 2 national face-to-face household surveys of representative samples of the German general population ( $n_{1998}=2,079$ ,  $n_{2015}=2,511$ ). Point prevalence ranges were 6.8–26.2% in 1998 and 11.6–32.1% in 2015. Dandruff, body odour, pimples, and an itchy scalp were the 4 most common skin symptoms, each of which affected more than 20% of the population at both time-points. For almost all symptoms, a statistically significant increase, with very small to small effect sizes, was observed over time. The increase in skin symptoms over time is congruent with the increase in skin diseases reported by the Global Burden of Disease study.**

**Key words:** skin symptoms; epidemiology; cross-sectional study; diagnostic self-evaluation.

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**Corr:** Jörg Kupfer, Institute of Medical Psychology, Justus Liebig University of Giessen, Klinikstrasse 29, DE-35392 Giessen, Germany. E-mail: Joerg.P.Kupfer@psycho.med.uni-giessen.de

Skin diseases are the 4<sup>th</sup> leading cause of disability worldwide (excluding mortality) (1), and the burden due to these diseases is very large in countries of all income levels (2). Yet, only a few studies have addressed the prevalence of skin symptoms in the general population, and epidemiological data is mostly limited to a narrow selection of symptoms. Moreover, different assessment methodologies for skin symptoms make comparisons of epidemiological data difficult.

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## SIGNIFICANCE

Due to methodological issues and a focus on single symptoms, data on the frequency of skin complaints in the general population are not easily accessible. We report here 12 self-reported skin symptoms in representative samples of the German general population in 1998 and 2015, and assess the time trend in reporting of these skin symptoms. Skin complaints were found to be common in the general population (1998: 6.8–26.2%; 2015: 11.6–32.1%) and increased over time. This increase is in agreement with the increase in skin diseases reported globally.

Symptoms associated with an irritated or blemished skin are multifarious, and include itch and excoriations, skin alterations and erythema, burning and tingling sensations, dandruff and an itchy scalp, pimples, body odour, oily skin, or ingrown hairs. Itch has often been described as the most frequent skin symptom (3). A distinction is made between acute itch (shorter than 6 weeks) and chronic itch (lasting 6 weeks and longer) (4). In large samples drawn from the general population, the point prevalence of acute itch was 19–21% (5, 6), while in other studies 6.5–8% of the general population reported being affected “quite a lot” or “very much” by itch (7, 8). For chronic itch a point prevalence of 13.5% has been reported in the general population (9). Complaints of dry, sensitive or irritated skin are quite common in the general population, with point prevalences ranging from 40% to 60%: corresponding studies assessed, for example, skin that lacked moisture and exhibited fine lines, scaling, or itch (point prevalence: 51.7%) or reactive or intolerant skin, with transient erythema or prickling, burning, or tingling sensations caused by various factors (point prevalence: 39.7%) (5). Similar results have been reported by Misery et al. (10), who found a point prevalence of 52–59% for sensitive skin associated with burning, prickling or irritation related to physical, chemical, psychological, or hormonal factors. In a comparative study of 8 European countries, point prevalences of 38% for dry skin and sensitive or very sensitive skin, and of 16% for greasy skin were reported (11). Studies that focused more strictly on “caseness”

of symptoms in the general population commensurately reported lower point prevalences: 3–6% dry and sore skin, 3–4% scaly skin, 2–3% hand rash, 1–2% face rash (7, 8), 15% prickling, 4% tightness, 4% pain, and 2% burning sensation (6). The latter studies also reported a point prevalence of 17% for dandruff (6), and 1.5–4% for being affected “quite a lot” or “very much” within the past week by pimples and 5% by sweating (7, 8).

All of the cited studies were cross-sectional and assessed skin symptoms at a specific time. The Global Burden of Disease Study has provided insights into the development of the prevalence of skin diseases over time: the percentage change in counts between 2005 and 2015 displayed a significant increase of 12.5% (12). However, these data refer to skin diseases, and, to the best of our knowledge, there are no such data on the epidemiology of single skin symptoms at different time-points that allow a direct comparison. A comparison of this nature should provide insight into how skin symptoms in the general population have evolved over the past 20 years. Somatic symptoms (musculoskeletal, exhaustion, cardiopulmonary, and gastrointestinal symptoms) have decreased over the past 40 years in Germany (13). However, no such data have been published in relation to skin symptoms.

The aim of the current study was to describe point prevalences of skin symptoms in adults in representative samples of the German population at 2 time-points (1998 and 2015), and to assess changes in the report of skin symptoms over the period of approximately 20 years between these surveys.

