

English version of "Häufigkeit allergischer Erkrankungen in Deutschland. Ergebnisse der Studie zur Gesundheit Erwachsener in Deutschland (DEGS1)"
 Bundesgesundheitsbl 2013 · 56:698–706
 DOI 10.1007/s00103-012-1652-7
 © Springer-Verlag Berlin Heidelberg 2013

U. Langen · R. Schmitz · H. Steppuhn

Department of Epidemiology and Health Monitoring, Robert Koch Institute, Berlin

Prevalence of allergic diseases in Germany

Results of the German Health Interview and Examination Survey for Adults (DEGS1)

Background

In view of their prevalence and their high socioeconomic importance for sufferers and for the healthcare system, allergies are today rightly characterised as a widespread disease [1].

The prevalence of allergies has increased dramatically in many regions of the world in recent years, without any exact explanatory model having been found for this increase. The rising prevalence of allergies is generally seen as being associated with various aspects of our "Western lifestyle" [2]. Evidence was found to support this hypothesis in Germany following reunification. In the German states that made up the former East Germany, the frequency of allergic diseases was considerably lower than in West Germany despite the higher air pollution levels [3, 4]. The prevalence of allergies in East and West Germany has converged as lifestyles in the two regions have become more similar [5].

Views have differed on the trend in allergy prevalence in Germany since the strong increase that was observed between the early 1970s and the early 1990s. While some of the literature suggests that prevalence might have reached a plateau [6], other authors appear to predict a further increase [7].

None of the said studies had the chance to observe the frequency of allergic diseases on the basis of a highly representative population sample. The evaluation of the findings of the German Health Inter-

view and Examination Survey for Adults (DEGS1) and comparison with the data from the German National Health Interview and Examination Survey 1998 (GNHIES98) form the basis for estimates of allergy prevalence in the resident German adult population and permit the charting of a trend in prevalence for the last decade.

Methods

The "German Health Interview and Examination Survey for Adults" (DEGS) is part of the health monitoring system at the Robert Koch Institute (RKI). The concept and design of DEGS are described in detail elsewhere [8, 9, 10, 11, 12]. The first wave (DEGS1) was conducted from 2008 to 2011 and comprised interviews, examinations and tests [13, 14]. The target population comprises the residents of Germany aged 18–79 years. DEGS1 has a mixed design that permits both cross-sectional and longitudinal analyses. For this purpose, a random sample from local population registries was drawn to complete the participants of the "German National Health Interview and Examination Survey 1998" (GNHIES98) who re-participated. A total of 8,152 persons participated, including 4,193 first-time participants (response rate 42%) and 3,959 revisiting participants of GNHIES98 (response rate 62%). In all, 7,238 persons attended one of the 180 examination centres, and 914 were interviewed only. The net sample (n=7,988) permits representative cross-sectional and time-trend analyses to be performed for

the age range of 18–79 years in comparison with GNHIES98 (n=7,124) [9]. The data of the revisiting participants can be used for longitudinal analyses.

Both DEGS1 and GNHIES98 used standardised computer-assisted medical interviews (CAPI) to ask participants about the medically diagnosed occurrence of asthma, allergic rhinoconjunctivitis, contact eczema, atopic dermatitis, food allergies and urticaria. In addition, DEGS1 included a question on a medically diagnosed insect venom allergy. Affirmative responses to the question whether the participants had ever been medically diagnosed with one of the listed diseases contributed to the score for the lifetime prevalence of the respective disease. If participants said they had suffered from the disease during the 12 months before the survey (GNHIES98) or that they had been medically diagnosed with an allergy in the last 12 months, this was listed as a positive 12-month prevalence for the disease in question. Details of the age, gender, socioeconomic status, region of residence (West/East Germany) and size of the municipality of residence were collected using a self-administered questionnaire. Socioeconomic status was determined using an index that includes information on school education and vocational training, professional status and net household income (weighted by household needs) and which enables a classification into low-, middle- and high-status groups [15].

This article determined the age- and sex-stratified lifetime and 12-month prevalence with corresponding 95% con-

Tab. 1 Lifetime prevalence of asthma and other atopic and allergic diseases categorised by sex and age group

