# Inpatient care for skin diseases in Germany: multi source analysis on the current and future health care needs

**Matthias Augustin, Gefion Girbig, Anne Kis, Falk G. Bechara, Michael Hertl, Sandra Hischke, Roland Kaufmann, Harald Löffler, Cornelia S. L. Müller, Jan Christoph Simon, Klaus Strömer, Julia Welzel, Tino Wetzig, Peter Elsner, Jobst Augustin, Christoph Löser, Tilo Biedermann**

**Angaben zur Veröffentlichung / Publication details:**

Augustin, Matthias, Gefion Girbig, Anne Kis, Falk G. Bechara, Michael Hertl, Sandra Hischke, Roland Kaufmann, et al. 2021. "Inpatient care for skin diseases in Germany: multi source analysis on the current and future health care needs." *JDDG: Journal der Deutschen Dermatologischen Gesellschaft* 19 (S5): 25–53. https://doi.org/10.1111/ddg.14620.

Submitted: 5.3.2021
Accepted: 29.7.2021

DOI: 10.1111/ddg.14620

# Inpatient care for skin diseases in Germany: multi-source analysis on the current and future health care needs

**Matthias Augustin[1], Gefion Girbig[1], Anne Kis[1], Falk G. Bechara[2], Michael Hertl[3], Sandra Hischke[1], Roland Kaufmann[4], Harald Löffler[5], Cornelia S. L. Müller[6], Jan-Christoph Simon[7], Klaus Strömer[8], Julia Welzel[9], Tino Wetzig[10], Peter Elsner[11], Jobst Augustin[1], Christoph Löser[12], Tilo Biedermann[13]**

(1) Institute for Health Services Research in Dermatology and Nursing (IVDP), University Medical Center Hamburg-Eppendorf (UKE), Hamburg, Germany
(2) Clinic for Dermatology and Allergology, St. Joseph Hospital, Clinical Center of the Ruhr University Bochum, Bochum, Germany
(3) Clinic for Dermatology and Allergology, University Hospital Marburg (UKGM), Marburg, Germany
(4) Department of Dermatology, Venereology, and Allergology, Goethe University Frankfurt, Frankfurt am Main, Germany
(5) Clinic for Dermatology, Allergology and Phlebology, Klinikum am Gesundbrunnen / SLK-Kliniken Heilbronn GmbH, Heilbronn, Germany
(6) Clinic for Dermatology, Venerology and Allergology, Saarland University Hospital and Medical Faculty of Saarland University, Homburg, Germany
(7) Department of Dermatology, Venereology and Allergology, University Hospital Leipzig, Leipzig, Germany
(8) Private dermatological practice, Fuistingstrasse 4, Ahaus, Germany
(9) Department of Dermatology and Allergology, Augsburg University Hospital, Augsburg, Germany
(10) Clinic for Dermatology, Dermatosurgery and Allergology, Asklepios Klinik Weißenfels, Weißenfels, Germany
(11) Department of Dermatology and Allergology, Friedrich Schiller University, Jena, Germany
(12) Department of Dermatology, Skin Tumor Center, Ludwigshafen Medical Center, Ludwigshafen, Germany
(13) Department of Dermatology and Allergology Biederstein, Technical University of Munich (TUM), Munich, Germany

 

## Summary

**Background**: In Germany, skin diseases are mainly treated in the 115 dermatological hospitals.

**Methods**: Health care and health economic analysis of dermatological inpatient care and prediction of future care needs based on primary and secondary data.

**Results**: Outpatient and inpatient care for dermatologic treatment indications is predominantly provided by dermatology specialists. Inpatient treatment was provided for 833,491 cases in 2018, corresponding to 4.21 % of all inpatient cases (19,808,687). Most common treatment cases were: epithelial skin cancer (total 87,386, of which dermatology clinics 52,608), followed by melanoma (23,917/17,774), psoriasis (19,291/13,352), erysipelas (73,337/11,260), other dermatitis (12,671/10,842), atopic dermatitis (AD) (11,421/9,734), and herpes zoster (26,249/9,652). With an average length of stay of 5.69 days, dermatology hospitals were in the bottom third. The proportion of inpatient indications cared for in dermatology hospitals was highest for prurigo (95.2 %), pemphigus (94.9 %), parapsoriasis (94.6 %), pemphigoid (90.3 %), eczema other than AD (85.6 %), and AD (85.2 %). While the total number of inpatient treatment cases in Germany has increased by an average of 17.5 % between 2000 and 2018, this is the case for 26.6 % of skin diseases and over 150 % for individual ones. The projection of current to future inpatient care suggests a continued high demand for inpatient care by dermatology hospitals.

**Conclusion**: Inpatient dermatological care will continue to be an indispensable component of qualified, socially necessary care in Germany.


## 1. Background

Skin diseases are among the most frequent reasons for seeking medical care in Germany. According to nationwide population-based surveys in companies, about 25 % of the German working population requires treatment at least once a year due to dermatological findings [1]. The largest share of health care for diseases of the skin and adjacent mucous membranes is provided in the outpatient sector, primarily by dermatologists, general practitioners and, in the case of minors, also by pediatricians. A smaller but relevant proportion of skin diseases have an indication for inpatient care. For this, 115 university and non-university dermatological clinics are currently available, as well as nine overlapping clinics for dermatological inpatient rehabilitation [2].

The spectrum of indications for inpatient dermatological care is broad and quantitatively includes in particular chronic inflammatory diseases and autoimmune diseases, tumor diseases, vascular diseases of the skin, allergic diseases, and a variety of hereditary skin diseases [3, 4]. In a publication by Beikert et al. (2013), the performance and profiles of skin clinics in Germany showed variations in inpatient treatment duration and the skin diseases treated, but overall a high continuity in the range of care [5].

Against the background of the constantly changing health care system in Germany, the present project was carried out with the objective of describing the current and future care of skin diseases in Germany in the inpatient sector. This was done under the following questions:

1. What is the status quo of inpatient care for skin diseases in Germany?
2. What is the proportion of dermatology patient care provided by the various specialty clinics?
3. What is the range of services provided by the supplying dermatology clinics?
4. Which indications in the narrower and broader sense represent indications requiring inpatient treatment?
5. What are the determinants of care needs and how will they evolve over the next few decades?
6. What is the current and future capacity of the dermatology clinics in Germany?
7. What is the importance of quality and efficiency of care in future inpatient dermatologic care and what is the evidence on comparative quality of care between dermatologic and non-dermatologic providers?
8. What is the potential for expanding outpatient dermatologic care?

## 2. Methods

To address these questions, a multi-source analysis of the current volume of care for skin diseases was conducted, and a descriptive model of care needs was subsequently developed


 

that included possible determinants of current and future care. In this predictive model, expected future needs were presented, taking into account demographic trends. The following methodology was used in detail:

### 2.1. Status quo of inpatient care for skin diseases in Germany

The data were taken by indication from the publications of the Federal Statistical Office (Destatis) [6]. The descriptive presentation was carried out for the years 2002 to 2018 by indication according to the four-digit ICD-10 codes. In addition to the overall overview, differentiations by age and gender as well as specialist clinic were also made for the last available year 2018. For this purpose, diseases of the skin and adjacent mucous membranes were defined as skin diseases according to the (Model) Specialty Training Regulations of the German Medical Association in the latest version of 2018 [7]. Furthermore, the selection and extraction of relevant diagnoses was based on the total list of discharge diagnoses of inpatient cases managed by dermatology departments in 2018. Primarily internally managed common diagnoses such as diabetes (ICD-10 E11) and arteriosclerosis (ICD-10 I70) were excluded.

### 2.2. Share of specialist departments in the care of dermatological diseases

The respective shares were taken from the data of the Federal Statistical Office (Destatis) for 2018.

### 2.3. Analysis of current inpatient dermatology facilities providing care

To characterize the current dermatology departments in Germany, a status quo-survey of medical directors was conducted in November 2019. According to the hospital directory, these were 115 dermatology clinics in 105 cities. The survey was conducted using a structured data entry form, which has already been presented in detail in other publications [2, 3].

### 2.4. Medical indications for inpatient dermatological care

The list of dermatological diseases requiring treatment was taken from the international ICD-11 catalog [8] and compared with the overviews of serious diseases of the Global Disease Burden Project [9] and the modeling made from it [10].

### 2.5. Determinants of future supply forecast models

Four forecast models were developed to predict future demand, based on previous publications: In the first forecast model, current inpatient care is carried forward on the basis of the status quo of recent years. Demographic trends were not initially taken into account. In the second model, demographic development was taken into account using current data from the Federal Statistical Office up to 2060 [11]. In the third model, the projection of inpatient care demand was adjusted for the projected change in morbidity (observed change in incidence and prevalence) in the ten most common dermatological inpatient admission indications. Age-related morbidity is again used as the weighting factor. For all models, the observation and forecast horizons refer to the years 2020–2060.

### 2.6. Health care capacity of inpatient dermatology departments

The capacity of bed-based dermatology hospitals was taken from current supply data from a nationwide survey of the sample of all dermatology inpatient departments [2]. Data are based on information for 2018 and 2019.

### 2.7. Quality of dermatologic vs. non-dermatologic care

To characterize the quality and efficiency of care, a systematic literature search was conducted in the Pubmed database. The results were evaluated qualitatively and semiquantitatively.

### 2.8. Starting points for the expansion of outpatient dermatological care

For the potential of outpatient dermatological care, an estimate was made for the most important inpatient diagnoses on the basis of relevant technologies, in particular drug innovations and the expansion of digital medicine. The spectrum of current outpatient dermatological indications was taken from the statistics of the KV Nordrhein [12–15]. The epidemiological data as a basis for future demand planning were taken from the prevalence and incidence data published for Germany [1, 12–31].

### 2.9. Sensitivity analysis

Univariate sensitivity analyses were performed for the assumptions made in the models to forecast future supply requirements.

 

### 2.10. Cartographic representations

The cartographic representations are based on the standards and recommendations of the "Good Cartographic Practice" [32]. The accessibility analyses were performed using a network analysis in a geographic information system. The ArcGIS program (ESRI Inc., Redlands, CA, USA) was used for the representation.

## 3. Results

### 3.1. Status quo of inpatient care for skin diseases in Germany

Skin and adjacent mucous membrane diseases treated as inpatients in all hospitals accounted for n = 833,491 cases in 2018, representing 4.21 % of the total number of inpatient cases in that year (n = 19,808,687). Inpatient treatments occurred in all age groups, but the age peak was in the 75–79 and 80–84 years old age groups (Figure 1). The most common inpatient diagnoses were, in descending order, ICD-10 C44 (basal cell carcinoma [BCC] and squamous cell carcinoma [SCC]) with n = 87,386 cases, I83 (lower extremity varices) with n = 77,887, A46 (erysipelas) with n = 73,337, and L02 (abscess, carbuncle) with n = 53,112 cases. Other indications typical in dermatology were C43 (malignant melanoma) with n = 23,917, L40 (psoriasis) with n = 19,291, L30 (other eczema) with n = 12,671, and L20 (atopic dermatitis) with n = 11,421 cases.

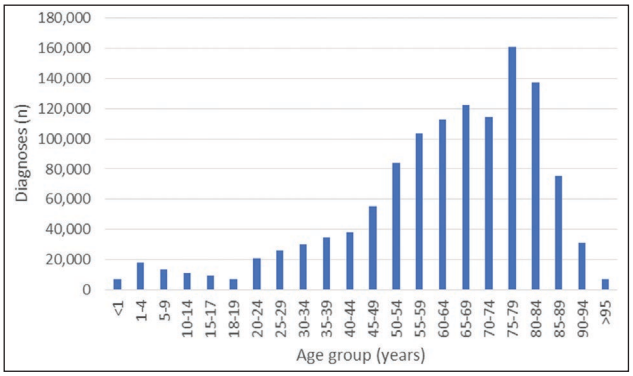


**Figure 1** Age distribution of inpatient treatment cases with main dermatological diagnoses in 2018 (n = 833,491 cases in all dermatology hospitals; analysis of hospital data from the Federal Statistical Office).

### 3.2. Course of inpatient treatment cases for dermatological diseases over the last 20 years

In relation to the year 2000, a disproportionately large increase in inpatient cases has been recorded for dermatological indications up to 2018 (Figures 2, 3). This applies in particular to those skin diseases which *(1)* show an increasing prevalence in Germany, such as squamous cell carcinoma and basal cell carcinoma, and which *(2)* occur in older age groups and thus increase in frequency in line with demographic change (for example, bullous autoimmune diseases).

In Germany, for example, n = 298,732 inpatient treatments were performed in the indication groups L0 to L99 (skin diseases in the narrower sense) in 2018. Compared to the year 2000 (n = 236,021), this represents an increase of 26.6 % (Figure 2). In contrast, the number of inpatient treatments for all indications increased by 17.5 % during the same period (from 16,864,324 to 19,808,687).

The relatively higher increase in dermatology inpatient diagnoses is unevenly distributed among different indications. For example, between 2000 and 2018, there was a particularly strong increase in epithelial skin tumors, especially basal cell and squamous cell carcinoma (ICD-10 C44), as well as in other dermatoses common in older age

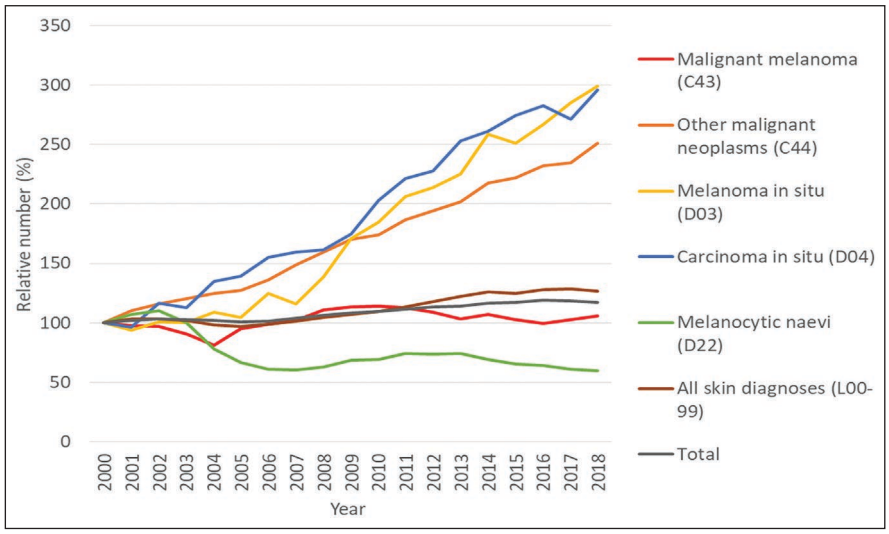


**Figure 2** Relative course of inpatient treatment cases of skin tumors with reference to the year 2000, observation years 2000 - 2018 (analysis of hospital data from the Federal Statistical Office).


 

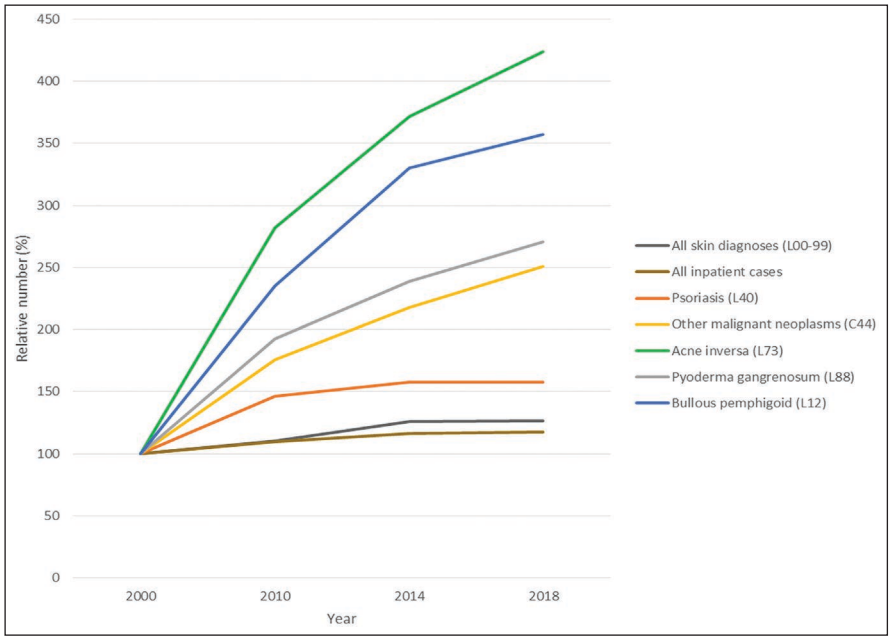


**Figure 3** Relative course of inpatient treatment cases of selected skin diseases with reference to the year 2000, observation years 2010, 2014, and 2018 (analysis of hospital data from the Federal Statistical Office).