## MATERIALS AND METHODS

### Ethics

Both surveys were conducted in accordance with the principles of the Declaration of Helsinki, and met the ethics guidelines of the international code of Marketing and Social Research practice by the International Chamber of Commerce and the European Society for Opinion and Marketing Research. The 2015 survey was approved by the ethics committee of the Medical Faculty of the University of Leipzig (process number: 044-15-09032015).

### Sampling

The nationwide face-to-face household surveys were conducted in 1998 and 2015. Random samples of the German general population were selected with the assistance of a demographic consulting company (Unabhängiger Service für Umfragen, Methoden und Analysen, Berlin, Germany). In both surveys the random-route-technique was applied, i.e. random selection of street, house, flat, and target person in the household. If not at home, a maximum of 3 attempts was made to contact the selected person. The inclusion criteria were a minimum age of 14 years, and sufficient knowledge of the German language. After providing written informed consent, structured questionnaires were presented. All interviews were conducted by trained interviewers in the private homes of the participants.

In total, 2,081 and 2,513 interviews were conducted in 1998 and 2015 (response rates: 68.9% and 51.9%). There were 4 cases with missing values on all items regarding skin symptoms (2 in

each survey), which were excluded from the current analyses. The samples are approximately representative of the non-institutionalized German general population regarding age, sex, and education (see Sample description, below, and **Table I**).

### Instruments

Sociodemographic variables were obtained (age, education, nationality, etc.). Skin symptoms were assessed, with 12 items assessing those skin symptoms most common in clinical practice (consensus of UG and JK: body odour, burning sensation, dandruff, erythema, excoriations, ingrown hairs, itch, itchy scalp, oily skin, pimples, skin changes, tingling of the skin). Answering options were those of the Giessen Subjective Complaints List (14): the opening question “To what extent do you currently feel affected by the following complaints?” was answered on a 5-point scale (0=never, 1=mild, 2=moderate, 3=considerable, 4=severe).

### Statistical analyses

Response categories were dichotomized to distinguish between both, “cases” and “non-cases” (answering option “0-never” vs answering options “1-mild” to “4-severe”), and between people impaired by a certain skin symptom or not (answering options “0-never” and “1-mild” vs answering options “2-moderate” to “4-severe”). Asymmetric Somers’ d and the 95% confidence interval (95% CI) for Somers’ d were calculated to test for the difference between proportions (15) with survey year as independent variable and each skin symptom as dependent variable. Somers’ d has been shown to underestimate the actual degree of association (16). Hence, the effects reported here are rather conservative estimates. Effect sizes are given as Cohen’s h, a measure of distance between independent population proportions. A value of 0.2 is considered a small effect size, 0.5 a medium effect size, and 0.8 a large effect size (17). Significance was set at  $\alpha=0.05$ . R version 3.5.0 (R Foundation for Statistical Computing, Vienna, Austria) was used to conduct statistical analyses (18).

## RESULTS

### Sample description

The analyses included a total of 4,590 subjects ( $n_{1998}=2,079$ ,  $n_{2015}=2,511$ ), with 56% females and a mean age of 49 years in both surveys (see Table I). In the 2015 survey more subjects had a middle or high education than in the 1998 survey; this phenomenon was related to a cohort effect, since access barriers to higher education

**Table I. Sociodemographic characteristics stratified by survey year**

	1998 <i>n</i> = 2,079	2015 <i>n</i> = 2,511	Total <i>n</i> = 4,590
Sex, <i>n</i> (%)			
Female	1,156 (55.6)	1,393 (55.5)	2,549 (55.5)
Male	923 (44.4)	1,118 (44.5)	2,041 (44.5)
Age, years, mean (SD)	49.11 (17.4)	48.78 (18.1)	48.93 (17.8)
Education <sup>a</sup> , <i>n</i> (%)			
Low	1,018 (49.0)	921 (36.7)	1,939 (42.3)
Middle	777 (37.4)	1,072 (42.7)	1,849 (40.3)
High	284 (13.7)	518 (20.6)	802 (17.5)
Nationality, <i>n</i> (%)			
German	2,048 (98.5)	2,425 (96.6)	4,473 (97.5)
Other	31 (1.5)	86 (3.4)	117 (2.5)

<sup>a</sup>Low=less than 10<sup>th</sup> grade, middle=10<sup>th</sup> grade, high=German Abitur (university entrance diploma), college or university degree.  
SD: standard deviation.

have diminished in Germany during the last 50 years. The proportion of non-German participants increased slightly, from 1.5% in 1998 to 3.4% in 2015, which was expected due to the ongoing globalization.