Disease	Age group in years	Sex	18–29	30–39	40–49	50–59	60–69	70–79	Total
Asthma	Women		12.8 (9.9–16.4)	9.4 (6.7–12.9)	11.7 (9.1–15.0)	7.5 (5.5–10.0)	10.4 (7.8–13.7)	7.0 (5.0–9.6)	9.9 (8.8–11.2)
	Men		11.3 (8.3–15.1)	7.6 (5.1–11.3)	7.1 (5.1–9.9)	5.4 (3.7–7.8)	6.4 (4.5–9.0)	4.6 (3.0–6.9)	7.3 (6.2–8.6)
	Total		12.0 (10.0–14.4)	8.5 (6.5–11.0)	9.4 (7.7–11.4)	6.4 (5.0–8.2)	8.5 (6.7–10.6)	5.9 (4.6–7.6)	8.6 (7.8–9.5)
Allergic rhinoconjunctivitis (hay fever)	Women		19.0 (15.9–22.6)	22.7 (18.2–27.9)	19.1 (15.9–22.7)	14.1 (11.4–17.3)	13.0 (10.1–16.6)	9.7 (6.9–13.5)	16.5 (15.2–18.0)
	Men		16.1 (12.5–20.4)	18.9 (15.2–23.4)	15.4 (12.7–18.7)	11.6 (9.2–14.6)	7.5 (5.6–9.8)	4.3 (2.9–6.5)	13.0 (11.7–14.4)
	Total		17.5 (15.1–20.2)	20.8 (17.9–24.0)	17.2 (15.2–19.4)	12.9 (11.1–14.9)	10.3 (8.4–12.6)	7.3 (5.5–9.6)	14.8 (13.8–15.8)
Atopic dermatitis	Women		6.6 (4.8–9.1)	5.7 (3.8–8.3)	3.1 (2.0–4.7)	3.8 (2.6–5.5)	2.4 (1.5–3.9)	1.6 (0.7–3.3)	3.9 (3.3–4.6)
	Men		6.3 (4.1–9.7)	2.7 (1.6–4.6)	4.0 (2.4–6.8)	1.7 (0.9–3.3)	1.1 (0.4–2.6)	0.9 (0.4–2.3)	3.1 (2.4–4.0)
	Total		6.5 (5.0–8.4)	4.2 (3.0–5.9)	3.6 (2.5–5.0)	2.8 (2.0–3.9)	1.7 (1.1–2.7)	1.3 (0.7–2.3)	3.5 (3.0–4.1)
Urticaria	Women		1.6 (0.7–3.7)	5.2 (3.2–8.3)	4.4 (3.1–6.2)	7.6 (5.6–10.2)	6.8 (4.8–9.4)	4.4 (2.9–6.6)	4.9 (4.1–5.9)
	Men		1.3 (0.6–2.6)	1.3 (0.6–3.0)	3.0 (1.7–5.2)	1.9 (1.1–3.2)	2.8 (1.5–5.2)	1.3 (0.5–3.4)	2.0 (1.5–2.7)
	Total		1.4 (0.8–2.5)	3.3 (2.1–4.9)	3.7 (2.7–5.0)	4.7 (3.6–6.2)	4.8 (3.7–6.4)	3.0 (2.0–4.4)	3.5 (3.0–4.0)
Contact eczema	Women		8.9 (6.3–12.5)	16.7 (13.4–20.7)	16.2 (13.5–19.4)	15.2 (12.4–18.5)	9.6 (7.3–12.5)	7.9 (5.5–11.3)	12.7 (11.5–14.0)
	Men		2.7 (1.6–4.3)	4.1 (2.3–7.2)	5.2 (3.6–7.5)	1.9 (1.0–3.4)	3.5 (2.1–5.7)	3.0 (1.6–5.3)	3.4 (2.8–4.2)
	Total		5.7 (4.2–7.6)	10.4 (8.3–12.9)	10.6 (9.0–12.5)	8.5 (7.0–10.4)	6.6 (5.2–8.4)	5.7 (4.2–7.8)	8.1 (7.3–8.9)
Food allergy	Women		7.6 (5.4–10.6)	6.4 (4.1–9.9)	7.7 (5.5–10.7)	6.7 (4.9–9.0)	6.1 (4.2–9.0)	3.0 (1.8–5.0)	6.4 (5.5–7.5)
	Men		4.3 (2.5–7.4)	3.0 (1.8–5.0)	4.3 (2.9–6.4)	2.0 (1.2–3.4)	1.3 (0.7–2.6)	1.4 (0.6–3.0)	2.9 (2.3–3.7)
	Total		5.9 (4.3–8.1)	4.7 (3.3–6.6)	5.9 (4.5–7.8)	4.3 (3.3–5.7)	3.8 (2.7–5.4)	2.3 (1.5–3.5)	4.7 (4.1–5.4)
Insect venom allergy	Women		3.5 (2.0–5.9)	3.7 (2.2–6.3)	4.0 (2.6–6.1)	3.6 (2.4–5.2)	3.6 (2.3–5.4)	3.1 (1.9–5.1)	3.6 (2.9–4.4)
	Men		2.1 (0.9–4.7)	1.5 (0.7–3.2)	2.7 (1.6–4.7)	2.1 (1.2–3.8)	2.1 (1.0–4.3)	0.8 (0.4–1.7)	2.0 (1.5–2.7)
	Total		2.8 (1.8–4.3)	2.6 (1.7–4.0)	3.3 (2.4–4.6)	2.8 (2.0–4.0)	2.9 (2.0–4.1)	2.1 (1.3–3.2)	2.8 (2.4–3.3)
Allergic disease ^a	Women		37.3 (33.2–41.7)	42.2 (37.2–47.4)	37.6 (33.8–41.7)	36.8 (32.4–41.3)	32.9 (28.7–37.4)	25.8 (21.5–30.7)	35.8 (33.9–37.7)
	Men		28.1 (23.5–33.2)	27.0 (22.6–31.9)	29.4 (25.5–33.6)	20.8 (17.5–24.5)	19.7 (16.5–23.5)	14.3 (11.3–17.9)	24.1 (22.4–26.0)
	Total		32.6 (29.6–35.7)	34.6 (30.9–38.4)	33.4 (30.9–36.0)	28.8 (25.9–31.8)	26.5 (23.7–29.6)	20.6 (17.8–23.7)	30.0 (28.7–31.3)

In percent with 95% confidence intervals; statistically significant differences between the sexes are in bold type

$n_{unweighted} = 7,988$ ^aAt least one allergic disease was named

Tab. 2 Lifetime prevalence of at least one allergic disease (asthma, allergic rhinoconjunctivitis, atopic dermatitis, urticaria, contact eczema, food allergy, insect venom allergy) categorised by gender, East/West Germany/Berlin, size of municipality and socioeconomic status

Influencing factor	Place of residence			Size of municipality				Socioeconomic status		
	East Germany	West Germany	Berlin	Rural <5,000 inh.	Small town 5,000≤20,000 inh.	Medium-sized town 20,000≤100,000 inh.	Large town 100,000 plus inh.	Low	Middle	High
Sex										
Women	27.9 (24.3–31.7)*	37.0 (34.9–39.2)*	43.2 (33.4–53.6)	33.6 (28.9–38.6)*	29.6 (25.6–33.9)	36.0 (33.3–38.8)*	41.3 (38.1–44.6)*	27.1 (22.9–31.7)	37.7 (35.5–40.0)*	39.3 (35.3–43.5)*
Men	19.3 (16.8–21.9)*	25.0 (23.0–27.2)*	26.9 (17.2–39.4)	23.8 (19.8–28.3)*	23.5 (20.6–26.7)	24.0 (21.2–27.0)*	25.0 (21.4–29.0)*	19.5 (15.9–23.8)	24.5 (22.2–26.9)*	27.6 (24.4–31.0)*
Total	23.5 (21.5–25.7)	31.1 (29.6–32.6)	35.1 (28.3–42.7)	28.7 (25.4–32.2)	26.5 (23.9–29.3)	30.1 (28.2–32.0)	33.2 (30.9–35.6)	23.5 (20.5–26.7)	31.3 (29.7–33.0)	32.8 (30.4–35.2)

In percent with 95% confidence intervals; statistically significant differences in the stated influencing factors are in bold type and those between women and men marked by an asterisk; $n_{unweighted} = 7,988$ inh. inhabitants

fidence intervals (95% CI) of allergic diseases and compared the figures with the GNHIES98 data. Data were evaluated using SPSS, Version 20 (SPSS Inc., Chicago, IL, USA). A weighting factor was used in all analyses to take account of deviations in the sample from the population structure (as of 31 December 2010) with regard to age, sex, region, nationality, as well as community type and education [9]. A separate weighting factor was prepared for the examination part. Calculation of the weighting factor also considered the re-participation probability of the GNHIES98 participants based on a logistic regression model. For the purpose of conducting trend analysis, the data from GNHIES98 were age-adjusted to the population level as of 31 December 2010. A non-response analysis and a comparison of selected indicators with data from census statistics indicate a high level of representativity of the net sample for the resident population of Germany aged 18–79 years [9]. To take into account the weighting as well as the correlation of the participants within a community, the confidence intervals were determined with SPSS 20 procedures for complex samples. Differences were regarded as statistically significant if the respective 95% confidence intervals did not overlap.