(Figure 2, 3). Typical examples of non-tumorous diseases with a disproportionately increasing number of inpatient treatments are bullous pemphigoid, pyoderma gangraenosum and hidradenitis suppurativa (acne inversa) (Figure 3).

## 3.3. Share of specialist clinics in the care of dermatological diseases

As expected, the percentage of patients with skin diseases who received care in dermatology clinics varied considerably. It was highest for prurigo (95.2 %), pemphigus (94.9 %), parapsoriasis (94.6 %), pemphigoid (90.3 %), other dermatitides (85.6 %), and atopic dermatitis (85.2 %) (Table 1).

The most frequent inpatient treatment cases in skin clinics are, in decreasing order (Table 2): other malignant neoplasms of the skin, especially SCC and BCC (ICD-10 C44; total 87,386, of which in skin clinics: 52.608), melanoma of the skin (C44; 23,917/17,774), psoriasis (L40; 19,291/13,352), erysipelas (A46; 73,337/11,260), other dermatitis (L30; 12,671/10,842), atopic [endogenous] dermatitis (L20; 11,421/9,734), and herpes zoster (B02; 26,249/9,652).

The most frequent ten dermatological indications account for 60 %, the most frequent 30 indications for 85 % and the most frequent 60 indications for 95 % of inpatient treatment cases.

## 3.4. Care provided by skin clinics compared to other specialty clinics

With 231,956 inpatient treatment cases in 2018 (Figure 4) and 1.32 million inpatient hospital days (Figure 5), skin clinics were in the middle range among specialized hospitals. With an average median length of stay of 5.69 days over the same period, skin clinics were in the bottom third (Figure 6).

Both outpatient and inpatient care for the most important inpatient dermatological treatment indications is largely provided by specialists in dermatology (Figure 7, 8). However, the share of other surgical specialties and oncology is also highly significant due to specializations in particular therapeutic areas (for example, head and neck tumors). Of crucial importance is the optimized networking of outpatient and inpatient areas, which is ensured between outpatient and inpatient dermatologists in particular by more than 40 skin tumor centers. For the future care of dermatological diseases, this optimized networking will be of high importance to maintain quality and efficiency.

## 3.5. Range of services offered by dermatology hospitals in Germany

To determine the range of services provided by German dermatology hospitals, a full survey of clinics was conducted in November 2019. From the 95 participating clinics, the following picture emerges of the inpatient care of patients by dermatology hospitals as of Jan 01, 2019 (Table 3).

### *3.5.1. Inpatient care*

In the inpatient sector, university dermatology hospitals provided care for an average of 2,874 inpatient cases, while non-university hospitals provided care for 1,983 inpatient cases (median 2,106, of which university hospitals 2,719, non-university hospitals 1,800) (Table 3). The number varied

 

**Table 1** Share of dermatology hospitals in the inpatient care of dermatological treatment cases in Germany in 2018 (from a total of 231,956 inpatient cases in dermatology clinics), sorted by the top 80 diagnoses with the highest share (analysis of hospital data from the Federal Statistical Office).

| Rank | ICD-10 | Diagnosis | Total (n) | Thereof dermatology (n) | Share dermatology (%) |
|---|---|---|---|---|---|
| 1 | L28 | Lichen simplex chronicus and prurigo | 3,172 | 3,020 | 95.21 |
| 2 | L10 | Pemphigus diseases | 1,259 | 1,195 | 94.92 |
| 3 | L41 | Parapsoriasis | 312 | 295 | 94.55 |
| 4 | L11 | Other acantholytic dermatoses | 80 | 75 | 93.75 |
| 5 | L87 | Disturbances of transepidermal elimination | 217 | 201 | 92.63 |
| 6 | L12 | Pemphigoid diseases | 4,548 | 4,106 | 90.28 |
| 7 | L43 | Lichen ruber planus | 1,247 | 1,116 | 89.49 |
| 8 | L66 | Scarring alopecia [hair loss with scarring] | 256 | 223 | 87.11 |
| 9 | L42 | Pityriasis rosea | 46 | 40 | 86.96 |
| 10 | D03 | Melanoma in situ | 2,956 | 2,560 | 86.60 |
| 11 | L30 | Other dermatitis | 12,671 | 10,842 | 85.57 |
| 12 | L20 | Atopic [endogenous] eczema | 11,421 | 9,734 | 85.23 |
| 13 | L80 | Vitiligo | 37 | 31 | 83.78 |
| 14 | L44 | Other papulosquamous skin diseases (including PRP) | 286 | 233 | 81.47 |
| 15 | Z01 | Other special examinations and clarifications for persons without complaints or stated diagnosis | 7,480 | 6,085 | 81.35 |
| 16 | L63 | Alopecia areata | 431 | 350 | 81.21 |
| 17 | L94 | Other localized diseases of the connective tissue | 1,305 | 1,025 | 78.54 |
| 18 | L56 | Other acute skin lesions caused by ultraviolet rays | 386 | 295 | 76.42 |
| 19 | B88 | Other parasite infestation of the skin | 55 | 41 | 74.55 |
| 20 | C43 | Malignant melanoma of the skin | 23,917 | 17,774 | 74.32 |
| 21 | L25 | Unspecified contact dermatitis | 338 | 249 | 73.67 |
| 22 | L71 | Rosacea | 858 | 630 | 73.43 |
| 23 | D04 | Carcinoma in situ of the skin | 3,283 | 2,405 | 73.26 |
| 24 | L24 | Toxic contact dermatitis | 535 | 382 | 71.40 |
| 25 | L40 | Psoriasis | 19,291 | 13,352 | 69.21 |
| 26 | L13 | Other bullous dermatoses | 378 | 261 | 69.05 |
| 27 | A51 | Early syphilis | 285 | 196 | 68.77 |
| 28 | B86 | Scabies | 8,537 | 5,852 | 68.55 |
| 29 | L93 | Lupus erythematosus | 1,216 | 827 | 68.01 |
| 30 | L88 | Pyoderma gangraenosum | 1,632 | 1,068 | 65.44 |
| 31 | L29 | Pruritus | 1,285 | 833 | 64.82 |
| 32 | L70 | Acne | 229 | 148 | 64.63 |
| 33 | L53 | Other erythematous diseases | 1,028 | 664 | 64.59 |

*Continued*


 

**Table 1** Continued.

| Rank | ICD-10 | Diagnosis | Total (n) | Thereof dermatology (n) | Share dermatology (%) |
|---|---|---|---|---|---|
| 34 | B85 | Pediculosis and phthiriasis | 38 | 24 | 63.16 |
| 35 | Z51 | Other medical treatment | 7,211 | 4,427 | 61.39 |
| 36 | C44 | Other malignant neoplasms of the skin (SCC, BCC) | 87,386 | 52,608 | 60.20 |
| 37 | L81 | Other disorders of skin pigmentation | 227 | 135 | 59.47 |
| 38 | L21 | Seborrheic eczema | 210 | 123 | 58.57 |
| 39 | L85 | Other epidermis thickening | 581 | 336 | 57.83 |
| 40 | C46 | Kaposi's Sarcoma | 315 | 179 | 56.83 |
| 41 | Z00 | General examination and clarification for persons without complaints or stated diagnosis | 4,535 | 2,519 | 55.55 |
| 42 | B35 | Dermatophytosis | 466 | 255 | 54.72 |
| 43 | L51 | Erythema exsudativum multiforme | 1,291 | 706 | 54.69 |
| 44 | L95 | Vasculitis not elsewhere classified that is confined to the skin | 856 | 436 | 50.93 |
| 45 | L64 | Alopecia androgenetica | 2 | 1 | 50.00 |
| 46 | L65 | Other hair loss without scarring | 18 | 9 | 50.00 |
| 47 | L67 | Anomalies of hair color and hair shaft | 6 | 3 | 50.00 |
| 48 | B07 | Viral warts | 871 | 435 | 49.94 |
| 49 | C84 | Mature T/NK cell lymphoma | 6,358 | 3,131 | 49.25 |
| 50 | D22 | Melanocytic nevus | 2,026 | 997 | 49.21 |
| 51 | L57 | Skin lesions due to chronic exposure to non-ionizing radiation | 2,721 | 1,301 | 47.81 |
| 52 | Q80 | Ichthyosis congenita | 135 | 63 | 46.67 |
| 53 | A53 | Other and unspecified syphilis | 128 | 59 | 46.09 |
| 54 | L75 | Diseases of the apocrine sweat glands | 27 | 12 | 44.44 |
| 55 | L52 | Erythema nodosum | 967 | 411 | 42.50 |
| 56 | L73 | Other diseases of the hair follicles | 6,786 | 2,810 | 41.41 |
| 57 | L83 | Acanthosis nigricans | 25 | 10 | 40.00 |
| 58 | B36 | Other superficial mycoses | 56 | 22 | 39.29 |
| 59 | L27 | Dermatitis caused by orally, enterally or parenterally ingested substances | 6,350 | 2,475 | 38.98 |
| 60 | B09 | Unspecified viral infection characterized by skin and mucosal lesions | 436 | 162 | 37.16 |
| 61 | B02 | Zoster | 26,249 | 9,652 | 36.77 |
| 62 | C00 | Malignant neoplasm of the lip | 1,779 | 641 | 36.03 |
| 63 | Q82 | Other congenital malformations of the skin | 1,851 | 659 | 35.60 |
| 64 | L50 | Urticaria | 10,315 | 3,507 | 34.00 |
| 65 | A63 | Other diseases predominantly transmitted by sexual intercourse, not elsewhere classified | 15 | 5 | 33.33 |

*Continued*

 

**Table 1** Continued.

| Rank | ICD-10 | Diagnosis | Total (n) | Thereof dermatology (n) | Share dermatology (%) |
|---|---|---|---|---|---|
| 66 | A94 | Arthropod-borne viral disease, unspecified | 3 | 1 | 33.33 |
| 67 | L26 | Exfoliative dermatitis | 21 | 7 | 33.33 |
| 68 | L82 | Seborrheic keratosis | 571 | 188 | 32.92 |
| 69 | L23 | Allergic contact dermatitis | 3,250 | 1,068 | 32.86 |
| 70 | T69 | Other damage due to low temperature | 31 | 10 | 32.26 |
| 71 | L55 | Dermatitis solaris acuta | 158 | 50 | 31.65 |
| 72 | M34 | Systemic sclerosis | 7,920 | 2,401 | 30.32 |
| 73 | B01 | Varicella | 1,050 | 308 | 29.33 |
| 74 | L68 | Hypertrichosis | 11 | 3 | 27.27 |
| 75 | L01 | Impetigo | 1,529 | 410 | 26.81 |
| 76 | D23 | Other benign neoplasms of the skin | 3,053 | 733 | 24.01 |
| 77 | B55 | Leishmaniasis | 70 | 16 | 22.86 |
| 78 | Q81 | Epidermolysis bullosa | 134 | 30 | 22.39 |
| 79 | B47 | Mycetoma | 27 | 6 | 22.22 |
| 80 | L97 | Ulcus cruris, not elsewhere classified | 7,172 | 1,521 | 21.21 |

**Table 2** Frequency of inpatient dermatological treatment cases in 2018 (top 80 diagnoses, in descending order by number of patient cases in skin clinics out of 231,956 inpatient cases; analysis of hospital data from the Federal Statistical Office).

| Rank | ICD-10 | Diagnosis | Total (n) | Thereof dermatology (n) | Share dermatology (%) | Dermatology cases cumulative |
|---|---|---|---|---|---|---|
| 1 | C44 | Other malignant neoplasms of the skin (SCC, BCC) | 87,386 | 52,608 | 60.20 | 52,608 |
| 2 | C43 | Malignant melanoma of the skin | 23,917 | 17,774 | 74.32 | 70,382 |
| 3 | L40 | Psoriasis | 19,291 | 13,352 | 69.21 | 83,734 |
| 4 | A46 | Erysipelas | 73,337 | 11,260 | 15.35 | 94,994 |
| 5 | L30 | Other dermatitis | 12,671 | 10,842 | 85.57 | 105,836 |
| 6 | L20 | Atopic [endogenous] eczema | 11,421 | 9,734 | 85.23 | 115,570 |
| 7 | B02 | Zoster | 26,249 | 9,652 | 36.77 | 125,222 |
| 8 | Z01 | Other special examinations and clarifications for persons without complaints or stated diagnosis | 7,480 | 6,085 | 81.35 | 131,307 |
| 9 | B86 | Scabies | 8,537 | 5,852 | 68.55 | 137,159 |
| 10 | Z51 | Other medical treatment | 7,211 | 4,427 | 61.39 | 141,586 |
| 11 | L12 | Pemphigoid diseases | 4,548 | 4,106 | 90.28 | 145,692 |
| 12 | L50 | Urticaria | 10,315 | 3,507 | 34.00 | 149,199 |
| 13 | C84 | Mature T/NK cell lymphoma | 6,358 | 3,131 | 49.25 | 152,330 |

*Continued*


 

**Table 2** Continued.

| Rank | ICD-10 | Diagnosis | Total (n) | Thereof dermatology (n) | Share dermatology (%) | Dermatology cases cumulative |
|---|---|---|---|---|---|---|
| 14 | L28 | Lichen simplex chronicus and prurigo | 3,172 | 3,020 | 95.21 | 155,350 |
| 15 | L73 | Other diseases of the hair follicles | 6,786 | 2,810 | 41.41 | 158,160 |
| 16 | D03 | Melanoma in situ | 2,956 | 2,560 | 86.60 | 160,720 |
| 17 | Z00 | General examination and clarification for persons without complaints or stated diagnosis | 4,535 | 2,519 | 55.55 | 163,239 |
| 18 | L27 | Dermatitis caused by orally, enterally or parenterally ingested substances | 6,350 | 2,475 | 38.98 | 165,714 |
| 19 | T86 | Failure and rejection of transplanted organs and tissues | 14,450 | 2,407 | 16.66 | 168,121 |
| 20 | D04 | Carcinoma in situ of the skin | 3,283 | 2,405 | 73.26 | 170,526 |
| 21 | M34 | Systemic sclerosis | 7,920 | 2,401 | 30.32 | 172,927 |
| 22 | I87 | Other vein diseases | 11,288 | 1,672 | 14.81 | 174,599 |
| 23 | L97 | Ulcus cruris, not elsewhere classified | 7,172 | 1,521 | 21.21 | 176,120 |
| 24 | L57 | Skin lesions due to chronic exposure to non-ionizing radiation | 2,721 | 1,301 | 47.81 | 177,421 |
| 25 | D69 | Purpura and other hemorrhagic diatheses | 11,683 | 1,267 | 10.84 | 178,688 |
| 26 | L10 | Pemphigus diseases | 1,259 | 1,195 | 94.92 | 179,883 |
| 27 | L43 | Lichen ruber planus | 1,247 | 1,116 | 89.49 | 180,999 |
| 28 | L98 | Other diseases of the skin and subcutaneous tissue, not elsewhere classified | 8,856 | 1,072 | 12.10 | 182,071 |
| 29 | L23 | Allergic contact dermatitis | 3,250 | 1,068 | 32.86 | 183,139 |
| 30 | L88 | Pyoderma gangraenosum | 1,632 | 1,068 | 65.44 | 184,207 |
| 31 | L94 | Other localized diseases of the connective tissue | 1,305 | 1,025 | 78.54 | 185,232 |
| 32 | D22 | Melanocytic nevus | 2,026 | 997 | 49.21 | 186,229 |
| 33 | L29 | Pruritus | 1,285 | 833 | 64.82 | 187,062 |
| 34 | L93 | Lupus erythematosus | 1,216 | 827 | 68.01 | 187,889 |
| 35 | L08 | Other local infections of the skin and subcutaneous tissue | 3,888 | 799 | 20.55 | 188,688 |
| 36 | D23 | Other benign neoplasms of the skin | 3,053 | 733 | 24.01 | 189,421 |
| 37 | L51 | Erythema exsudativum multiforme | 1,291 | 706 | 54.69 | 190,127 |