#### Point prevalence of, and changes in, skin symptoms between 1998 and 2015

Reporting of almost all skin symptoms increased substantially between 1998 and 2015 (see **Table II**). The 4 most common skin symptoms that affected each more than 20% of the population in 1998 ("cases": dandruff 26.2%, body odour 21.9%, pimples 21.0%, itchy scalp 23.1%) remained the main symptoms in 2015. However, the order changed due to a significant increase in the report of pimples (32.1%,  $p < 0.001$ ), itchy scalp (28.3%,  $p < 0.001$ ), and body odour (28.0%,  $p < 0.001$ ), while the frequency of dandruff did not vary significantly (27.6%,  $p > 0.05$ ). Dandruff, pimples, and itchy scalp were among the 4 most common symptoms in 1998 and 2015 amongst persons at least moderately affected by a symptom as well, and showed a statistically significant increase from 1998 to 2015 (dandruff: 8.6–10.5%,  $p < 0.05$ ; pimples: 6.4–10.0%,  $p < 0.001$ ; itchy scalp: 6.5–9.0%,  $p < 0.01$ ; see

Table II: "impaired"). The frequency of body odour also increased (4.9–6.8%,  $p < 0.01$ ), but its prominence among "impaired" persons was of only medium relevance, ranking in the lower middle field of the frequencies of moderate to heavy skin symptoms.

A strong increase of approximately 10% each in the period from 1998 to 2015 was observed in "cases" of skin changes (14.7–26.0%,  $p < 0.001$ ), itch (17.0–25.4%,  $p < 0.001$ ), erythema (13.4–23.0%,  $p < 0.001$ ), and oily skin (15.1–22.4%,  $p < 0.001$ ). An increase was also found among "impaired" persons: skin changes increased from 4.6% to 9.1% ( $p < 0.001$ ), itch from 5.3% to 8.1% ( $p < 0.001$ ), erythema from 3.6% to 7.5% ( $p < 0.001$ ), and oily skin from 5.0% to 8.1% ( $p < 0.001$ ).

Among the less prominent skin symptoms, the report of excoriations and ingrown hairs increased over time (excoriations: 9.9% "cases" in 1998 vs 14.4% in 2015,  $p < 0.001$ , 3.0% "impaired" in 1998 vs 5.5% in 2015,  $p < 0.001$ ; ingrown hairs: 6.8% "cases" in 1998 vs 11.6% in 2015,  $p < 0.001$ , 1.9% "impaired" in 1998 vs 3.1% in 2015;  $p < 0.01$ ), while the report of tingling of the skin and a burning sensation remained more stable (tingling of the skin: 15.0% "cases" in 1998 vs 17.4% in 2015,  $p < 0.05$ , 4.4% "impaired" in 1998 vs 5.2% in 2015,