Results

Allergic diseases in DEGS1: lifetime prevalence

The lifetime prevalence for the medical diagnosis of allergic diseases surveyed in DEGS1 was 8.6% for asthma, 14.8% for allergic rhinoconjunctivitis, 3.5% for atopic dermatitis and urticaria, 8.1% for contact eczema, 4.7% for food allergies and 2.8% for insect venom allergies. In all, 30% of adults have been medically diagnosed as suffering from at least one of the afore-mentioned allergic diseases during their lifetime (■ Tab. 1). In general, a significantly higher percentage of women (35.8%) than men (24.1%) said they had been given at least one allergy diagnosis; 9.9% versus 7.3% for asthma, for example, and 16.5% versus 13.0% for allergic rhinoconjunctivitis (both differences are also

Bundesgesundheitsbl 2013 · DOI 10.1007/s00103-012-1652-7
© Springer-Verlag Berlin Heidelberg 2013

U. Langen · R. Schmitz · H. Steppuhn

Prevalence of allergic diseases in Germany. Results of the German Health Interview and Examination Survey for Adults (DEGS1)

Abstract

In the first wave of the “German Health Interview and Examination Survey for Adults” (DEGS1), up-to-date and representative data regarding allergic diseases in 7,988 18- to 79-year-old subjects living in Germany were collected using computer-assisted medical interviews. The study identified a lifetime prevalence of 8.6% for asthma, 14.8% for allergic rhinoconjunctivitis, 3.5% each for atopic dermatitis and urticaria, 8.1% for contact eczema, 4.7% for food allergies and 2.8% for insect venom allergies. Overall, nearly one third of adults in Germany have been diagnosed with at least one of the above-mentioned allergies during their lifetime by a physician. Currently, nearly 20% suffer from at least one allergic disease. Generally, women reported an allergic disease more frequently

than men did and younger subjects more frequently than older ones. Additionally, allergies are more common in the former federal states of West Germany than in the former East German federal states. A high socioeconomic status and living in large cities both increase allergy risk. During the last 10 years, asthma prevalence increased about 3%, whereas the prevalence of urticaria and contact eczema declined. The lifetime prevalence of allergic rhinoconjunctivitis, atopic dermatitis and food allergies appeared unchanged. In total, allergy prevalence has declined from 32.7 to 28.7% over the past decade.

Keywords

Allergies · Asthma · Atopic diseases · Adults · Health survey

Häufigkeit allergischer Erkrankungen in Deutschland. Ergebnisse der Studie zur Gesundheit Erwachsener in Deutschland (DEGS1)

Zusammenfassung

In der ersten Welle der „Studie zur Gesundheit Erwachsener in Deutschland“ (DEGS1) wurden aktuelle und bundesweit repräsentative Daten zum allergischen Krankheitsgeschehen von 7988 18- bis 79-Jährigen mittels computergestützter, ärztlicher Interviews erhoben. Demnach liegt die Lebenszeitprävalenz (LZP) für Asthma bronchiale bei 8,6%, Heuschnupfen bei 14,8%, Neurodermitis und Urtikaria bei jeweils 3,5%, Kontaktekzeme bei 8,1%, Nahrungsmittelallergien bei 4,7% und Insektengiftallergien bei 2,8%. Insgesamt ist bei einem knappen Drittel der Erwachsenen mindestens eine der genannten Allergien jemals ärztlich diagnostiziert worden. Aktuell leiden fast 20% an mindestens einer Allergie. Frauen sind generell häufiger betroffen als Männer und Jüngere häufiger als Äl-

tere. Außerdem sind Allergien in den alten Bundesländern verbreiteter als in den neuen. Ein hoher sozioökonomischer Status und das Leben in Großstädten erhöhen ebenfalls die Krankheitshäufigkeit. Im 10-Jahres-Trend stieg die Asthmaprävalenz um knapp 3%, die Prävalenzen für Urtikaria und Kontaktekzeme sanken, die LZP für Heuschnupfen, Neurodermitis und Nahrungsmittelallergie blieb unverändert. Dadurch ist die Allergieprävalenz insgesamt von 32,7% auf 28,7% rückläufig.

Schlüsselwörter

Allergische Erkrankungen · Asthma bronchiale · Atopische Erkrankungen · Erwachsene · Gesundheitssurvey

significant). The difference between the sexes was particularly marked in the case of contact eczema, and this difference was significant in all age groups. Women and men between the ages of 18 and 49 years showed a higher prevalence for most allergic diseases than the older age groups.

A statistically significant higher prevalence for at least one reported allergy diagnosis was seen for adults from West Germany and Berlin, women from large

towns and adults with high socioeconomic status than for adults from East Germany, women from small towns and adults with middle or low socioeconomic status (■ Tab. 2). One of the detailed findings of our evaluation is that almost two in three of all 30–39-year-old women in Berlin (64.7%) said that they have been given a medical allergy diagnosis during the course of their life (data not shown in table).