*Continued*

 

**Table 2** Continued.

| Rank | ICD-10 | Diagnosis | Total (n) | Thereof dermatology (n) | Share dermatology (%) | Dermatology cases cumulative |
|---|---|---|---|---|---|---|
| 38 | B00 | Herpes virus infection | 6,314 | 677 | 10.72 | 190,804 |
| 39 | L53 | Other erythematous diseases | 1,028 | 664 | 64.59 | 191,468 |
| 40 | Q82 | Other congenital malformations of the skin | 1,851 | 659 | 35.60 | 192,127 |
| 41 | C00 | Malignant neoplasm of the lip | 1,779 | 641 | 36.03 | 192,768 |
| 42 | L71 | Rosacea | 858 | 630 | 73.43 | 193,398 |
| 43 | E88 | Other metabolic disorders | 4,945 | 541 | 10.94 | 193,939 |
| 44 | I73 | Other peripheral vascular diseases | 3,402 | 450 | 13.23 | 194,389 |
| 45 | L95 | Vasculitis not elsewhere classified that is confined to the skin | 856 | 436 | 50.93 | 194,825 |
| 46 | B07 | Viral warts | 871 | 435 | 49.94 | 195,260 |
| 47 | L52 | Erythema nodosum | 967 | 411 | 42.50 | 195,671 |
| 48 | L01 | Impetigo | 1,529 | 410 | 26.81 | 196,081 |
| 49 | M33 | Dermatomyositis-Polymyositis | 2,946 | 409 | 13.88 | 196,490 |
| 50 | L24 | Toxic contact dermatitis | 535 | 382 | 71.40 | 196,872 |
| 51 | L63 | Alopecia areata | 431 | 350 | 81.21 | 197,222 |
| 52 | L85 | Other epidermis thickening | 581 | 336 | 57.83 | 197,558 |
| 53 | A99 | Unspecified viral hemorrhagic disease | 3,085 | 311 | 10.08 | 197,869 |
| 54 | B01 | Varicella | 1,050 | 308 | 29.33 | 198,177 |
| 55 | L41 | Parapsoriasis | 312 | 295 | 94.55 | 198,472 |
| 56 | L56 | Other acute skin lesions caused by ultraviolet rays | 386 | 295 | 76.42 | 198,767 |
| 57 | L92 | Granulomatous diseases of the skin and subcutaneous tissue | 1,831 | 293 | 16.00 | 199,060 |
| 58 | L13 | Other bullous dermatoses | 378 | 261 | 69.05 | 199,321 |
| 59 | B35 | Dermatophytosis | 466 | 255 | 54.72 | 199,576 |
| 60 | L25 | Unspecified contact dermatitis | 338 | 249 | 73.67 | 199,825 |
| 61 | L44 | Other papulosquamous skin diseases (incl. PRP) | 286 | 233 | 81.47 | 200,058 |
| 62 | L66 | Scarring alopecia [hair loss with scarring] | 256 | 223 | 87.11 | 200,281 |
| 63 | L87 | Disturbances of transepidermal elimination | 217 | 201 | 92.63 | 200,482 |
| 64 | A51 | Early syphilis | 285 | 196 | 68.77 | 200,678 |
| 65 | L82 | Seborrheic keratosis | 571 | 188 | 32.92 | 200,866 |
| 66 | C46 | Kaposi's sarcoma | 315 | 179 | 56.83 | 201,045 |

*Continued*


 

**Table 2** Continued.

| Rank | ICD-10 | Diagnosis | Total (n) | Thereof dermatology (n) | Share dermatology (%) | Dermatology cases cumulative |
|---|---|---|---|---|---|---|
| 67 | B09 | Unspecified viral infection characterized by skin and mucosal lesions | 436 | 162 | 37.16 | 201,207 |
| 68 | L70 | Acne | 229 | 148 | 64.63 | 201,355 |
| 69 | L60 | Diseases of the nails | 1,402 | 146 | 10.41 | 201,501 |
| 70 | L81 | Other disorders of skin pigmentation | 227 | 135 | 59.47 | 201,636 |
| 71 | L21 | Seborrheic eczema | 210 | 123 | 58.57 | 201,759 |
| 72 | L11 | Other acantholytic dermatoses | 80 | 75 | 93.75 | 201,834 |
| 73 | Q80 | Ichthyosis congenita | 135 | 63 | 46.67 | 201,897 |
| 74 | A53 | Other and unspecified syphilis | 128 | 59 | 46.09 | 201,956 |
| 75 | A52 | Late syphilis | 361 | 55 | 15.24 | 202,011 |
| 76 | L55 | Dermatitis solaris acuta | 158 | 50 | 31.65 | 202,061 |
| 77 | B88 | Other parasite infestation of the skin | 55 | 41 | 74.55 | 202,102 |
| 78 | L42 | Pityriasis rosea | 46 | 40 | 86.96 | 202,142 |
| 79 | L58 | Radiodermatitis | 182 | 35 | 19.23 | 202,177 |
| 80 | L80 | Vitiligo | 37 | 31 | 83.78 | 202,208 |

from 7,813 to 104 cases per year. Comparing 2015 and 2018, there was a small median decrease from 2,126 to 2,106 cases.

### *3.5.2. Outpatient care*

The median number of outpatients treated in 2018 was 13,313 cases, of which 21,447 in university hospitals and 7,638 in non-university hospitals (median total: 2,106, of which university hospitals: 18,847, non-university hospitals: 6,000). The number varied between 111 and 58,600 in university hospitals and between 111 and 58,600 in non-university hospitals.

### *3.5.3. Cases served compared to previous year*

Overall, 64.1 % found an increase in inpatient cases compared to the previous year, 15.2 % found a decrease, and 20.7 % found no change, including university hospitals: 58.1 % – 25.8 % – 16.1 %, and non-university hospitals: 67.2 % – 9.8 % – 23.0 %.

### *3.5.4. Case mix and case mix index*

The average case mix in 2018 was 1,805.0 (university hospitals: 2,021.1; non-university hospitals: 1,636.4), and the average case mix index (CMI) was 0.76 (university hospitals: 0.74; non-university hospitals: 0.77).

The average length of stay was found to be 5.79 days (university hospitals: 5.50; non-university hospitals: 5.90).

Changes between 2015 and 2018 were found to be: case mix: 1,769 vs. 1,567, CMI: 0.80 vs. 0.80, length of stay: 6.00 days vs. 5.79 days.

### *3.5.5. Medical staff*

The average number of full-time positions was 13, and the average number of part-time positions was 3 (max. 48, min. 3; university hospitals: 27/23, non-university hospitals: 11/9).

The proportion of women was 53.0 % among senior physicians and 73.3 % among residents (university hospitals: 42.4 %/68.9 %; non-university hospitals: 58.7 %/75.8 %; urban areas: 50.2 %/73.1 %; rural areas: 63.7 %/74.2 %).

A very or somewhat poor applicant situation was reported by the directors surveyed by 68.2 % for senior physicians, 58.8 % for specialists, and 6.4 % for residents.

A worse applicant situation was expressed in non-university hospitals and in rural areas.

### *3.5.6. Clinical performance focus*

With regard to the indications treated, the dermatology hospitals in Germany show a wide range (Table 2). When grouped into focus areas, dermatosurgical and general

 

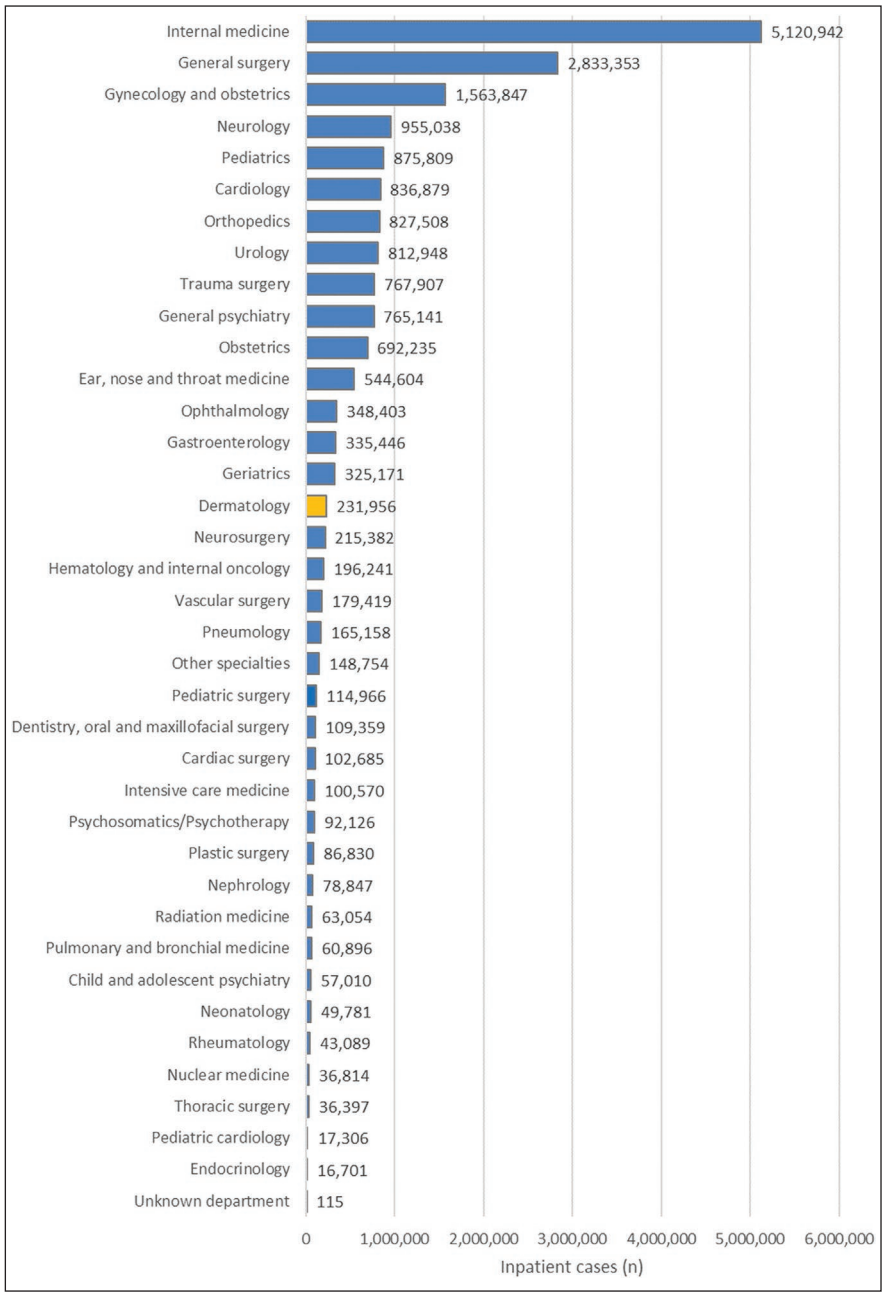


**Figure 4** Number of inpatient treatment cases in Germany in 2018 comparing the departments (analysis of hospital data from the Federal Statistical Office).

dermatological cases are the most frequently treated indication groups in both university and non-university hospitals, followed by oncological cases (Table 4).

### 3.6. Indications for inpatient dermatological care

Inpatient dermatological care covers a large number of skin diseases of different genesis (Tables 1, 2). According to the Social Security Code V (SGB V) [33], the indication for inpatient treatment results from the particular severity of the disease and the justified prospect of a relevantly better treatment with higher patient benefit through inpatient care. For most dermatological diseases, there is a broader spectrum of corresponding severity levels and thus a clinical continuum in the indication for outpatient versus inpatient care. In each case, a distinction is made between *(1)* indications that predominantly require inpatient care, *(2)* indications that require optional inpatient care, and *(3)* indications that rarely require inpatient care or do not require inpatient care. A high proportion of patients requiring inpatient treatment is found, for example, among those with severe allergic and inflammatory skin reactions, severe autoimmune skin diseases, skin


 

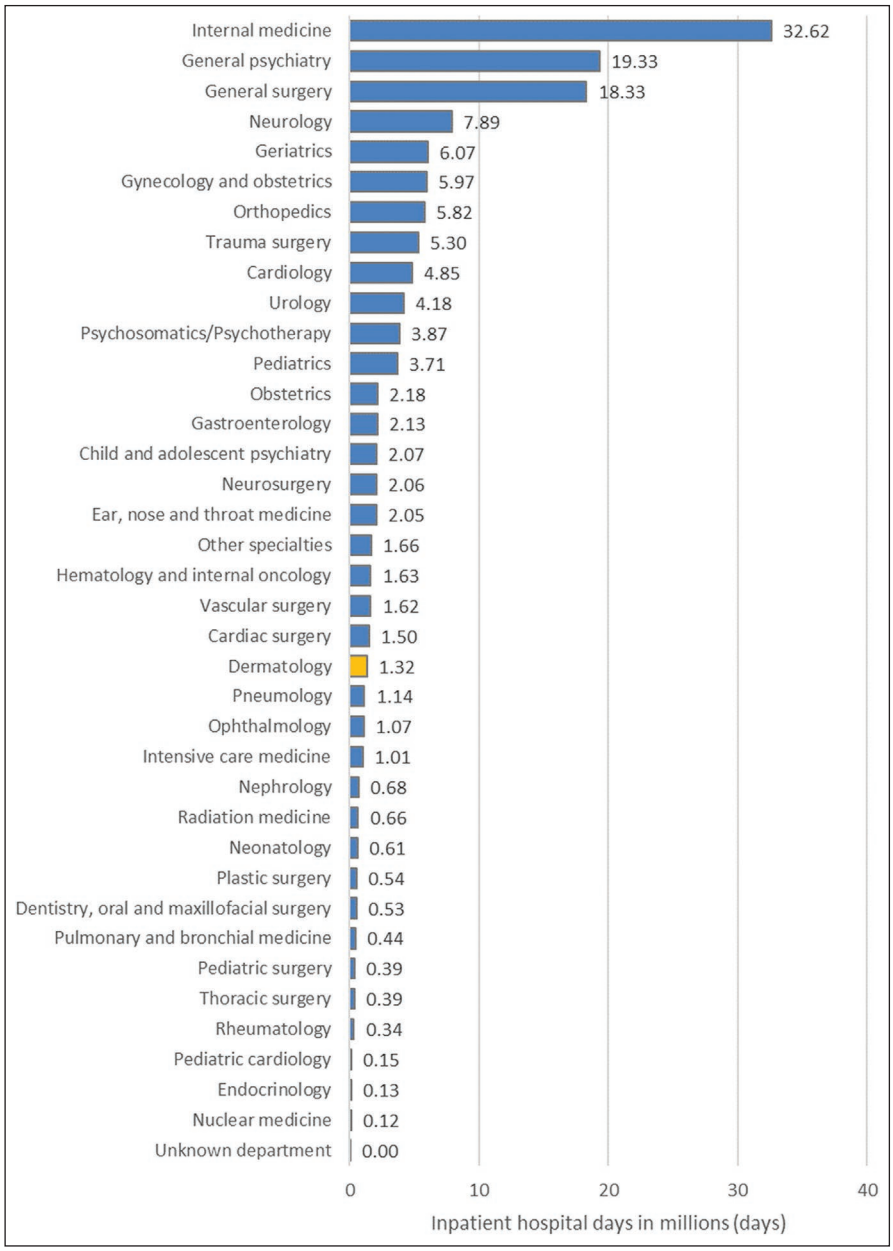


**Figure 5** Number of inpatient hospital days (in millions) in 2018 by department (analysis of hospital data from the German Federal Statistical Office).

tumors, and chronic wounds. For many, purely outpatient care will not be possible also in the future. In contrast, a greater potential for increased outpatient care is found in the main forms of psoriasis due to the high volume of highly effective drugs, while special forms such as generalized pustular psoriasis and erythrodermic forms continue to require primarily inpatient treatment.