**Table II. Descriptive statistics and test statistics for people affected by skin symptoms, stratified by survey year**

Symptom	1998 (n = 2,079)			2015 (n = 2,511)			Test statistic		
	Rank	%	N <sub>positive/total</sub>	Rank	%	N <sub>positive/total</sub>	Somers' d [95% CI]	p-value	Cohen's h
Pimples									
Cases	4	21.0	436/2,078	1	32.1	796/2,480	0.11 [0.086; 0.137]	<0.001	0.25
Impaired	3	6.4	134/2,078	2	10.0	247/2,480	0.04 [0.019; 0.051]	<0.001	0.13
Itchy scalp									
Cases	2	23.1	480/2,077	2	28.3	701/2,480	0.05 [0.026; 0.077]	<0.001	0.12
Impaired	2	6.5	134/2,077	4	9.0	224/2,480	0.03 [0.010; 0.041]	0.001	0.10
Body odour									
Cases	3	21.9	455/2,077	3	28.0	695/2,480	0.06 [0.036; 0.086]	<0.001	0.14
Impaired	7	4.9	102/2,077	8	6.8	168/2,480	0.02 [0.005; 0.032]	0.007	0.08
Dandruff									
Cases	1	26.2	544/2,078	4	27.6	686/2,484	0.01 [-0.014; 0.040]	0.275	0.03
Impaired	1	8.6	179/2,078	1	10.5	262/2,484	0.02 [0.002; 0.036]	0.026	0.07
Skin changes									
Cases	8	14.7	305/2,077	5	26.0	646/2,482	0.11 [0.090; 0.136]	<0.001	0.28
Impaired	7	4.6	96/2,077	3	9.1	226/2,482	0.04 [0.030; 0.059]	<0.001	0.18
Itch									
Cases	5	17.0	353/2,078	6	25.4	632/2,488	0.08 [0.061; 0.107]	<0.001	0.21
Impaired	4	5.3	111/2,078	5	8.1	202/2,488	0.03 [0.013; 0.042]	<0.001	0.11
Erythema									
Cases	9	13.4	278/2,076	7	23.0	572/2,482	0.10 [0.074; 0.118]	<0.001	0.25
Impaired	9	3.6	75/2,076	7	7.5	186/2,482	0.04 [0.026; 0.052]	<0.001	0.17
Oily skin									
Cases	6	15.1	314/2,078	8	22.4	556/2,484	0.07 [0.050; 0.095]	<0.001	0.19
Impaired	5	5.0	104/2,078	6	8.1	201/2,484	0.03 [0.017; 0.045]	<0.001	0.13
Tingling of the skin									
Cases	7	15.0	311/2,073	9	17.4	433/2,486	0.02 [0.003; 0.046]	0.027	0.07
Impaired	8	4.4	91/2,073	10	5.2	129/2,486	0.01 [-0.004; 0.020]	0.207	0.04
Excoriations									
Cases	11	9.9	205/2,075	10	14.4	356/2,479	0.04 [0.026; 0.064]	<0.001	0.14
Impaired	10	3.0	63/2,075	9	5.5	128/2,479	0.02 [0.010; 0.033]	<0.001	0.11
Burning sensation									
Cases	10	10.6	220/2,076	11	12.9	321/2,482	0.02 [0.005; 0.042]	0.014	0.07
Impaired	11	2.8	58/2,076	11	3.5	87/2,482	0.01 [-0.003; 0.017]	0.169	0.04
Ingrown hairs									
Cases	12	6.8	142/2,074	12	11.6	289/2,482	0.05 [0.031; 0.065]	<0.001	0.17
Impaired	12	1.9	40/2,074	12	3.1	78/2,482	0.01 [0.003; 0.021]	0.009	0.08

Symptoms ordered descending by frequency of cases in 2015. "Cases": persons answering "mild" to "severe" (1–4). "Impaired": persons answering "moderate" to "severe" (2–4).



$p > 0.05$ ; burning sensation: 10.6% "cases" in 1998 vs 12.9% in 2015,  $p < 0.05$ , 2.8% "impaired" in 1998 vs 3.5% in 2015;  $p > 0.05$ ).

In "cases", the effect sizes for statistically highly significant differences between both survey years ( $p < 0.001$ ) were small, ranging between  $h = 0.12$  (itchy scalp) and  $h = 0.28$  (skin changes). In "impaired" persons, these effect sizes were generally smaller, ranging between  $h = 0.11$  (excoriations, itch) and  $h = 0.18$  (skin changes, see Table II). The complete frequency distributions for all skin symptoms are shown in Table SI.

## DISCUSSION

Dandruff was the most common skin symptom at both data collection time-points, both in "cases" and in persons "impaired" by a skin symptom, with the exception of pimples being the most common symptom among "cases" in 2015. The range of point prevalences for "cases" was 6.8–26.2% in 1998 and 11.6–32.1% in 2015. In persons "impaired" by a skin symptom, the ranges were 1.9–8.6% in 1998 and 3.1–10.5% in 2015. The steepest increases in point prevalences between 1998 and 2015 for "cases" as well as for persons "impaired" by a symptom were observed in skin changes, pimples and erythema ("cases": percentage increase = 11.3%/11.1%/9.6%, respectively; "impaired": percentage increase = 4.5%/3.6%/3.9%, respectively). The increase in the report of almost all skin symptoms was statistically significant, with small to very small effect sizes.

Dandruff and pimples ranged among the most common skin symptoms in the current study. The prevalence of dandruff was higher in the current study than reported previously (26–28% vs 17%) (6); the same applied for persons "impaired" by pimples (6.4–10% vs 1.5–4%) (7, 8). These divergences might be due to different assessment methods (i.e. closed vs open questions, different answering options). Dandruff is a core symptom of seborrhoeic dermatitis and is also important in psoriasis of the scalp and eczema (6). Seborrhoeic dermatitis has a prevalence of 3.2% among German adults (19); psoriasis has a prevalence of 2% among the Western population (20). This coincides with approximately 2% (1998) to 3% (2015) indicating they were considerably or severely affected by dandruff in the current study (see Table SI). Pimples occur, in addition to occurring in other skin diseases, as part of acne vulgaris, which affects approximately 20% of young people to a moderate or severe degree, and persists in half of individuals into the 20s and 30s (21). Given that the current study included an age range from 14 to 94 years, a prevalence rate of 6–10% of persons being "impaired" by pimples seems to be consistent with the general picture. Also consistent with previous findings, symptoms of itch (itch, itchy scalp) ranged amongst the most common symptoms of the skin. Similarly to dandruff and pimples, the point