Tab. 3 Prevalence of asthma and other atopic and allergic diseases in the last 12 months categorised by sex and age group

	Age group in years	18–29	30–39	40–49	50–59	60–69	70–79	Total
Disease	Sex							
Asthma	Women	6.7 (4.6–9.5)	6.4 (4.3–9.6)	6.7 (4.7–9.6)	4.6 (3.0–6.8)	8.2 (5.9–11.4)	5.2 (3.5–7.7)	6.3 (5.4–7.3)
	Men	4.0 (2.4–6.5)	4.6 (2.6–7.9)	3.4 (2.3–5.0)	3.1 (1.9–5.0)	4.5 (3.0–6.7)	2.3 (1.3–4.0)	3.7 (2.9–4.6)
	Total	5.3 (3.9–7.0)	5.5 (4.0–7.6)	5.0 (3.9–6.5)	3.8 (2.7–5.3)	6.4 (4.8–8.5)	3.9 (2.8–5.4)	5.0 (4.4–5.6)
Allergic rhinoconjunctivitis (hay fever)	Women	17.1 (14.0–20.7)	18.2 (14.4–22.8)	15.9 (12.9–19.4)	10.5 (8.2–13.3)	10.2 (7.7–13.3)	6.5 (4.3–9.6)	13.3 (12.1–14.6)
	Men	12.2 (9.3–15.9)	16.2 (12.6–20.6)	12.9 (10.5–15.9)	9.7 (7.4–12.5)	6.1 (4.4–8.4)	3.1 (1.9–4.9)	10.6 (9.5–11.9)
	Total	14.6 (12.4–17.1)	17.2 (14.6–20.2)	14.4 (12.5–16.5)	10.1 (8.5–11.9)	8.2 (6.5–10.3)	5.0 (3.6–6.8)	12.0 (11.1–12.9)
Atopic dermatitis	Women	5.0 (3.5–7.1)	4.1 (2.6–6.5)	1.4 (0.8–2.7)	3.1 (2.0–4.9)	1.3 (0.7–2.4)	1.0 (0.4–2.6)	2.7 (2.2–3.3)
	Men	3.7 (2.2–6.3)	1.0 (0.4–2.5)	2.5 (1.4–4.4)	1.0 (0.5–2.2)	0.9 (0.3–2.5)	0.5 (0.1–1.5)	1.8 (1.3–2.5)
	Total	4.3 (3.2–5.9)	2.6 (1.7–3.8)	2.0 (1.3–3.0)	2.1 (1.4–3.0)	1.1 (0.7–1.9)	0.8 (0.4–1.6)	2.2 (1.9–2.7)
Urticaria	Women	0.3 (0.1–1.2)	3.1 (1.6–6.1)	1.6 (0.9–2.9)	2.4 (1.5–3.8)	2.1 (1.2–3.5)	0.6 (0.3–1.5)	1.7 (1.3–2.3)
	Men	0.7 (0.3–1.6)	0.6 (0.1–2.4)	0.9 (0.4–2.0)	1.1 (0.5–2.3)	0.8 (0.3–2.2)	0.3 (0.1–1.0)	0.8 (0.5–1.2)
	Total	0.5 (0.2–1.0)	1.9 (1.0–3.4)	1.3 (0.8–2.0)	1.8 (1.2–2.6)	1.5 (0.9–2.3)	0.5 (0.2–1.0)	1.2 (1.0–1.6)
Contact eczema	Women	3.6 (2.1–6.0)	6.0 (3.8–9.3)	5.2 (3.6–7.5)	4.6 (3.0–6.8)	3.8 (2.5–5.6)	1.7 (0.8–3.5)	4.2 (3.5–5.0)
	Men	1.0 (0.4–2.1)	1.7 (0.7–4.2)	2.0 (1.1–3.6)	1.4 (0.6–2.9)	2.0 (0.9–4.3)	0.4 (0.1–1.2)	1.5 (1.0–2.0)
	Total	2.2 (1.4–3.5)	3.8 (2.5–5.8)	3.6 (2.6–4.8)	3.0 (2.1–4.2)	2.9 (2.0–4.2)	1.1 (0.6–2.1)	2.8 (2.4–3.3)
Food allergy	Women	4.6 (2.9–7.1)	4.5 (2.6–7.8)	4.5 (2.9–6.9)	3.3 (2.2–5.0)	3.4 (1.9–6.0)	0.6 (0.3–1.4)	3.6 (2.9–4.5)
	Men	1.8 (0.9–3.8)	1.5 (0.7–3.1)	2.4 (1.4–4.2)	1.3 (0.6–2.6)	0.5 (0.2–1.4)	No case	1.4 (1.0–2.0)
	Total	3.2 (2.2–4.6)	3.0 (1.9–4.7)	3.4 (2.4–4.9)	2.3 (1.6–3.3)	2.0 (1.2–3.4)	0.3 (0.2–0.8)	2.5 (2.1–3.0)
Insect venom allergy	Women	0.7 (0.2–2.2)	1.1 (0.4–3.1)	0.9 (0.3–2.6)	0.7 (0.3–1.6)	0.4 (0.1–1.3)	0.1 (0.0–0.6)	0.7 (0.4–1.1)
	Men	0.3 (0.0–1.8)	0.3 (0.1–1.3)	0.5 (0.1–1.9)	0.3 (0.1–1.0)	No case	0.1 (0.0–0.5)	0.3 (0.1–0.6)
	Total	0.5 (0.2–1.3)	0.7 (0.3–1.7)	0.7 (0.3–1.6)	0.5 (0.3–1.0)	0.2 (0.1–0.7)	0.1 (0.0–0.3)	0.5 (0.3–0.7)
Allergic disease ^a	Women	25.6 (21.9–29.6)	30.6 (25.6–36.1)	24.5 (21.0–28.3)	21.5 (18.3–25.1)	20.2 (16.7–24.3)	13.5 (10.4–17.5)	22.9 (21.3–24.6)
	Men	16.6 (13.0–20.8)	21.3 (17.1–26.2)	19.6 (16.3–23.2)	14.6 (11.8–18.0)	12.8 (10.0–16.1)	6.2 (4.5–8.5)	15.9 (14.3–17.5)
	Total	20.9 (18.5–23.7)	25.9 (22.6–29.6)	22.0 (19.8–24.3)	18.1 (15.9–20.5)	16.6 (14.1–19.4)	10.2 (8.2–12.7)	19.4 (18.3–20.5)

In percent with 95% confidence intervals; statistically significant differences between the sexes are in bold type

^an_{unweighted} = 7,988 ^bAt least one allergic disease was named

Allergic diseases in DEGS1: 12-month prevalence

During the 12 months before the survey, 5.0% of participants had medically diagnosed asthma, 12.0% allergic rhinoconjunctivitis, 2.2% atopic dermatitis, 1.2% urticaria, 2.8% contact eczema, 2.5% food allergy and 0.5% insect venom allergy. According to the survey, 19.4% of adults currently suffer from at least one allergic disease (■ **Tab. 3**). Like lifetime prevalence, the 12-month prevalence for at least one allergic disease is significantly higher among women than men (22.9% vs. 15.9%). In all, 6.3% of women currently suffer from asthma compared to only 3.7% of men; the figures for allergic rhinoconjunctivitis are 13.3% for women compared to 10.6% for men,

and these differences are also significant. A marked and significant difference between men and women was also found for contact eczema, particularly among the 40–59-year-olds. The 12-month prevalence of most allergies decreased with increasing age; this trend is significant from the age of 50 years with allergic rhinoconjunctivitis, for example.