An important determinant of severe courses with a high disease burden is age. An example of an age distribution predominantly in the last third of life are the skin cancers, where especially squamous cell carcinoma and basal cell carcinoma are found in the high age groups. An equally large accumulation in the old age groups is also found, among others, in the bullous autoimmune diseases. Typical examples of skin diseases with a high incidence in people over 60 years of age are therefore bullous pemphigoid (Figure 9), melanoma (Figure 10) and squamous cell carcinoma of the skin (Figure 11). In these cases, there has been both an age-related and an intrinsic increase in the number of cases in recent decades.

## 3.7. Forecast models for future inpatient care requirements for skin diseases in Germany

The following analysis determines future inpatient care needs based on current and past inpatient care, taking into account demographic effects and the epidemiology of skin diseases.

 

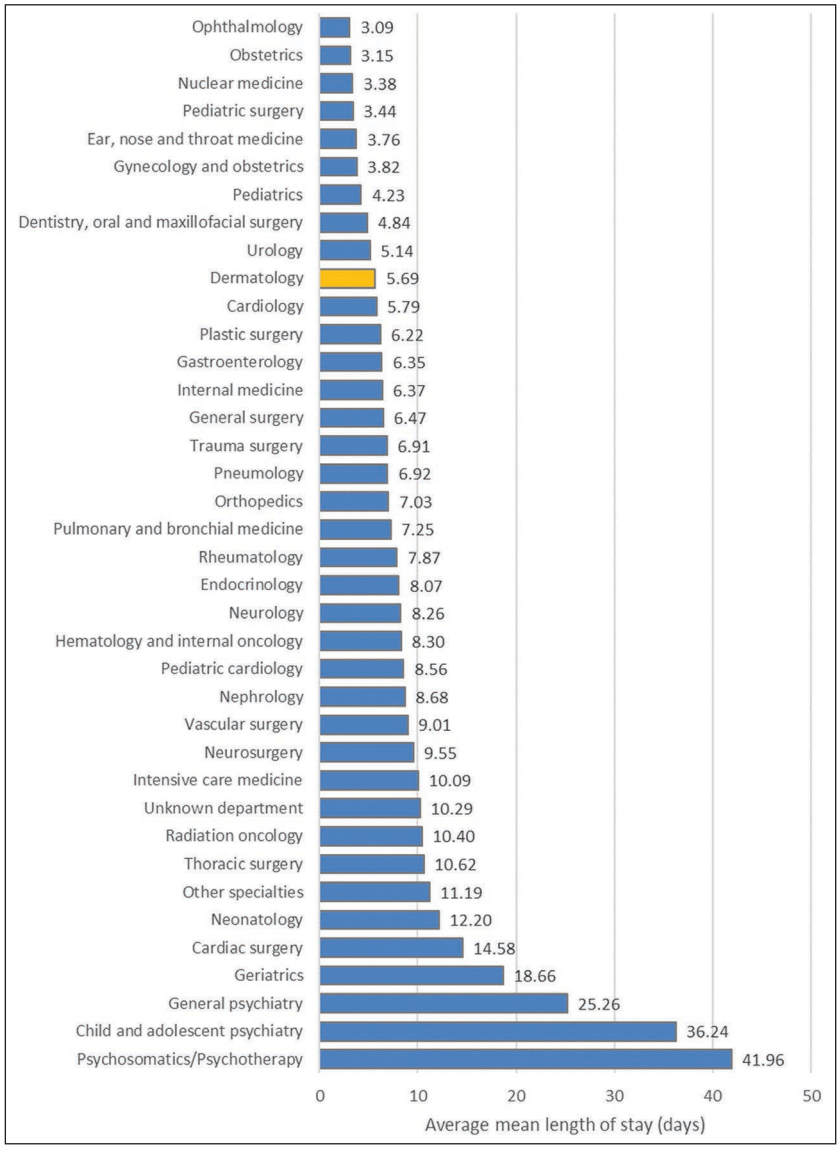


**Figure 6** Average mean length of stay in inpatient treatment (days) in the various specialty departments in 2018 (analysis of hospital data from the German Federal Statistical Office).

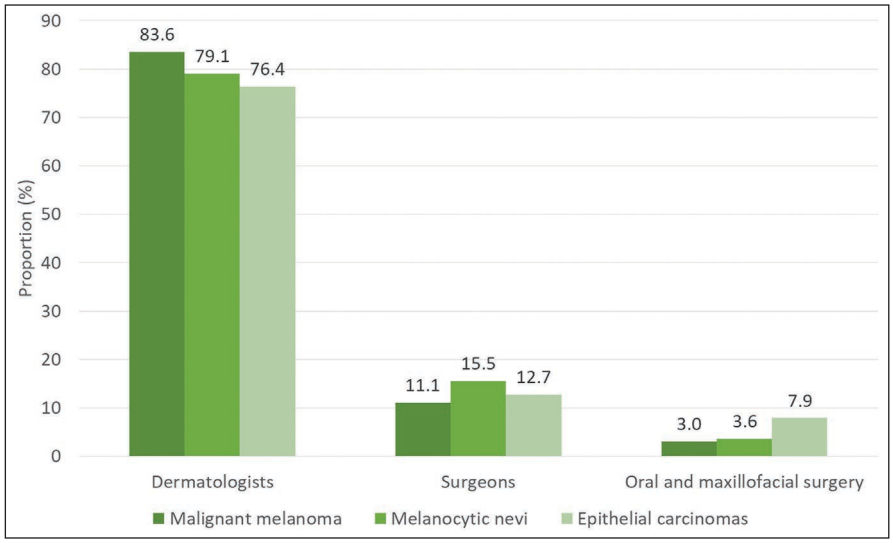


**Figure 7** Share of specialist groups in outpatient care for skin cancer in Germany.


 

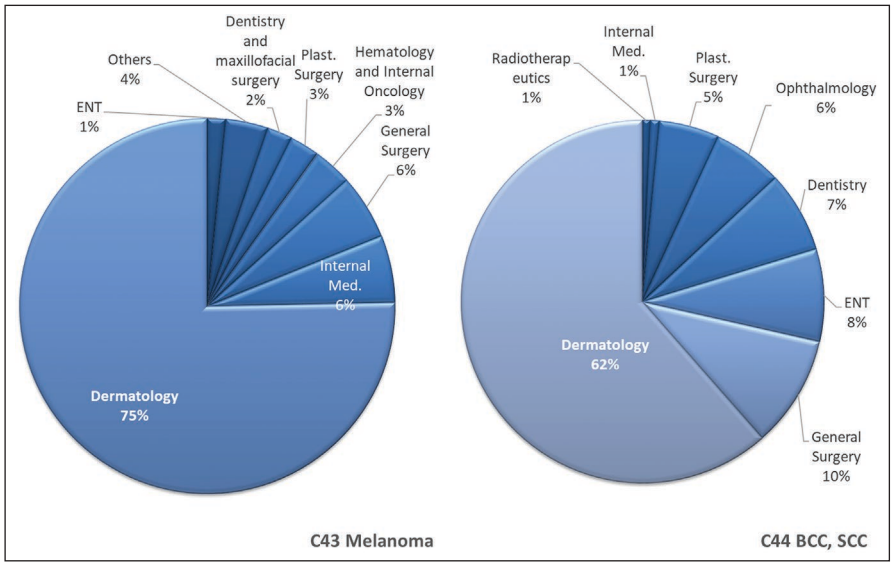


**Figure 8** Proportion of specialist groups in inpatient care for skin cancer in Germany.

**Table 3** Structure and process characteristics of dermatology hospitals in Germany (as of Jan 01, 2019).

| Parameter | Mean value | Range |
|---|---|---|
| *Number of beds* | | |
| Inpatient beds, thereof | 45 | 10–153 |
| University hospitals | 52 | 24–106 |
| Non-university clinics | 40 | 10–153 |
| Urban space | 48 | 10–153 |
| Rural area | 33 | 16–96 |
| *Change in the number of beds 2019* | | |
| No change (%) | 79.3 | 70.6–83.3 |
| Increase (%) | 9.8 | 5.9–23.1 |
| Decrease (%) | 10.9 | 0.0–23.5 |
| *Future planning of the number of beds* | | |
| No change (%) | 65.2 | 46.9–75.0 |
| Increase (%) | 28.3 | 23.3–37.5 |
| Decrease (%) | 6.5 | 1.7–15.6 |
| *Occupancy* | | |
| Average occupancy | 84.7 | 64–111 |
| University hospitals | 85.2 | 64–111 |
| Non-university clinics | 84.5 | 65–100 |
| *Inpatient cases* | | |
| Average number | 2,302 | 104–7,813 |
| University hospitals | 2,874 | 1,157–7,168 |
| Non-university clinics | 1,983 | 104–7,813 |
| Urban space | 2,607 | 450–7,813 |
| Rural area | 1,204 | 104–2,040 |
| *Outpatient cases* | | |
| Average number | 13,313 | 0–58,600 |
| University hospitals | 21,447 | 111–58,600 |
| Non-university clinics | 7,638 | 0–40,000 |
| Urban space | 14,967 | 111–58,600 |
| Rural area | 5,678 | 0–17,000 |
| *Inpatient cases – change* | | |
| No change (%) | 20.7 | 16.1– 23.0 |
| Increase (%) | 64.1 | 58.1–67.2 |
| Decrease (%) | 15.2 | 9.8–25.8 |
| *Case mix* | | |
| Average case mix | 1,805.0 | 188.0–5,478.0 |
| University hospitals | 2,021.1 | 188.0–5,478.0 |
| Non-university clinics | 1,636.4 | 302.4–3,308.9 |
| Urban space | 1,831.4 | 188.0–5478.0 |
| Rural area | 979.8 | 329.5–1774.0 |
| *Case mix index* | | |
| Average case mix index | 0.76 | 0.43–0.96 |
| University hospitals | 0.74 | 0.43–0.87 |
| Non-university clinics | 0.77 | 0.78–0.96 |
| Urban space | 0.76 | 0.43–0.94 |
| Rural area | 0.76 | 0.43–0.96 |

 

**Table 4** Proportion of dermatological specialties in inpatient cases in German dermatological hospitals in 2018.

| Dermatological specialties | Total (%) | University hospitals (%) | Non-university clinics (%) |
|---|---|---|---|
| Dermatosurgical cases | 33.6 | 34.1 | 33.3 |
| General dermatological cases | 31.3 | 28.9 | 32.6 |
| Oncological cases | 15.5 | 18.1 | 14.1 |
| Other (e. g. allergology, phlebology) | 19.6 | 18.9 | 20.0 |

### *3.7.1. Population development as a determinant of future inpatient care requirements*

It is well known that between 2020 and 2060, the total German population is expected to decline slowly at first, but then more sharply (Figure 12). According to experts, this development will not be compensated for by migration. Due to demographic change with an increase in the median age and, at the same time, a lower reproduction rate, the share of the elderly population will increase significantly, and the absolute number of elderly people will remain high for several decades.

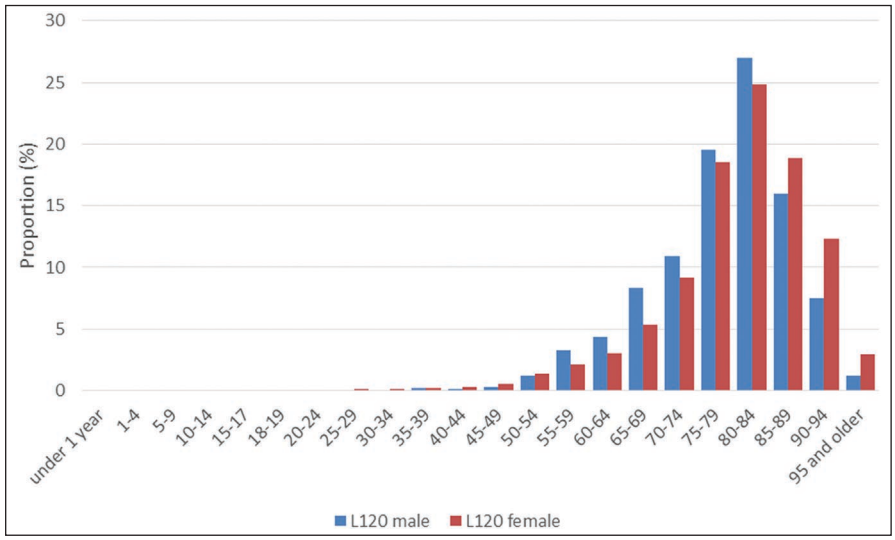


**Figure 9** Age distributions in inpatient care in 2018: bullous pemphigoid (ICD-10 L12.0; n = 4,548 inpatient cases).

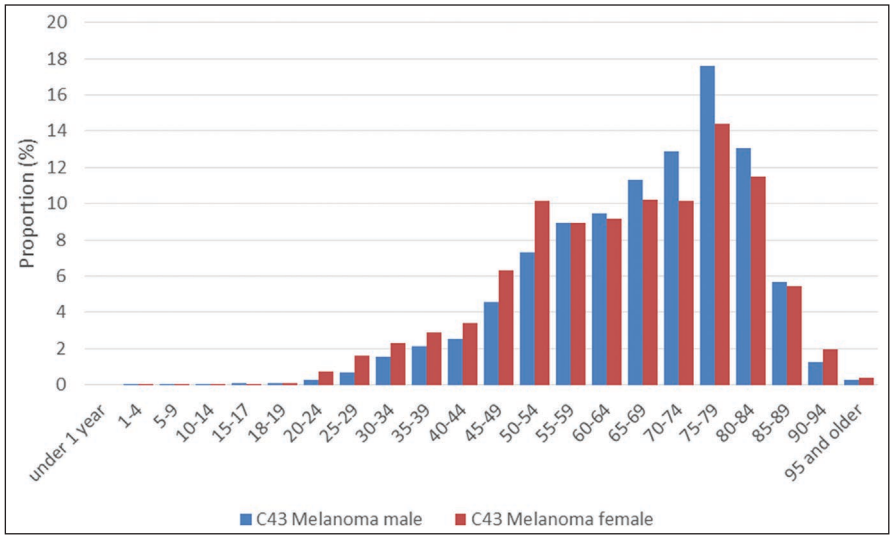


**Figure 10** Age distributions in inpatient care in 2018: melanoma (ICD-10 C43; n = 23,917 inpatient cases).


 

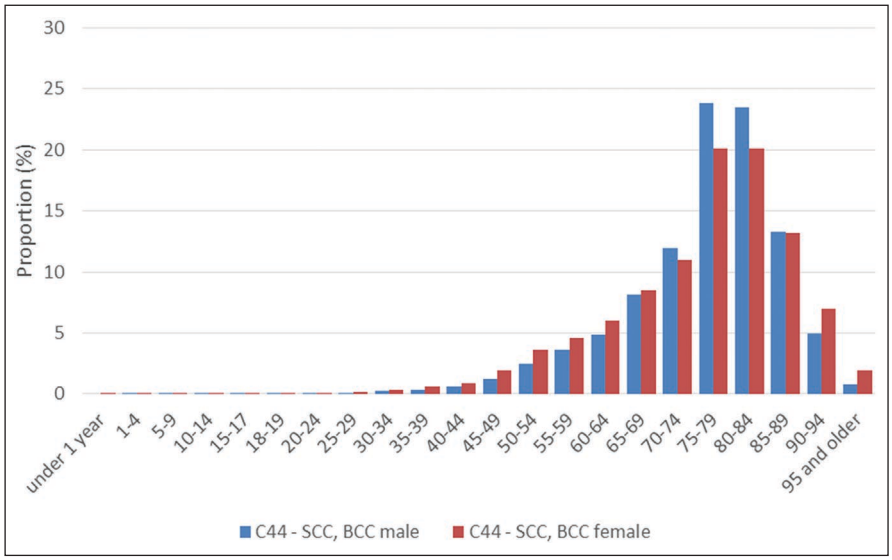


**Figure 11** Age distributions in inpatient care in 2018: epithelial skin cancer, mainly squamous cell carcinoma (SCC) and basal cell carcinoma (BCC) (ICD-10 C44; n = 87,386 inpatient cases).