prevalence of "cases" affected by itch was slightly higher in the current study than in comparable ones (25.4% in 2015 vs 19–21% reported in 2013/14 (5, 6)). Nonetheless, the results regarding persons "impaired" by itch (8.1% in 2015) were concordant with studies from Scandinavia (6.5–8%) (7, 8) that applied a similar questionnaire as the current study. The rates of "cases" with a reactive or intolerant skin (observable by erythema, burning or tingling sensations) were markedly lower in the current study (13–23% in 2015 vs 40%) (5, 22). As mentioned above, methodological differences might explain the divergent results; in this case, the term "sensitive skin", which was applied in the cited studies seems to be valid for many individuals surveyed worldwide (22), while the current study asked more explicitly for specific symptoms such as erythema. Using the definition of sensitive skin as "A syndrome defined by the occurrence of unpleasant sensations (stinging, burning, pain, pruritus, and tingling sensations) in response to stimuli that normally should not provoke such sensations" as established by the International Forum for the Study of Itch (23) might guide further research and yield more consistency in reporting. Results regarding persons "impaired" by a burning sensation of the skin were less contradictory (2.8–3.5% compared with 2%) (6). Similarly, the point prevalence of oily skin in the current study was consistent with previous findings regarding greasy skin (11). Regarding some other symptoms, such as body odour or ingrown hair, no comparative data has been published to our knowledge; regarding related conditions such as hyperhidrosis the available literature is ambiguous, reporting prevalence rates from 3% (24) to 16% (25). Hence, this study is the first to report the prevalence and burden of those common complaints in the general population.

The increase in reports of skin symptoms over the time-period 1998 to 2015 was remarkable, but in agreement with findings from the Global Burden of Disease study (12). The increase in skin symptoms might be related to the increase in psychological disorders. Distress, depression and anxiety, as well as self-harm, increased over time (12) and are each strongly related to skin symptoms. The neuroimmunological influence of stress on the skin has been well documented (26, 27), as well as the link between psychological stress and skin diseases, such as psoriasis (28, 29). Depression and anxiety have been established as important comorbid diseases in skin conditions (30). Some additional societal trends might have influenced the increase in skin symptoms observed through the current study. Hypotheses include a stronger focus on the skin in the media and marketed ideals of beauty in advertisements, targeting common beauty practices such as body hair removal, which itself can lead to skin symptoms: Skin was the second most common focus of appearance concern, both in individuals with and without body dysmorphic disorder (31). More frequent manipulations of the skin include higher rates

of piercings and tattoos, which might cause adverse reactions (32), and also include higher rates of non-suicidal self-harm, such as cutting, scratching, or burning of the skin (33). The number of surgical and non-surgical cosmetic procedures also increased (34). Similar to skin symptoms, the prevalence of dysmorphic concerns has increased over recent decades (35).

A strength of the current study was the use of 2 large representative population-based samples, assessed at different time-points, which enabled us to capture a picture of the change in skin symptoms over time at the symptom level. However, there are limitations: skin symptoms were assessed via self-report only, and an evaluation of skin conditions by a trained observer (e.g. a dermatologist) or an evaluation of medical records was not carried out. While the current data provided evidence that skin symptoms increased over time, change was assessed between 1998 and 2015 only, and neither longer-term effects (e.g. due to industrialization) nor variation in skin symptoms within shorter time-periods (e.g. due to seasonal changes, (10)) were explored here.

In summary, skin symptoms and skin diseases impose a high burden of disease on the individual and place great demands on healthcare system resources due to their huge number (12). The current study highlighted the increase in skin symptoms over time, which is congruent with the increase in skin diseases reported by the Global Burden of Disease study. However, comparison of epidemiological data remains difficult due to the variation in assessment methods. The field may benefit from standardized measures and criteria for the self-report assessment of skin symptoms. First results of the development of corresponding questionnaires are promising (40). Despite the reported shortcomings, this study provides a sound assessment of the point prevalences and the change over time of a broad spectrum of skin symptoms in representative samples of the German population. Further research is needed to link these symptoms with skin and other diseases, health behaviour and utilization of the healthcare system.

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