Trend in allergic diseases over time

■ **Tab. 4** shows a comparison of the lifetime prevalence of various allergic diseases between GNHIES98 and DEGS1. According to the figures, the prevalence of asthma has increased significantly during the last 10 years, rising by just under three percentage points from 5.7 to 8.6%; the increase is more marked

among women than men. The differences were most significant in the age groups from 20 to 29 and 40 to 49 years. The prevalence of urticaria and contact eczema has fallen significantly over time, and this trend is primarily driven by young adults aged from 18 to 49 years and above all by the women in this age group. As with the lifetime prevalence of allergic rhinoconjunctivitis, atopic dermatitis and food allergies in men and women in all age groups has remained constant over the last 10 years, while the overall prevalence for at least one reported allergic disease has declined significantly (from 32.7 to 28.7%—■ **Tab. 4**).

Tab. 4 Trend over time in the lifetime prevalence of asthma and other atopic and allergic diseases categorised by sex and age group

Disease	Age group in years							Total
	18-29	30-39	40-49	50-59	60-69	70-79	Total	
Asthma	Women GNHIES98	8.8 (6.1-12.6)	6.2 (4.4-8.6)	6.8 (4.9-9.3)	6.3 (4.4-8.9)	5.3 (3.3-8.3)	3.4 (1.7-6.6)	6.3 (5.3-7.4)
	Women DEGS1	12.8 (9.9-16.4)	9.4 (6.7-12.9)	11.7 (9.1-15.0)	7.5 (5.5-10.0)	10.4 (7.8-13.7)	7.0 (5.0-9.6)	9.9 (8.8-11.2)
Men GNHIES98	Men GNHIES98	4.6 (3.2-6.5)	4.8 (3.2-7.0)	4.7 (2.8-7.7)	4.6 (3.0-7.0)	7.6 (5.1-11.1)	4.8 (2.6-8.4)	5.1 (4.2-6.1)
	Men DEGS1	11.3 (8.3-15.1)	7.6 (5.1-11.3)	7.1 (5.1-9.9)	5.4 (3.7-7.8)	6.4 (4.5-9.0)	4.6 (3.0-6.9)	7.3 (6.2-8.6)
Total GNHIES98	Total GNHIES98	6.7 (5.1-8.7)	5.5 (4.2-7.0)	5.7 (4.2-7.7)	5.5 (4.1-7.1)	6.4 (4.7-8.6)	4.0 (2.6-6.1)	5.7 (5.0-6.4)
	Total DEGS1	12.0 (10.0-14.4)	8.5 (6.5-11.0)	9.4 (7.7-11.4)	6.4 (5.0-8.2)	8.5 (6.7-10.6)	5.9 (4.6-7.6)	8.6 (7.8-9.5)
Allergic rhino-conjunctivitis (hay fever)	Women GNHIES98	20.9 (17.2-25.2)	18.5 (15.6-21.8)	16.0 (13.2-19.2)	14.5 (11.6-18.1)	11.9 (8.9-15.6)	9.4 (5.9-14.5)	15.4 (13.9-17.1)
	Women DEGS1	19.0 (15.9-22.6)	22.7 (18.2-27.9)	19.1 (15.9-22.7)	14.1 (11.4-17.3)	13.0 (10.1-16.6)	9.7 (6.9-13.5)	16.5 (15.2-18.0)
Men GNHIES98	Men GNHIES98	23.1 (19.4-27.4)	19.5 (16.6-22.7)	12.6 (9.9-16.0)	9.4 (6.5-13.3)	8.3 (5.9-11.7)	4.8 (2.4-9.2)	13.5 (12.0-15.1)
	Men DEGS1	16.1 (12.5-20.4)	18.9 (15.2-23.4)	15.4 (12.7-18.7)	11.6 (9.2-14.6)	7.5 (5.6-9.8)	4.3 (2.9-6.5)	13.0 (11.7-14.4)
Total GNHIES98	Total GNHIES98	22.0 (19.2-25.1)	19.0 (16.9-21.3)	14.3 (12.2-16.6)	11.9 (9.4-14.6)	10.1 (8.0-12.8)	7.3 (5.1-10.4)	14.5 (13.3-15.8)
	Total DEGS1	17.5 (15.1-20.2)	20.8 (17.9-24.0)	17.2 (15.2-19.4)	12.9 (11.1-14.9)	10.3 (8.4-12.6)	7.3 (5.5-9.6)	14.8 (13.8-15.8)
Atopic dermatitis	Women GNHIES98	8.6 (6.4-11.4)	5.1 (3.5-7.4)	3.4 (2.3-5.1)	2.0 (1.2-3.3)	1.6 (0.8-3.4)	1.9 (0.6-5.8)	3.8 (3.1-4.7)
	Women DEGS1	6.6 (4.8-9.1)	5.7 (3.8-8.3)	3.1 (2.0-4.7)	3.8 (2.6-5.5)	2.4 (1.5-3.9)	1.6 (0.7-3.3)	3.9 (3.3-4.6)
Men GNHIES98	Men GNHIES98	3.9 (2.5-6.0)	3.1 (2.0-4.7)	2.3 (1.3-3.8)	1.2 (0.6-2.4)	1.3 (0.5-3.2)	2.2 (0.8-5.9)	2.3 (1.9-2.9)
	Men DEGS1	6.3 (4.1-9.7)	2.7 (1.6-4.6)	4.0 (2.4-6.8)	1.7 (0.9-3.3)	1.1 (0.4-2.6)	0.9 (0.4-2.3)	3.1 (2.4-4.0)
Total GNHIES98	Total GNHIES98	6.2 (4.9-7.9)	4.0 (3.1-5.3)	2.8 (2.0-3.9)	1.6 (1.0-2.5)	1.5 (0.8-2.6)	2.0 (0.9-4.7)	3.1 (2.6-3.6)