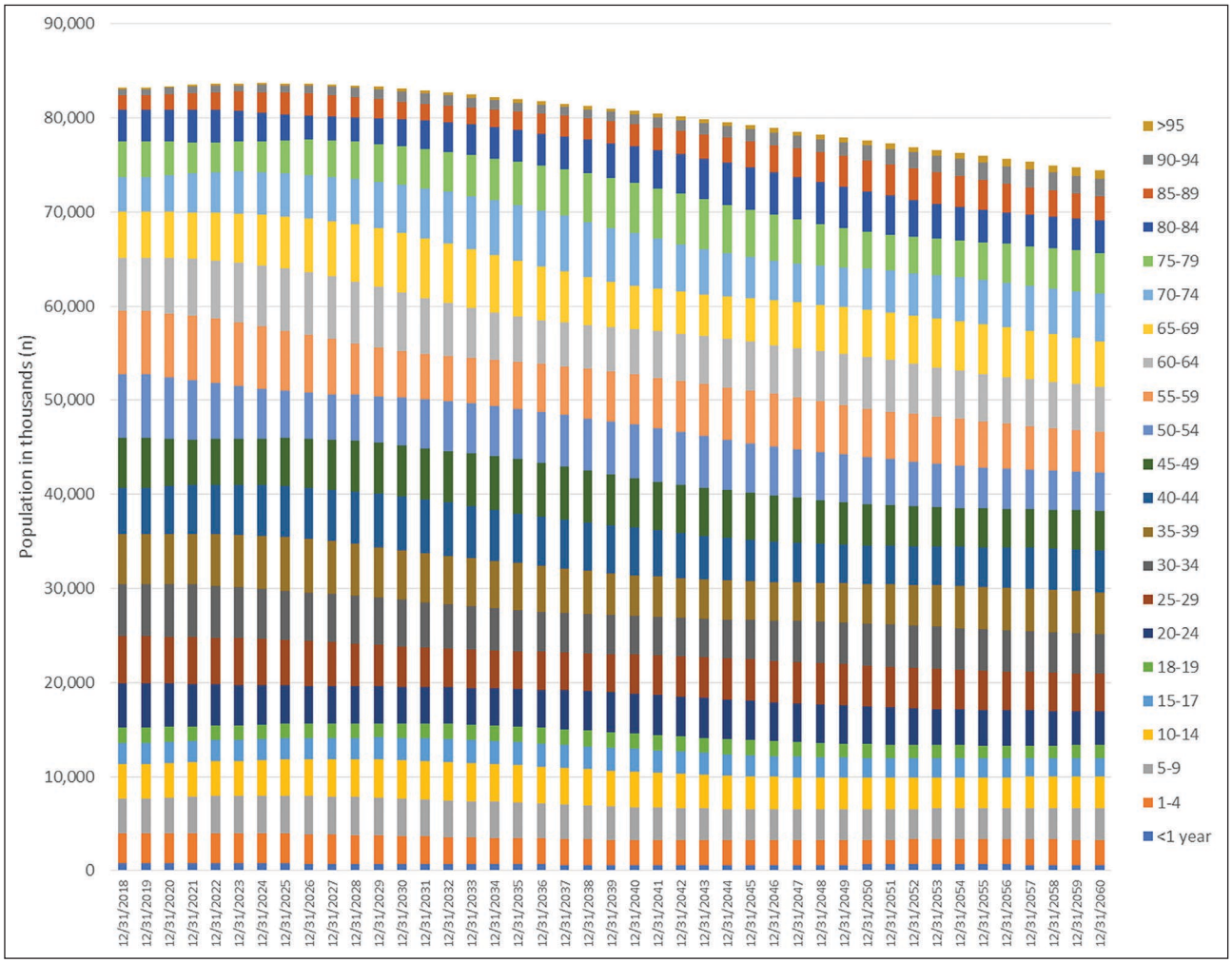


**Figure 12** Population development in Germany 2020–2060 according to age groups (data from the Federal Statistical Office 2020).

 

**Table 5** Selection of typical common skin diseases and their prevalence in the German population (multi-source analysis).

| Disease | Prevalence 2017 | |
|---|---|---|
| | (%) | Persons in Germany (n) |
| Acne | 4.00 | 3,256,000 |
| Actinic keratoses | 2.60 | 2,116,400 |
| Allergic diseases | 41.70 | 33,943,800 |
| Allergic rhinitis | 25.00 | 20,350,000 |
| Alopecia | 2.60 | 2,116,400 |
| Eczema diseases except neurodermatitis | 6.80 | 5,535,200 |
| Chronic venous insufficiency | 15.40 | 12,535,600 |
| Hand eczema | 1.10 | 895,400 |
| Skin tumors, malignant | 1.90 | 1,546,600 |
| Skin tumors, benign | 72.00 | 58,608,000 |
| Herpes simplex diseases | 5.50 | 4,477,000 |
| Hidradenitis suppurativa/ Acne inversa | 0.45 | 366,300 |
| Hyperhidrosis | 15.60 | 12,698,400 |
| Hyperhidrosis, severe forms | 2.50 | 2,035,000 |
| Intertrigo | 1.00 | 814,000 |
| Contact eczema | 7.80 | 6,349,200 |
| Lichen ruber | 0.45 | 366,300 |
| Mycoses of the skin | 11.20 | 9,116,800 |
| Nevus cell naevi (birthmarks) | 92.00 | 74,888,000 |
| Neurodermatitis | 4.20 | 3,418,800 |
| Neurodermatitis, severe forms | 0.80 | 651,200 |
| Pruritus | 16.90 | 13,756,600 |
| Pruritus, severe forms | 4.50 | 3,663,000 |
| Psoriasis vulgaris | 2.50 | 2,035,000 |
| Psoriasis vulgaris, severe forms | 0.50 | 407,000 |
| Pyoderma | 9.20 | 7,488,800 |
| Rosacea | 2.30 | 1,872,200 |
| Seborrheic keratoses | 26.00 | 21,164,000 |
| Rare severe skin diseases | 0.40 | 325,600 |
| Urticaria, chronic | 1.20 | 976,800 |
| Viral warts | 3.20 | 2,604,800 |
| Vitiligo | 0.60 | 488,400 |
| Wounds, hard to heal | 1.10 | 895,400 |

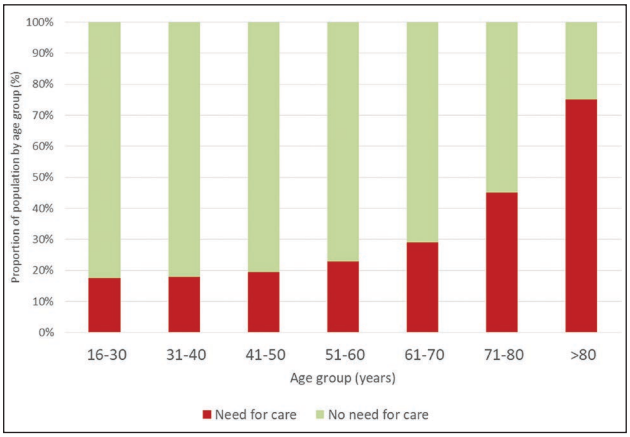


**Figure 13** Proportion of the adult standard population in Germany with a need for treatment due to a skin disease based on a population-based survey series (n = 154,313) (based on [1]).

### *3.7.2. Epidemiology of skin diseases as a determinant of future inpatient care needs*

Skin diseases have a high frequency in the general population in Germany as well as internationally (Table 5). According to a population-based study of 154,313 people, the need for care of a dermatological disease is about 25 % per year [1] (Figure 13). This need is met largely on an outpatient basis. However, the number of skin diseases requiring inpatient treatment due to their severity is considerable and reflects the overall high prevalence in the population.

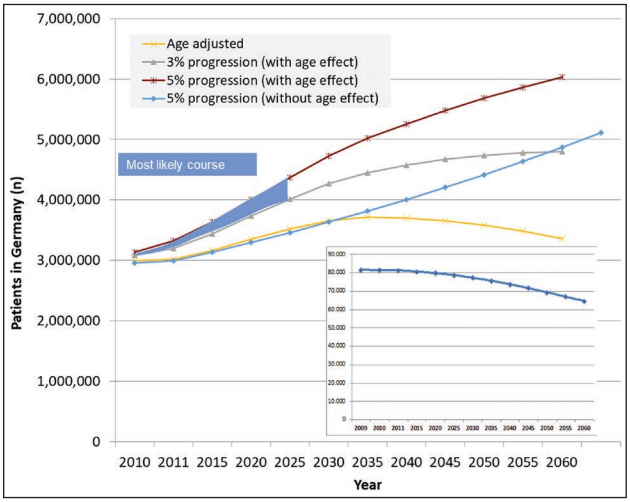


**Figure 14** Prognosis of the prevalence development of actinic keratoses as an expression of the future skin cancer risk in the population. In the small window, the predicted development of the population (multi-source analysis; data from 2011 to 2020).


 

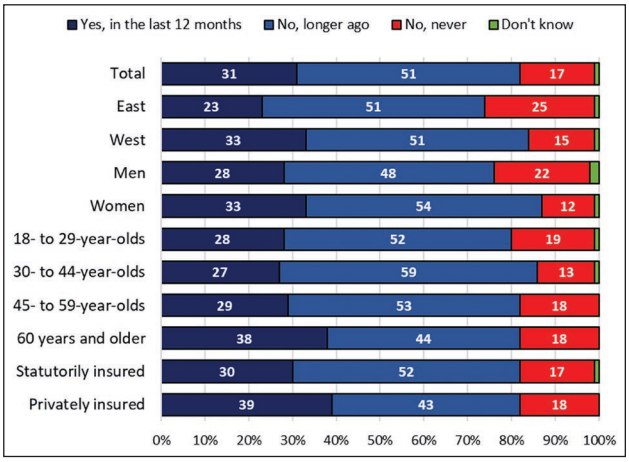


**Figure 15** Proportion of the adult standard population in Germany that has already been treated by a dermatologist in the last twelve months or ever (based on [34]).

The development of the prevalence of important skin diseases with a high potential need for inpatient care indicates a further increase, especially in the area of skin cancer. The forecast of the prevalence of actinic keratoses is an important example here, as it represents an expression of the future risk of skin cancer in the population (Figure 14). Because of the damage already done by non-ionizing radiation, the progression can be predicted with comparative certainty. It can be assumed that, contrary to the trend in population development, there will be a significant increase in actinic keratoses and thus also in white skin cancer.

### *3.7.3. Transition between outpatient and inpatient care of skin diseases as a determinant of future inpatient care needs*

According to a population-representative survey, about 30 % of the German population have contact with a dermatologist within one year (Figure 15) [34]. About 80 % have already been to a dermatologist once in their life. The most frequent occasions for treatment are screening and examinations for skin cancer (28 % of respondents), chronic inflammatory skin diseases such as psoriasis and atopic dermatitis (9 %), allergic skin diseases (9 %), and acne (7 %), followed by many other skin diseases (Figure 16).

Specialist dermatological treatment has the highest preference among a large proportion of the population: In the event of a dermatological disease, over 70 % of the adult population would consult a dermatologist directly, particularly for skin diseases in general, atopic dermatitis, psoriasis, acne, skin cancer, prevention of skin cancer and occupational skin diseases (Figure 17).

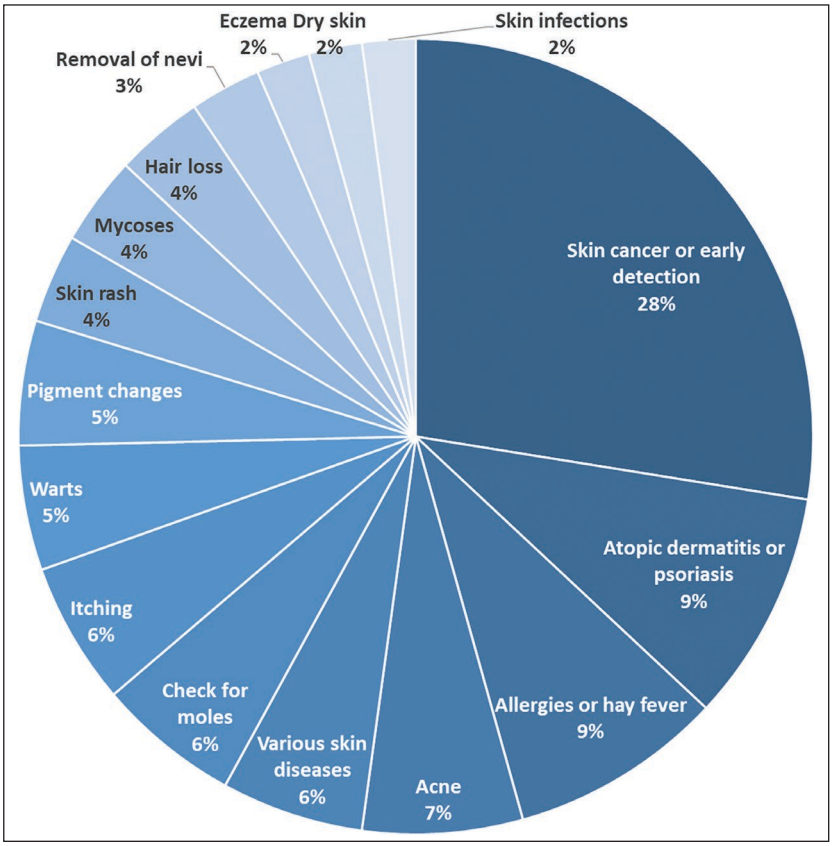


**Figure 16** Disease patterns of adult German patients leading to dermatologist (based on [34]).

 

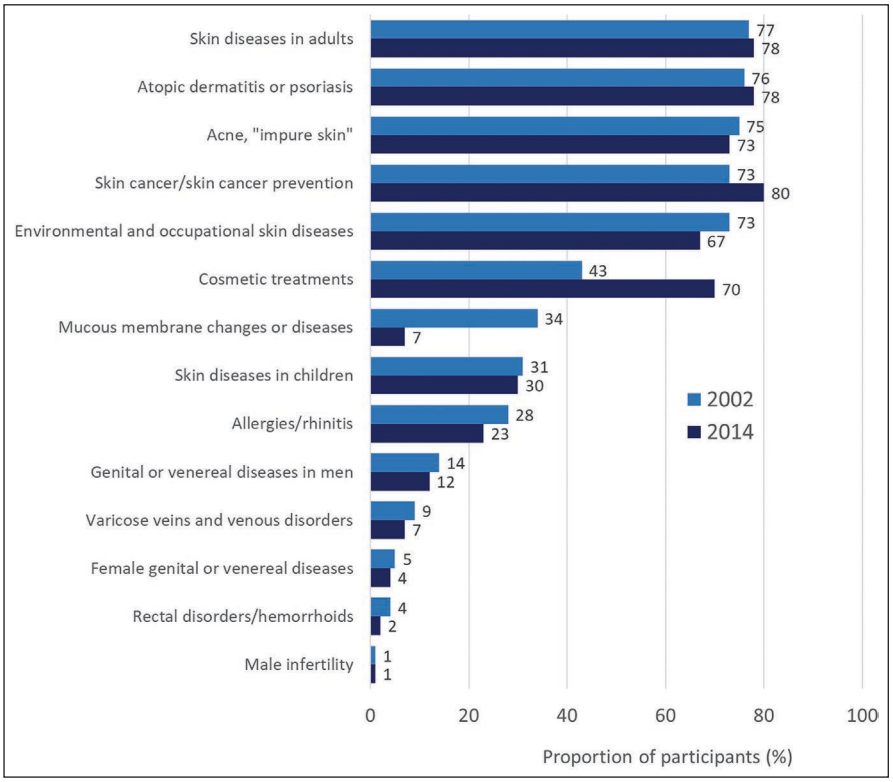


**Figure 17** Proportion of the standard German population who would consult a dermatologist directly for dermatological diseases (based on [34]).

The indications of the dermatological treatments carried out by specialists in the care of panel doctors show corresponding distributions to the epidemiology of skin diseases (Table 6). These represent relevant interfaces to inpatient care as well as to the optimization of outpatient before inpatient care.

### *3.7.4. Inpatient care demand 2020 to 2060: forecast model updating current inpatient dermatological care*

If current rates of dermatological inpatient care are extrapolated in relation to age groups, demographic change will result in an increase in treatment cases of about 40 % over the next 40 years (Figure 18).

### *3.7.5. Inpatient care demand 2020 to 2060: forecast model assuming continuation of the trend in current inpatient dermatological care*

In the second model, the inpatient care demand is determined by taking into account the growth rates of inpatient treatment cases for dermatological diseases in the five, ten and 15 preceding years. Based on the development of the rate of inpatient treatment cases for dermatological indications observed in the last ten years, this intrinsic effect and demographic change will result in an increase in dermatological inpatient care until 2060. Insofar as a technologically based or regulatory based weakening of the inpatient treatment rate takes place here, this curve is more subdued (Figure 19).

### *3.7.6. Inpatient care demand 2020 to 2060: forecast model assuming continuation of the trend in current inpatient dermatological care*

In the third model, the inpatient care demand is adjusted for the forecast change in morbidity (Figure 20). The number of inpatient treatment cases in recent years is kept constant in the ratios. This results in a slight increase in inpatient cases of white skin cancer, a significant increase in autoimmune dermatoses, but a decrease in chronic inflammatory diseases.

In summary, the rates of increase in inpatient dermatological care due to the increase in the frequency of skin diseases and the increase in inpatient treatment cases due to demographic development each represent relevant determinants which together suggest a slight further increase in inpatient treatment cases in the coming decades, despite gradually declining population figures in Germany.

## 3.8. Care capacity of inpatient dermatology departments

In view of the continuing high demand for care of skin diseases requiring inpatient treatment, the question of the availability of the corresponding bed capacities is of great


 

**Table 6** Most frequent dermatological treatment diagnoses of SHI-accredited dermatology practices in KV Nordrhein (data analysis KV Nordrhein; mean value of quarters 1–4/2019).

| Rank | ICD-10 | Diagnosis | Share of diagnoses (%) |
|---|---|---|---|
| 1 | D22 | Melanocytic nevus | 25.2 |
| 2 | L30 | Other dermatitis | 14.3 |
| 3 | C44 | Other malignant neoplasms of the skin | 11.5 |
| 4 | B35 | Dermatophytosis [Tinea] | 9.6 |
| 5 | Z12 | Special procedures for the examination for neoplasms | 8.1 |
| 6 | L40 | Psoriasis | 7.7 |
| 7 | L71 | Rosacea | 6.2 |
| 8 | L20 | Atopic [endogenous] eczema | 6.3 |
| 9 | L70 | Acne | 6.4 |
| 10 | L57 | Skin lesions due to chronic exposure to non-ionizing radiation. | 6.6 |
| 11 | L82 | Seborrheic keratosis | 6.0 |
| 12 | D04 | Carcinoma in situ of the skin | 4.8 |
| 13 | B07 | Viral warts | 4.4 |
| 14 | J30 | Vasomotor and allergic rhinopathy | 4.1 |
| 15 | D23 | Other benign neoplasms of the skin | 4.0 |
| 16 | T78 | Adverse reactions, not elsewhere classified | 3.7 |
| 17 | C43 | Malignant melanoma of the skin | 3.7 |
| 18 | B86 | Scabies | 3.2 |
| 19 | L21 | Seborrheic eczema | 3.5 |
| 20 | L85 | Other epidermis thickening | 2.6 |
| 21 | L81 | Other disorders of skin pigmentation | 2.7 |
| 22 | L72 | Follicular cysts of the skin and subcutaneous tissue | 2.5 |
| 23 | I83 | Varices of the lower extremities | 2.3 |
| 24 | D48 | Neoplasm of uncertain or unknown behavior in other and unspecified locations | 2.2 |
| 25 | L23 | Allergic contact dermatitis | 2.0 |

importance. An analysis of the available care capacity reveals regional differences that are subject to control at best at the state level. Here, the bed requirement plans and the regional regulations of inpatient care determine the supply of care in the inpatient dermatology sector. For this reason, the supply in the regional area by dermatological clinics was analyzed.

The analyses show that there is generally a lower density of care in rural areas than in urban areas. The average distance to the nearest dermatology clinic varies greatly (Figures 21, 22).

Another important planning parameter is bed density in relation to population. A large disparity is also found here, with no region in Germany having a ratio of less than 50,000 inhabitants per bed (data not shown).

## 3.9. Availability of outpatient specialist dermatological care

The availability of outpatient specialist dermatology care plays an important role in further inpatient dermatology care planning.

When determining the distance to the nearest dermatologist in the outpatient sector, the geocoded simulation of all inhabitants of Germany shows a predominantly good, but in some cases also very poor accessibility (Figures 23, 24). A significant reduction in the number of specialist physician offices can also be expected in the coming decades [35]. In many regions, it will not be possible to shift from inpatient to outpatient care.

 

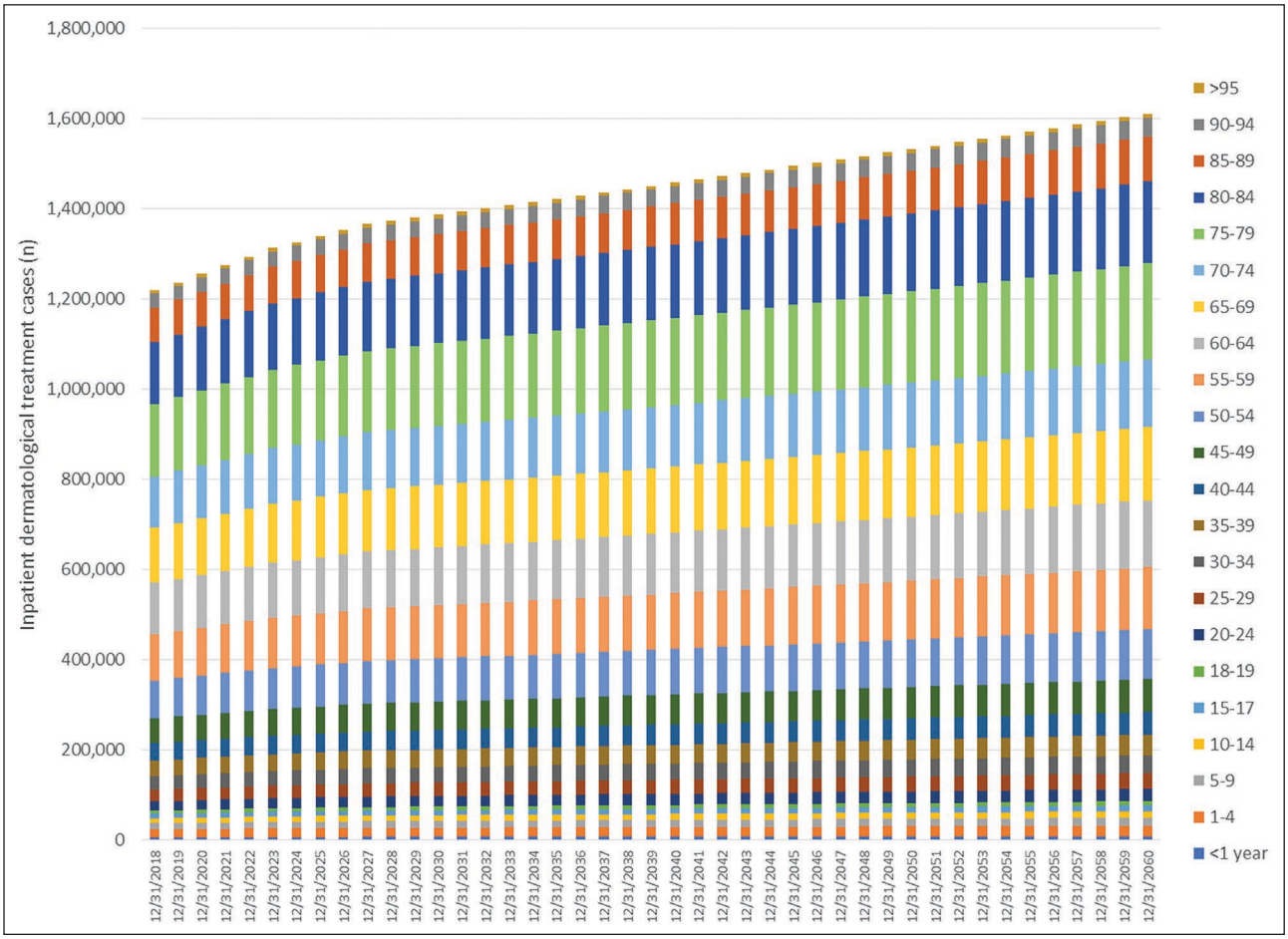


**Figure 18** Scenario of future inpatient dermatological treatment cases in Germany when extrapolating the inpatient care rates determined in 2018 in relation to age groups (analysis of population data and hospital data from the Federal Statistical Office).

### 3.10. Quality of care provided by dermatology specialists compared to physicians in other specialties

A decisive criterion for future demand planning and the allocation of inpatient bed capacity is the extent to which differences in quality and efficiency between dermatological and non-dermatological clinics can be expected in inpatient care. A recent literature review found clear evidence for the superiority of specialist dermatological care in numerous core indications of dermatology (Figure 25). The conclusion of the study situation is: *(1)* dermatologists made fewer misdiagnoses compared to non-dermatologists, *(2)* dermatologists performed a correct treatment strategy in a high percentage compared to non-dermatologists, and *(3)* the efficiency of care provided by dermatologists was higher.

### 3.11. Outpatient potential of dermatological care

Another criterion for future demand planning is the option of even greater outpatient care for patients with skin diseases. Here the limits are, as shown above, *(1)* the decreasing availability of outpatient care capacity and *(2)* the high severity and high comorbidity of many patients with severe skin diseases. Even with the addition of innovative technologies and digital options such as teledermatology, there is still an expected need for inpatient dermatological care by dermatology clinics, which, according to the available data, will not be less than in the past.

## 4. Discussion

The objective of the present project was to characterize current and future inpatient dermatological care with its range of services and demand. For this purpose, a standard demand model according to the requirements of the German Social Security Code V (Sozialgesetzbuch V, SBG V) was used.

In health care planning, the need for inpatient care in Germany is regulated at the state level according to the German Social Security Code (SGB). Important determinants of the need for inpatient care are the population-related mortality and morbidity of these diseases, which are


 

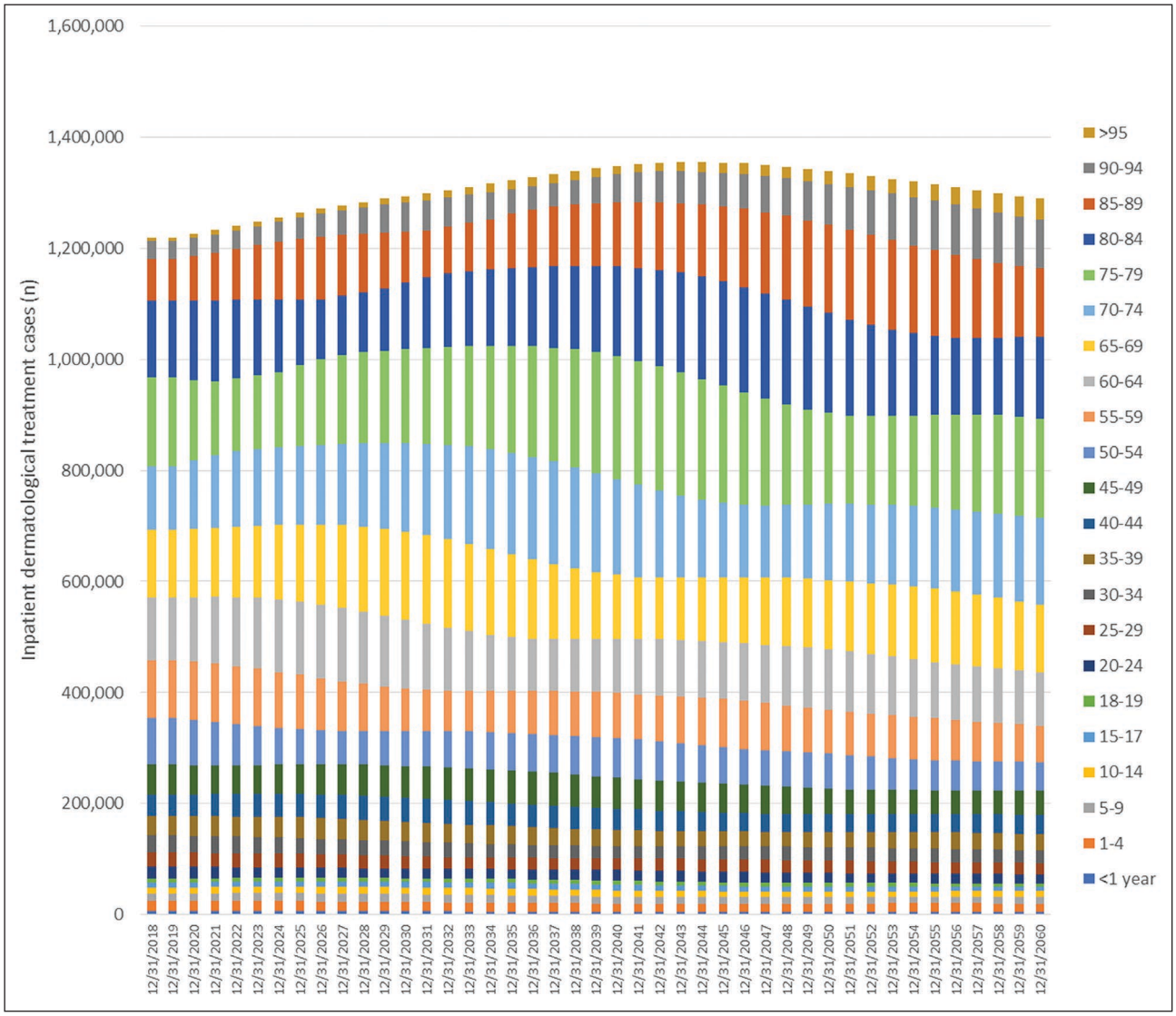


**Figure 19** Projection of future inpatient dermatological treatment cases in Germany when taking into account demographic developments and the 10-year trend in inpatient care based on the inpatient care rates determined in 2018 in relation to age groups (evaluation of hospital data from the Federal Statistical Office).

estimated by means of incidence and prevalence measures. In addition to the objective criteria, however, the subjective burden of disease and disabilities are also of relevance to social legislation on an indication-by-indication basis. The SGB V (§ 39 ff) is decisive for the entitlement to hospital treatment of the statutorily insured, and the Hospital Financing Act (KHG) and the Hospital Remuneration Act (KHEntgG) with the agreements made at the federal and state level as well as at the level of the individual hospital (in particular § 17b KHG, §§ 9 ff KHEntgG) are decisive for the recognition and billing of services.