	Total DEGS1	6.5 (5.0-8.4)	4.2 (3.0-5.9)	3.6 (2.5-5.0)	2.8 (2.0-3.9)	1.7 (1.1-2.7)	1.3 (0.7-2.3)	3.5 (3.0-4.1)
Urticaria	Women GNHIES98	6.7 (4.6-9.6)	12.2 (9.6-15.3)	13.6 (10.9-16.7)	11.3 (8.8-14.4)	9.1 (6.4-12.9)	5.5 (3.2-9.1)	10.0 (8.9-11.2)
	Women DEGS1	1.6 (0.7-3.7)	5.2 (3.2-8.3)	4.4 (3.1-6.2)	7.6 (5.6-10.2)	6.8 (4.8-9.4)	4.4 (2.9-6.6)	4.9 (4.1-5.9)
Men GNHIES98	Men GNHIES98	4.9 (3.1-7.7)	4.9 (3.4-7.1)	5.8 (4.8-8.4)	4.1 (2.7-6.1)	3.7 (2.2-6.3)	3.8 (1.6-8.4)	4.7 (3.8-5.7)
	Men DEGS1	1.3 (0.6-2.6)	1.3 (0.6-3.0)	3.0 (1.7-5.2)	1.9 (1.1-3.2)	2.8 (1.5-5.2)	1.3 (0.5-3.4)	2.0 (1.5-2.7)
Total GNHIES98	Total GNHIES98	5.8 (4.4-7.6)	8.4 (6.9-10.2)	9.6 (7.9-11.6)	7.7 (6.2-9.5)	6.5 (4.8-8.8)	4.7 (2.9-7.5)	7.3 (6.6-8.2)
	Total DEGS1	1.4 (0.8-2.5)	3.3 (2.1-4.9)	3.7 (2.7-5.0)	4.7 (3.6-6.2)	4.8 (3.7-6.4)	3.0 (2.0-4.4)	3.5 (3.0-4.0)
Contacteczema	Women GNHIES98	26.3 (21.8-31.4)	31.4 (27.1-36.2)	23.9 (20.2-28.0)	18.5 (15.2-22.2)	10.7 (8.2-13.9)	7.5 (4.6-12.0)	20.3 (18.4-22.5)
	Women DEGS1	8.9 (6.3-12.5)	16.7 (13.4-20.7)	16.2 (13.5-19.4)	15.2 (12.4-18.5)	9.6 (7.3-12.5)	7.9 (5.5-11.3)	12.7 (11.5-14.0)
Men GNHIES98	Men GNHIES98	8.1 (5.8-11.2)	9.2 (7.0-12.0)	7.8 (5.6-10.7)	9.1 (6.8-12.0)	7.5 (4.9-11.3)	2.8 (1.2-6.2)	7.7 (6.6-9.0)
	Men DEGS1	2.7 (1.6-4.3)	4.1 (2.3-7.2)	5.2 (3.6-7.5)	1.9 (1.0-3.4)	3.5 (2.1-5.7)	3.0 (1.6-5.3)	3.4 (2.8-4.2)
Total GNHIES98	Total GNHIES98	17.2 (14.6-20.2)	20.0 (17.5-22.7)	15.6 (13.5-18.0)	13.8 (11.8-16.0)	9.2 (7.3-11.4)	5.4 (3.6-8.0)	14.1 (12.8-15.4)
	Total DEGS1	5.7 (4.2-7.6)	10.4 (8.3-12.9)	10.6 (9.0-12.5)	8.5 (7.0-10.4)	6.6 (5.2-8.4)	5.7 (4.2-7.8)	8.1 (7.3-8.9)
Food allergy	Women GNHIES98	9.2 (6.7-12.3)	9.7 (7.2-12.8)	9.7 (7.2-13.0)	5.4 (3.6-7.9)	5.6 (3.9-8.0)	3.0 (1.5-6.1)	7.3 (6.3-8.4)
	Women DEGS1	7.6 (5.4-10.6)	6.4 (4.1-9.9)	7.7 (5.5-10.7)	6.7 (4.9-9.0)	6.1 (4.2-9.0)	3.0 (1.8-5.0)	6.4 (5.5-7.5)
Men GNHIES98	Men GNHIES98	4.1 (2.5-6.5)	5.0 (3.5-7.1)	4.4 (2.9-6.6)	2.0 (1.1-3.7)	1.4 (0.6-3.3)	2.6 (1.1-6.1)	3.4 (2.4-4.2)
	Men DEGS1	4.3 (2.5-7.4)	3.0 (1.8-5.0)	4.3 (2.9-6.4)	2.0 (1.2-3.4)	1.3 (0.7-2.6)	1.4 (0.6-3.0)	2.9 (2.3-3.7)
Total GNHIES98	Total GNHIES98	6.6 (5.1-8.5)	7.3 (5.8-9.0)	7.0 (5.4-9.0)	3.7 (2.7-5.1)	3.6 (2.6-5.0)	2.8 (1.6-5.0)	5.4 (4.7-6.1)
	Total DEGS1	5.9 (4.3-8.1)	4.7 (3.3-6.6)	5.9 (4.5-7.8)	4.3 (3.3-5.7)	3.8 (2.7-5.4)	2.3 (1.5-3.5)	4.7 (4.1-5.4)

Tab. 4 Trend over time in the lifetime prevalence of asthma and other atopic and allergic diseases categorised by sex and age group (Continued)

Age group in years	18–29	30–39	40–49	50–59	60–69	70–79	Total
Allergic disease ^a							
Women GNHIES98	45.1 (40.4–49.9)	50.2 (45.0–55.3)	43.3 (38.6–48.2)	39.6 (35.2–44.2)	30.1 (25.6–35.1)	22.8 (17.0–29.9)	39.3 (36.7–41.9)
Women DEGS1	34.8 (30.7–39.2)	41.5 (36.4–46.7)	36.6 (32.8–40.6)	35.3 (31.0–39.9)	31.8 (27.7–36.3)	24.3 (20.0–29.1)	34.4 (32.5–36.3)
Men GNHIES98	34.3 (29.9–39.0)	30.7 (27.0–34.7)	25.6 (21.6–30.0)	23.9 (19.8–28.5)	21.6 (17.3–26.7)	16.2 (11.7–22.1)	26.0 (24.1–28.1)
Men DEGS1	26.8 (22.1–32.0)	26.6 (22.2–31.4)	27.9 (24.0–32.1)	18.9 (15.7–22.6)	18.8 (15.5–22.5)	13.6 (10.6–17.2)	22.9 (21.1–24.8)
Total GNHIES98	39.7 (36.2–43.4)	40.1 (36.8–43.6)	34.3 (31.0–37.7)	31.7 (28.6–35.1)	26.0 (22.8–29.4)	19.8 (15.7–24.7)	32.7 (30.8–34.7)
Total DEGS1	30.7 (27.6–33.9)	34.0 (30.3–37.8)	32.2 (29.7–34.8)	27.1 (24.3–30.2)	25.5 (22.6–28.5)	19.5 (16.7–22.5)	28.7 (27.4–30.0)