At the individual level, the necessity of inpatient hospital treatment is defined uniformly throughout Germany by the resolution of the Federal Joint Committee on a new version of the Hospital Treatment Guideline of January 22, 2015 [36] as follows: "Inpatient hospital treatment is necessary if further treatment with the resources of a hospital must be provided for medical reasons. It is not necessary in the case of treatments that do not serve the therapy of an illness in the insurance-law sense (for example, cosmetic surgery). Outpatient treatment has priority over inpatient treatment if the treatment objective can be achieved expediently and without disadvantage to the patient by means of outpatient care, including home nursing (§ 39 (1) sentence 2 SGB V)." It goes on to say, "The prescription of inpatient hospital treatment is considered solely for medical reasons. The special concerns

 

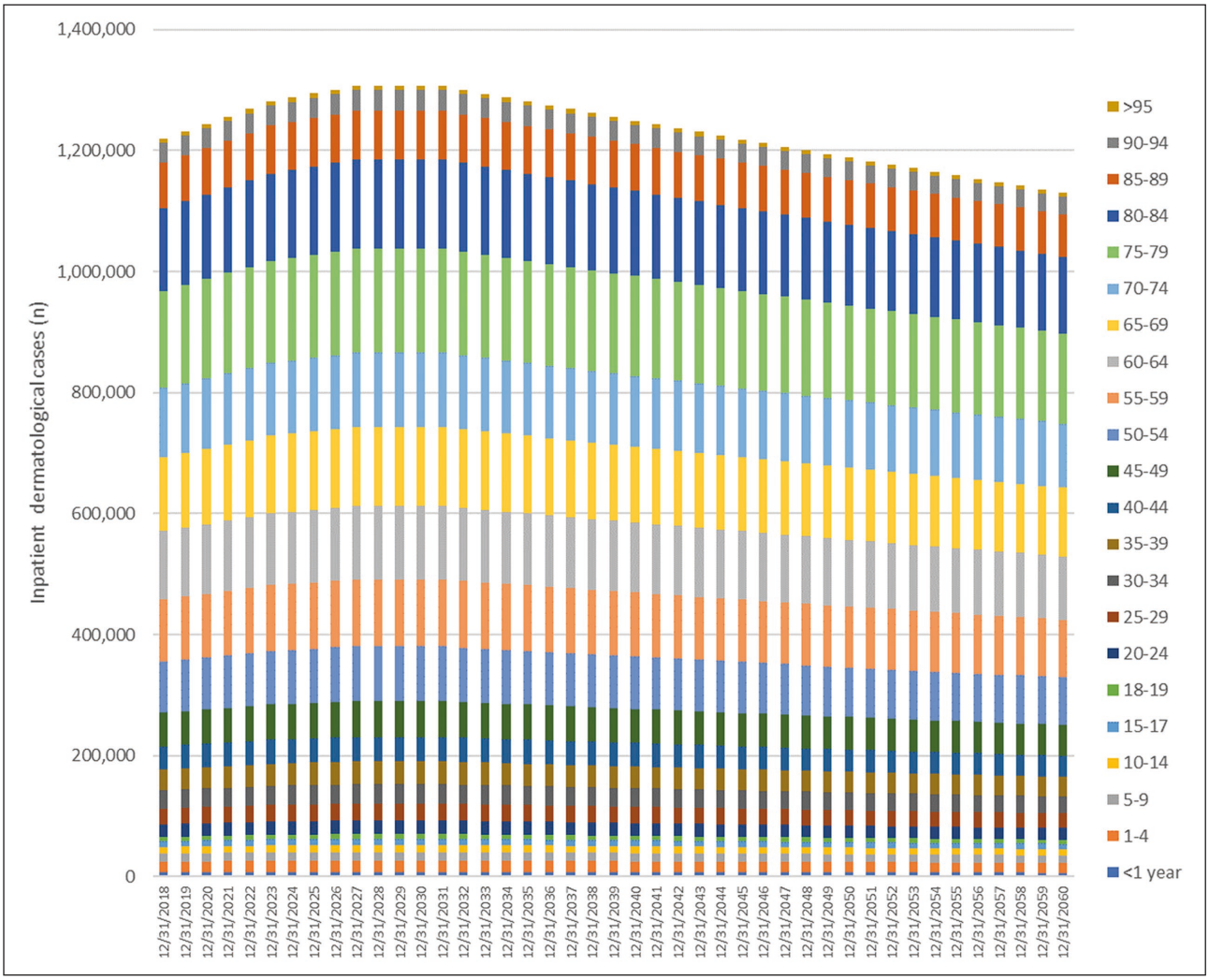


**Figure 20** Development of inpatient care performance taking into account the development of morbidity based on the 10-year trend 2010–2020 (analysis of hospital data from the Federal Statistical Office).

of disabled and chronically ill people must be taken into account (§ 2a SGB V). All parties involved are to cooperate in avoiding occupancy of hospitals by patients who do not require treatment by hospital means." The G-AEP criteria (Appropriateness evaluation protocol), which were agreed upon in Germany by the National Association of Statutory Health Insurance Funds and the German Hospital Federation to review the appropriateness of inpatient hospital treatment, also provide orientation for the practice of the examined need for care in the inpatient area for dermatological indications [37].

The focus in defining and planning future inpatient care needs is on *(1)* the development of epidemiology and *(2)* the severity and relevance of the respective indication including its comorbidity, for which a mode of care has been established over the last decades. Both were initially analyzed separately in order to avoid making possible overuse, underuse, and misuse as the basis for current and future needs assessment.

The need was therefore first divided into the components of the need assessment and then modeled with disease severity and the extent of objective and subjective negative consequences of the disease. This showed that in a broad spectrum of dermatological diseases, patients have a higher level of need for inpatient care, with a continuum from mild to severe cases in each of most diseases. This applies, for example, to tumor diseases of the skin, autoimmune diseases and chronic inflammatory skin diseases. The indication for inpatient care is always based on the medical as well as socio-legal question of whether inpatient treatment, compared to outpatient treatment, can better avert mortality, morbidity and high patient burden as well as negative consequences caused by the disease and its therapy to a more than minor extent. In addition to the purely disease-related foundation of


 

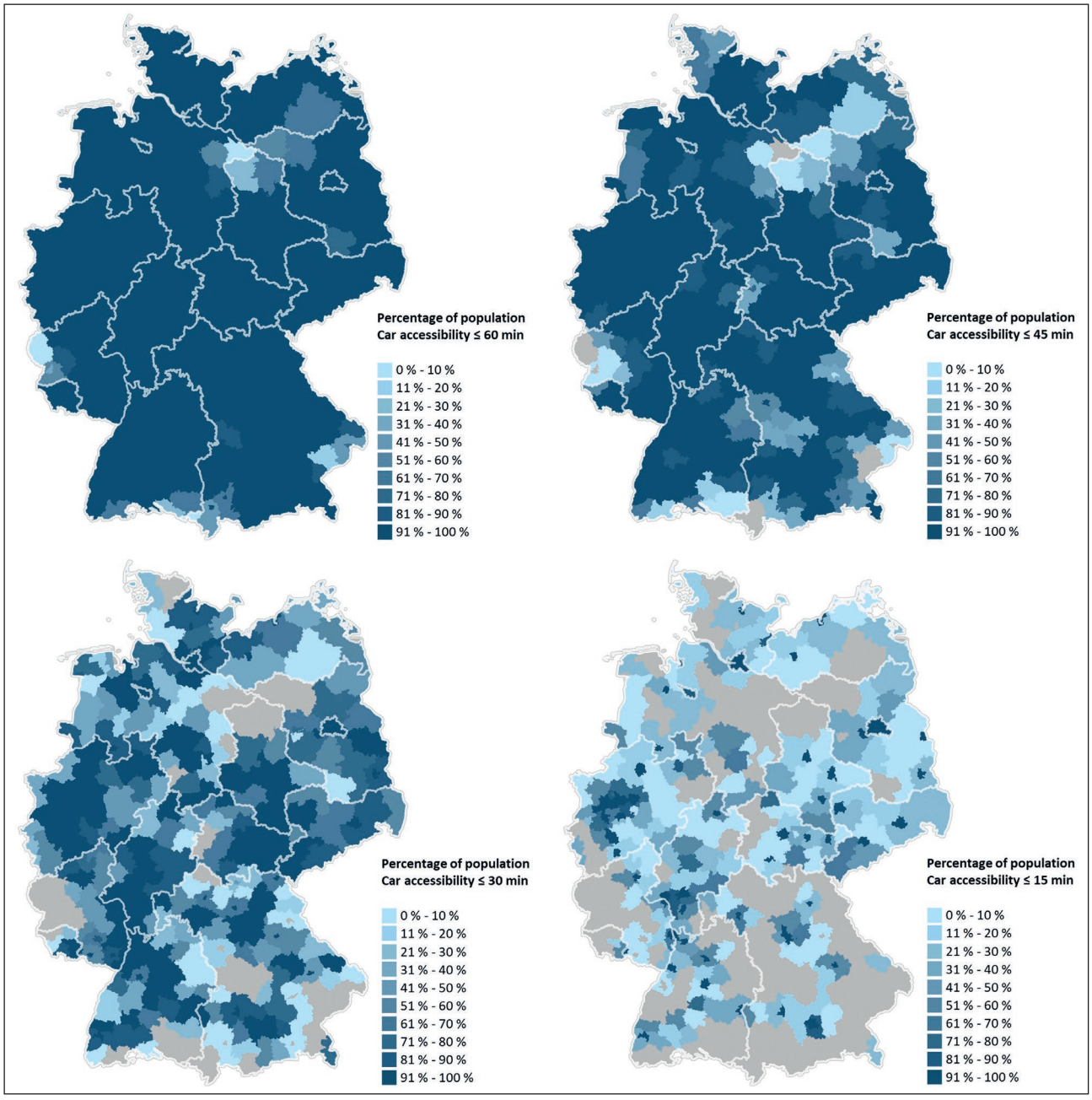


**Figure 21** Percentage of the population at the district level with a car accessibility of 15, 30, 45, and 60 min to the nearest dermatology clinic (data basis: © ESRI, © BKG, as of 2020).

the inpatient indication, other patient-related factors, in particular age, multimorbidity and multimedication, were also taken into account accordingly.

In a second approach, it was determined to what extent the current mode of inpatient care, which in the second decade after the introduction of DRG (Diagnosis Related Groups) has in the meantime undergone a very stringent definition of the need for inpatient care, will be continued while adjusting to demographic developments. In this approach, it was initially noted that inpatient care for dermatological diseases in Germany has experienced a relative increase, in contrast to inpatient care for all diseases as a whole. This is especially true for the severe malignant tumors of the skin, the complex autoimmune diseases and genodermatoses as well as chronic

 

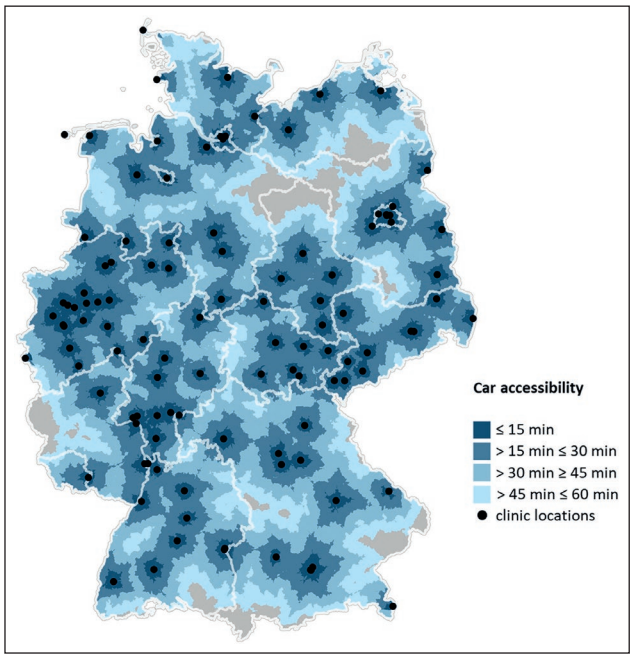


**Figure 22** Car accessibility of all dermatology clinic locations in Germany (data basis: © ESRI, © BKG, as of 2020).

inflammatory and vascular diseases. Taking into account the intrinsic increase in inpatient cases in the years 2005–2019, a further increase in inpatient treatment requirements is to be expected here. In addition, there is the factor of demographic development, since a relevant proportion of the indications requiring inpatient care occur more frequently in older and, above all, very old people.

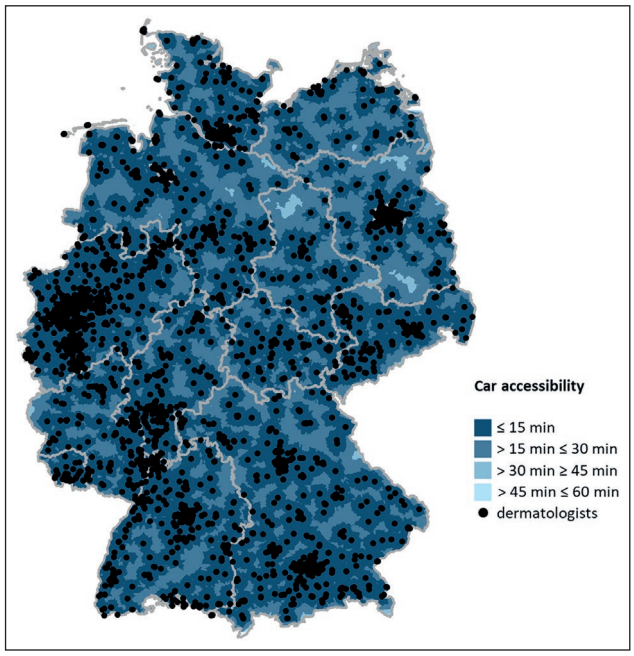


**Figure 23** Car accessibility of all dermatologist locations in Germany (data basis: © ESRI, © BKG, DDA, as of 2020).

The data clearly show that there is currently a nationwide inpatient dermatological care system providing a wide range of care, which provides a large proportion of the inpatient treatments relevant to care in Germany for indications such as skin cancer. A division of labor with other disciplines is recognizable in each case, this anyway below the statistically visible level at the level of cooperation between the inpatient departments.

The analysis of inpatient care for skin diseases in Germany shows in particular that important diseases with indications for inpatient care are frequently to far predominantly treated by dermatology departments. This applies in particular to skin cancer and severe immune diseases of the skin. The skin clinics offer a wide range of care with a large number of specializations and can therefore meet the high breadth of care requirements.

In characterizing the major indications for inpatient care, it is striking that over 60 different indications contribute significantly to the case mix in inpatient care.

On the other hand, most skin diseases are on a continuum between mild forms that can be managed on an outpatient basis and severe to most severe forms that escalate on an outpatient basis or are primarily not manageable with the options of outpatient medicine. For each indication, it is therefore necessary to determine which proportion based on which criteria define the need for inpatient care. In forecasting the need for inpatient dermatological care, two basic approaches were included in the planning: first, to extrapolate the status quo of care, taking into account demographic change; second, to adjust to the current intrinsic trend of changing epidemiology of the diseases; third, *de novo*, omitting the current care services due to morbidity burden.