In percent with 95% confidence intervals; statistically significant differences between the studies are in bold type

Data from GNHIES98 and DEGS1 weighted for alignment with the population structure in 2010

^aUnweighted = 7,099 (GNHIES98) and 7,988 (DEGS1)

^bAt least one allergic disease was named

Allergic sensitisation

Allergic sensitisation is the topic of the article “Prevalence of sensitisation to aeroallergens and food allergens—results of the German Health Interview and Examination Survey for Adults (DEGS1)”, also contained in this issue.

Discussion

Method

In the DEGS1 survey, participants were asked by a physician about medically diagnosed allergies in a CAPI interview. This method ensures the collection of valid data and therefore forms the basis for a valid estimation of allergy prevalence [16]. In view of the fact that there may be no medical diagnosis despite the presence of an allergy—due, for example, to people suffering from only slight allergic symptoms not having seen a doctor—the prevalence estimates based on medical diagnoses are conservative estimates. However, comparison of answers to the two questions: “Have you ever suffered from ...?” versus “Has a doctor ever diagnosed you with ...?” showed over 90% correspondence of the answers for allergic rhinoconjunctivitis, food allergies and urticaria and an approx. 80% correspondence for allergic contact eczema and asthma [4]. Moreover, the polling of medical diagnoses is a widespread and internationally recognised method for the collection of data on allergies.

Lifetime prevalence

Almost one in three adults living in Germany has at some point in their life been diagnosed with allergic disease. The primary forms of allergy are allergic rhinoconjunctivitis, asthma and contact eczema. With the exception of atopic dermatitis, all diagnosed allergies affect women significantly more frequently than men. One particularly conspicuous finding is the difference with regard to contact eczema (12.7% women and 3.4% men). This difference is statistically significant across all age groups. One conceivable reason for this difference between the sexes is choice of occupation, another is the dif-

ference in frequency of contact with fashion jewellery and perfumes. The “Allergy in Germany White Paper” [1], for example, points to the fact that contact allergies mainly take place via the hands and are in this respect often a manifestation of an occupational disease. The occupations that cause these allergies include female domains such as hairdressing, care or cleaning jobs. Nickel is still seen as the most frequent contact allergen—despite the fact that the amounts used in fashion jewellery are restricted—followed by perfumes.

There is a major discrepancy between the literature and the stated lifetime prevalence for medically diagnosed urticaria, which at 3.5% is well below the estimates of German associations that specialise in the field [1, 17]. It is possible that chronic urticaria is more frequently remembered by participants than the more common acute urticaria. The specialist bodies in Germany estimate that the prevalence of chronic urticaria in the general population is about 2% [1].

The findings show that young adults suffer from atopic dermatitis considerably more frequently than the older age groups. Atopic dermatitis is considered to be particularly common among children [18]. This means that the higher prevalence among young adults does not necessarily indicate an increase in the frequency of the disease but could be due to memory bias. The shorter the time between the disease and the interview, the more often participants were able to recall the disease [19].

The difference in the frequency of allergic illnesses between West and East Germany identified after the fall of the Berlin Wall remains significant, even though prevalence levels were expected to converge owing to the increased prevalence of allergies in East Germany [20] and although prevalence levels are indeed closer than they were. The manifestation of allergic diseases is seen as being closely connected to the Th1-Th2 differentiation of helper T cells in the immune system of children [21]. This means that improved hygiene and hence fewer infectious stimuli on the immune system create fewer Th1 cells but more Th2 cells, which play a key role in the emergence of allergic diseases.

es. It appears that the increased frequency of allergies among children due to changes in living conditions has not been carried over into the adult section of the population.

The shift in the Th1-Th2 balance is probably also responsible for the existing significant difference in allergy prevalence between small and large towns. The literature describes how children who have grown up on a farm are better protected against allergies [22, 23].

The phenomenon that allergic sensitisation and therefore disease frequency increases with rising socioeconomic status is well established among children and also confirmed for adults by other German allergy studies like the KORA-C [24]. Our data underline this phenomenon among women more markedly than among men. The reasons for this are not known but are believed to be associated with the hygiene hypothesis (“exaggerated” hygiene among individuals of higher socioeconomic status). One very recent hypothesis is based on a study [25] showing that the social ranking among monkeys is linked to gene regulatory variation, which in turn affects the immune cells. The decrease in T cells in the peripheral blood of animals of low social status correlated with increased probability of infections (although the hygiene hypothesis would suggest that these animals are less likely to suffer from allergies).

Twelve-month prevalence

At 5.0%, the 12-month prevalence for asthma corresponds exactly to the prevalence estimate in the “Lung White Paper” [26]. The higher disease frequency among women—in contrast to the higher prevalence among boys when it comes to children—is well established [27]. Women on the whole are also more likely to suffer from allergic rhinoconjunctivitis, a finding that has only been observed in the German health surveys conducted since 1998 [28].

Atopic dermatitis is found far more frequently in young adults than in older people, and the 12-month prevalence of urticaria among women is double that among men; this is a disease that mainly affects women [1]. It is difficult to find an expla-

nation for this, since—as indicated by the figures for lifetime prevalence—the current survey covers only some of the various forms of urticaria. Women are in the majority for both the 12-month prevalence and lifetime prevalence of contact eczema, particularly so in the age groups in regular employment. Possible reasons for this have already been discussed in the section on lifetime prevalence.

Overall, women also report significantly more frequently that they currently suffer from food allergies, and the older age groups (60 years and above) are mainly responsible for the magnitude of this difference. One reason for this could be that women have a more varied diet than men [29] and therefore come into contact with a higher number of potential allergens.

Overall, insect venom allergies are seldom, even though their potentially serious effects on health mean they are of scientific interest [30].