In all three cases, the need for dermatological health care for the inpatient sector is considered to remain high and – following the trend of the last 15 years – a continued increase in the need for inpatient care is to be expected. The future possibilities of an increased outpatient shift instead of inpatient care were also examined and included in the forecast. In the non-surgical dermatological field, technologies with the potential to avoid inpatient care include modern drug therapies, which can be considered and are already effective for some patients, particularly those with severe chronic inflammatory skin diseases. In contrast, outpatient care has already been used to a great extent for surgery and other diseases that can only be treated in inpatient dermatological complex therapy and will continue to be an indispensable component of inpatient care in the future.


 

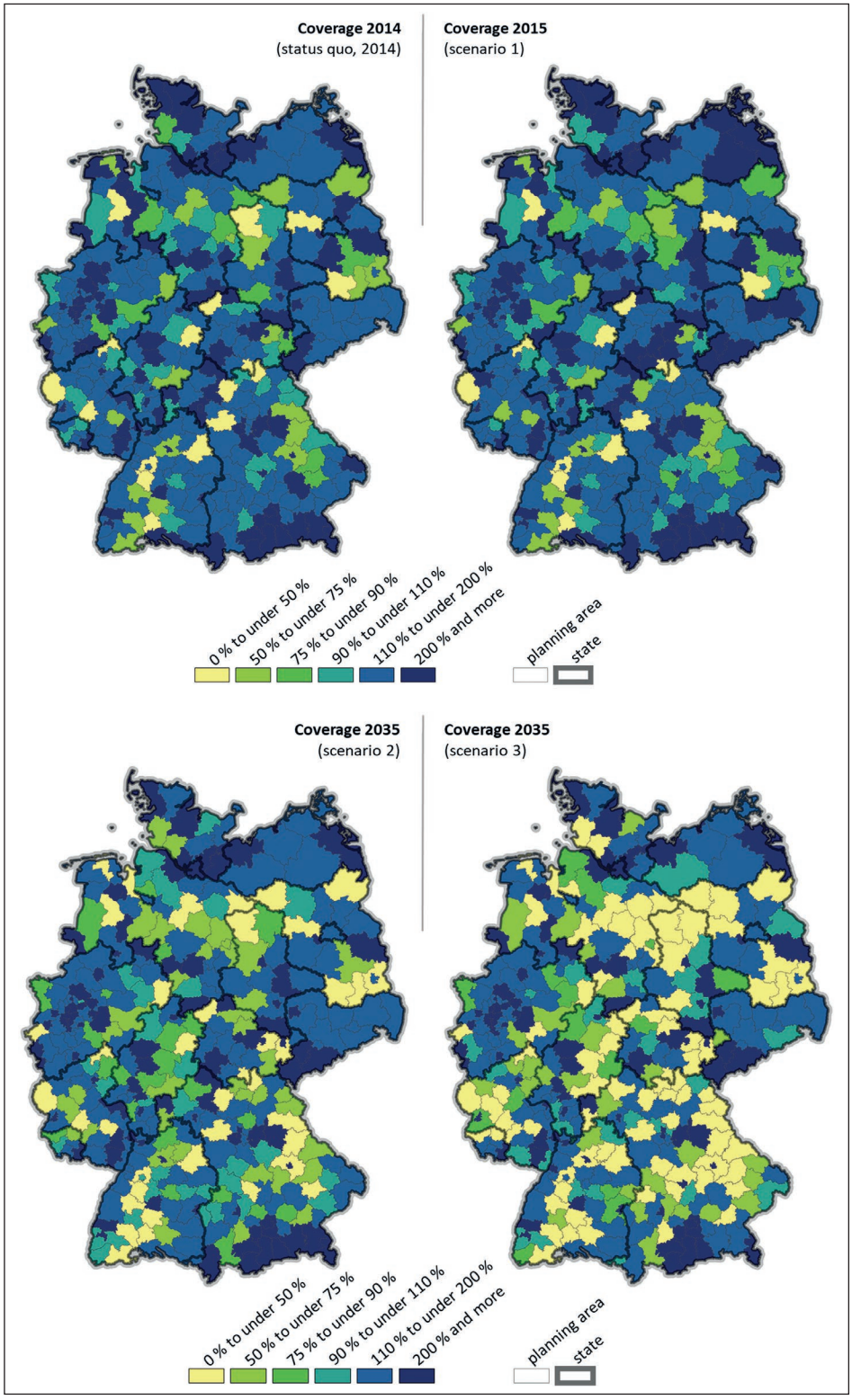


**Figure 24** Dermatology coverage "status quo", "scenario 1" (100 % restocking of all physician seats by 2035), "scenario 2" (one physician seat per planning area cannot be restocked by 2035), "scenario 3" (two physician seats in more rural regions cannot be restocked by 2035) [35] (Data basis: © ESRI, © BKG, © BBSR, DDA, as of 2013/2014).

 

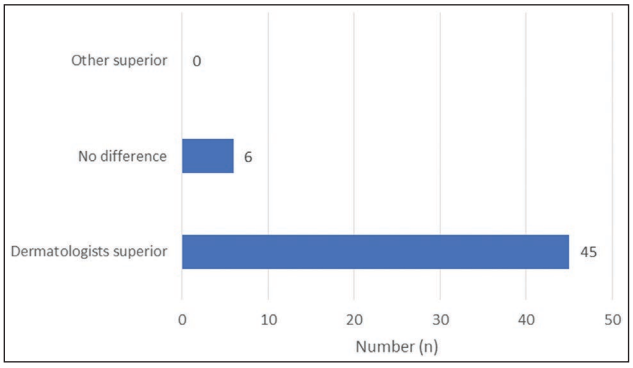


**Figure 25** Data situation on the quality of care provided by dermatologists versus non-dermatologists in the literature (n = 51 studies in head-to-head comparison).

## Acknowledgement

The authors thank the Scientific Communication Team of the IVDP, especially Sara Tiedemann and Mario Gehoff, for copy editing.

## Financial support

This study was not financially supported.

### Conflict of interest

None.

### Correspondence to

Matthias Augustin, MD
Institute for Health Services Research in Dermatology and Nursing (IVDP)
University Medical Center Hamburg-Eppendorf (UKE)

Martinistrasse 52
20246 Hamburg, Germany

E-mail: m.augustin@uke.de

### References

1 Augustin M, Herberger K, Hintzen S et al. Prevalence of skin lesions and need for treatment in a cohort of 90 880 workers. Br J Dermatol 2011; 165(4): 865–73.
2 Girbig G, Biedermann T, Hertl M et al. Strukturen und Leistungsmerkmale der Hautkliniken in Deutschland: Aktuelle Bestandsaufnahme und Langzeitverlauf. J Dtsch Dermatol Ges 2021. doi: 10.1111/ddg.14618
3 Augustin M, Girbig G, Hertl M et al. Status quo und Perspektiven der Hautkliniken in Deutschland: Versorgungsspektren und Personalsituation. J Dtsch Dermatol Ges 2021. doi: 10.1111/ddg.14616
4 Fürstenberg T, Gierling P, Irps S et al. DRG benchmarking: analysis of service structures and -differences in dermatology departments. J Dtsch Dermatol Ges 2014; 12(7): 594–604.
5 Beikert FC, Stadler R, Kaufmann R, Augustin M. Performance profiles of German university dermatology departments. J Dtsch Dermatol Ges 2013; 11(2): 170–6.
6 Statistisches Bundesamt (Destatis). Gesundheit. Krankenhäuser. Available from: https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Gesundheit/Krankenhaeuser/_inhalt.html (Last accessed October 15, 2020).
7 Bundesärztekammer. (Muster-)Weiterbildungsordnung 2018. Available from: https://www.bundesaerztekammer.de/aerzte/aus-weiter-fortbildung/weiterbildung/muster-weiterbildungsordnung/ (Last accessed February 11, 2021).
8 Basra MKA, Shahrukh M. The burden of skin diseases. Expert Rev Pharmacoecon Outcomes Res 2009; 9(3): 271–83.
9 Seth D, Cheldize K, Brown D, Freeman EF. Global burden of skin disease: inequities and innovations. Curr Dermatol Rep 2017; 6(3): 204–10.
10 Lim HW, Collins SAB, Resneck JS Jr. et al. A risk adjustment approach to estimating the burden of skin disease in the United States. J Am Acad Dermatol 2018; 78(1): 129–40.
11 Statistisches Bundesamt (Destatis). Bevölkerung. Bevölkerungsvorausberechnung. Available from: https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Bevoelkerungsvorausberechnung/_inhalt.html (Last accessed October 15, 2020).
12 Kassenärztliche Vereinigung Nordrhein. Die häufigsten ICD-10 Schlüssel und Kurztexte (nach Fachgruppen) 1. Quartal 2019. Available from: https://www.kvno.de/fileadmin/shared/pdf/online/verordnungen/morbiditaetsstatistik/100icd_19-1.pdf (Last accessed July 23, 2021).
13 Kassenärztliche Vereinigung Nordrhein. Die häufigsten ICD-10 Schlüssel und Kurztexte (nach Fachgruppen) 2. Quartal 2019. Available from: https://www.kvno.de/fileadmin/shared/pdf/online/verordnungen/morbiditaetsstatistik/100icd_19-2.pdf (Last accessed July 23, 2021).
14 Kassenärztliche Vereinigung Nordrhein. Die häufigsten ICD-10 Schlüssel und Kurztexte (nach Fachgruppen) 3. Quartal 2019. Available from: https://www.kvno.de/fileadmin/shared/pdf/online/verordnungen/morbiditaetsstatistik/100icd_19-3.pdf (Last accessed July 23, 2021).
15 Kassenärztliche Vereinigung Nordrhein. Die häufigsten ICD-10 Schlüssel und Kurztexte (nach Fachgruppen) 4. Quartal 2019. Available from: https://www.kvno.de/fileadmin/shared/pdf/online/verordnungen/morbiditaetsstatistik/100icd_19-4.pdf (Last accessed July 23, 2021).
16 Augustin M, Glaeske G. Hautkrebsreport. Übersicht über Epidemiologie, Versorgung und Prävention, Hamburg, 2019.
17 Heyer K. Versorgungsepidemiologie des Ulcus cruris in Deutschland. Erkrankungshäufigkeit, Versorgungsqualität und Prädiktoren der Wundheilung. Wiesbaden: Springer 2016.
18 Mohr N, Petersen J, Kirsten N, Augustin M. Epidemiology of vitiligo – a dual population-based approach. Clin Epidemiol 2021; 13: 373–82.
19 Staubach P, Mann C, Peveling-Oberhag A et al. Epidemiologie der Urtikaria bei Kindern in Deutschland [Epidemiology of


 

Urticaria in German Children]. J Dtsch Dermatol Ges 2021; 19 (7): 1013–20.
20 Kirsten N, Petersen J, Hagenström K, Augustin M. Epidemiology of hidradenitis suppurativa in Germany – an observational cohort study based on a multisource approach. J Eur Acad Dermatol Venereol 2020; 34 (1): 174–9.
21 Zander N, Sommer R, Schäfer I et al. Epidemiology and dermatological comorbidity of seborrhoeic dermatitis. population-based study in 161,269 employees. Br J Dermatol 2019; 181 (4): 743–8.
22 Augustin M, Sommer R, Zander N et al. Epidemiologie, Versorgungsbedarf und Versorgungsvolumina peripherer Venenkrankheiten in Deutschland: Multi-Source Analyse von Primär- und Sekundärdaten [Epidemiology, Health Care Needs and Care Volumes of Peripheral Venous Diseases in Germany: Multisource Analysis of Primary and Secondary Data]. Phlebologie 2018; 47 (5): 242–51.
23 Augustin J, Kis A, Sorbe C et al. Epidemiology of skin cancer in the German population: impact of socioeconomic and geographic factors. J Eur Acad Dermatol Venereol 2018; 32 (11): 1906–13.
24 Heyer K, Herberger K, Protz K et al. Epidemiology of chronic wounds in Germany: analysis of statutory health insurance data. Wound Repair Regen 2016; 24 (2): 434–42.
25 Augustin M, Radtke MA, Glaeske G et al. Epidemiology and comorbidity in children with psoriasis and atopic eczema. Dermatology 2015; 231: 35–40.
26 Augustin M, Glaeske G, Radtke MA et al. Epidemiology and comorbidity of psoriasis in children. Br J Dermatol 2010; 162 (3): 633–6.
27 Reich K, Krueger K, Moessner R, Augustin M. Epidemiology and clinical pattern of psoriatic arthritis in Germany: a prospective interdisciplinary epidemiological study of 1511 patients with plaque-type psoriasis. Br J Dermatol 2009; 160 (5): 1040–7.
28 Krensel M, Petersen J, Mohr P et al. Schätzung der Prävalenz und Inzidenz von Hautkrebs in Deutschland [Estimating Prevalence and Incidence of Skin Cancer in Germany]. J Dtsch Dermatol Ges 2019; 17 (12): 1239–49.
29 Augustin M, Glaeske G, Hagenström K (Hrsgg.): Psoriasisreport. Prävention, Versorgung und Innovation, Hamburg, 2021.
30 Augustin M, Glaeske G, Hagenström K (Hrsgg.): Neurodermitisreport. Prävention, Versorgung und Innovation, Hamburg, 2021.
31 Hansen I. Epidemiologie von Hautkrankheiten in Deutschland: Systematische Literaturanalyse des aktuellen Forschungsstands. Doctoral Thesis, Universität Hamburg, 2021.
32 Augustin J, Kistemann T, Koller D et al. Gute Kartographische Praxis im Gesundheitswesen (GKPiG). Available from: https://nbn-resolving.org/urn:nbn:de:0168-ssoar-52071-9 (Last accessed July 23, 2021).
33 Sozialgesetzbuch (SGB V). Fünftes Buch. Gesetzliche Krankenversicherung. Stand: Zuletzt geändert durch Art. 311 V v. 19.6.2020 I 1328. Available from: https://www.sozialgesetzbuch-sgb.de/sgbv/1.html (Last accessed February 12, 2021).
34 Augustin M, Eissing L, Elsner P et al. Perception and image of dermatology in the german general population 2002–2014. J Eur Acad Dermatol Venereol 2017; 31(12): 2124–30.
35 Kis A, Augustin M, Augustin J. Regionale fachärztliche Versorgung und demographischer Wandel in Deutschland – Szenarien zur dermatologischen Versorgung im Jahr 2035. J Dtsch Dermatol Ges 2017; 15(12): 1199–210.
36 Gemeinsamer Bundesausschuss (G-BA). Richtlinie des Gemeinsamen Bundesauschusses über die Verordnung von Krankenhausbehandlung (Krankenhauseinweisungs-Richtlinie/KE-RL) vom 22. Januar 2015. Available from: https://www.g-ba.de/downloads/62-492-1406/KE-RL_2017-03-16_iK-2017-06-08.pdf (Last accessed February 11, 2021).
37 GKV-Spitzenverband. Katalog der G-AEP Kriterien vom 06.04.2004. Available from: https://www.gkv-spitzenverband.de/media/dokumente/krankenversicherung_1/amb_stat_vers/ambulantes_operieren/aop_vertrag/KH_G-AEP-Kriterien_2004-04-06.pdf (Last accessed October 14, 2020).

 

# Janssen-Sponsored Satellite Symposium at the 30th EADV Virtual Congress 2021

## The art of joint forces: crafting psoriatic arthritis care for dermatologists

This virtual satellite symposium will focus on the necessity for practicing dermatologists to understand the burden of psoriatic arthritis in patients with psoriasis. It will emphasize how important it is that dermatologists detect early signals of psoriatic arthritis in patients with psoriasis and also understand why targeting IL-23 directly can be effective in treating and potentially also preventing the development of psoriatic arthritis for their psoriasis patients.

**View Now**

Janssen Immunology

PHARMACEUTICAL COMPANIES OF Johnson & Johnson

WILEY

CP-255722