Trend over time

The sum of allergic diseases has decreased significantly since 1998, but a closer analysis of the trends over time show that the prevalence of asthma has continued to increase (in line with the trend observed between the 1970s and 1990s) and that the prevalence of allergic rhinoconjunctivitis, atopic dermatitis and food allergies has remained constant and has now reached a plateau. The visible decline in allergic diseases is driven by the lower incidence stated by participants of medical diagnoses for urticaria and contact eczema, particularly among the younger participants. One possible reason for this is that younger people really do suffer from these diseases less frequently. There are, for example, restrictions on highly allergenic substances in everyday objects, such as the use of nickel in fashion jewellery [31] or formaldehyde in cosmetics [32]. In addition, there is now broader public debate on the potential allergic effects of various substances, such as the use of henna or its additive *p*-phenylenediamine (PPD) as a hair dye or in reversible skin tattoos [33]. At the same time, there are other factors that may have resulted in a lower number of medical diagnoses despite an un-

changed prevalence of the disease itself. Ointments and creams containing corticosteroids are now available over the counter, for example [34], meaning that people can treat non-serious skin allergies themselves and consult a doctor less often than they used to.

The increase in asthma remains an important issue, as this atopic disease is of high socioeconomic significance and represents a major burden for sufferers. An increase in prevalence was recently also reported among young adults (between the ages of 20 and 44 years) in Italy. The median prevalence of current asthma recorded in three Italian surveys rose from 4.1% in 1991 to 6.6% in 2010 [35]. According to a study in the UK, the lifetime prevalence of asthma among adults increased by over 20% based on medical diagnoses between 2001 and 2005 [36].

The increase in asthma prevalence in DEGS1 is mainly attributed to the group of young adults. In the youngest age group from 18 to 29 years, it is the men who play the main role in this increase. Here again, this could be due to a number of factors: it is known—and confirmed by the data from the German Health Interview and Examination Survey for Children and Adolescents (KiGGS)—that boys suffer more frequently from asthma than girls do and that this trend is reversed around the time of puberty [23, 37]. This reversal is seen as partly being due to the larger bronchial cross-sections among girls and men and partly due to hormonal factors. The task of follow-up studies will therefore be to establish whether the growth of the bronchial tubes of boys in puberty is less pronounced than it used to be (there is presently a downward trend in height increase in the USA [38]). The testosterone deficit evident today in men associated with overweight and chronic disease, and that already manifests itself in younger years, has been described in the literature [39]. This could mean that hormonal protective factors are less present in men than they used to be. Moreover, since the symptoms of asthma are triggered by countless—and sometimes non-specific—external stimuli, it will also be necessary to address the question of whether the more frequent use of cosmetics and perfume by men [40] could also be partly responsible for this development.

Conclusion

In summary, we can therefore confirm that a plateau has been reached for allergic rhinoconjunctivitis, atopic dermatitis and food allergies and that their prevalence is now stable at a high level. By contrast, the prevalence of asthma still appears to be on the increase.

Corresponding address

Dr. U. Langen

Department of Epidemiology and Health Monitoring, Robert Koch Institute
General Pape Str. 62–66, 12101 Berlin
Germany
u.langen@rki.de

Acknowledgements. The study was financed with resources from the Robert Koch Institute and the Federal Ministry of Health.

Conflict of interest. On behalf of all authors, the corresponding author states that there are no conflicts of interest.

References

- Ring J, Bachert C, Bauer C-P, Czech W (eds) (2010) Weißbuch Allergie in Deutschland. Urban&Vogel, München
- Graham-Rowe D (2011) When allergies go West. *Nature* 479:52–54
- Hermann-Kunz E (1999) Häufigkeit allergischer Krankheiten in Ost- und Westdeutschland. *Gesundheitswesen* 61:S100–S105
- Hermann-Kunz E (2000) Allergic diseases in Germany. *Bundesgesundheitsbl Gesundheitsforsch Gesundheitsschutz* 43:400–406
- Robert Koch-Institut (RKI) (2009) Allergische Erkrankungen. In: Beiträge zur Gesundheitsberichterstattung des Bundes. 20 years nach dem Fall der Mauer: Wie hat sich die Gesundheit in Deutschland entwickelt? RKI, Berlin, pp 76–81
- Zöllner I, Weiland S, Piechotowski I et al (2005) No increase in the prevalence of asthma, allergies, and atopic sensitisation among children in Germany: 1992–2001. *Thorax* 60:545–548
- Maziak W, Behrens T, Brasky TM et al (2003) Are asthma and allergies in children and adolescents increasing? Results from ISAAC phase I and phase III surveys in Munster, Germany. *Allergy* 58:572–579
- Gößwald A, Lange M, Kamtsiuris P, Kurth BM (2012) DEGS: German health interview and examination survey for adults. A nationwide cross-sectional and longitudinal study within the framework of health monitoring conducted by the Robert Koch-Institute. *Bundesgesundheitsbl Gesundheitsforsch Gesundheitsschutz* 55:775–780
- Kamtsiuris P, Lange M, Hoffmann R et al (2013) The first wave of the German health interview, and examination survey for adults (DEGS1). Sampling design, response, sample weights and representativeness. *Bundesgesundheitsbl Gesundheitsforsch Gesundheitsschutz* 56:620–630
- Kurth BM (2012) Das Gesundheitsmonitoring—was es enthält und wie es genutzt werden kann. *Public Health Forum* 20(76):4.e1–4.e3
- Kurth BM, Lange C, Kamtsiuris P, Hölling H (2009) Health monitoring at the Robert Koch-Institute. Status and perspectives. *Bundesgesundheitsbl Gesundheitsforsch Gesundheitsschutz* 52:557–570
- Scheidt-Nave C, Kamtsiuris P, Gößwald A et al (2012) German health interview and examination survey for adults (DEGS)—design, objectives and implementation of the first data collection wave. *BMC Public Health* 12:730
- Gößwald A, Lange M, Dölle R, Hölling H (2013) The first wave of the German health interview and examination survey for adults (DEGS1). Participant recruitment, fieldwork, and quality management. *Bundesgesundheitsbl Gesundheitsforsch Gesundheitsschutz* 56:611–619
- Robert Koch-Institut (ed) (2009) DEGS: Studie zur Gesundheit Erwachsener in Deutschland – Projektbeschreibung. Beiträge zur Gesundheitsberichterstattung des Bundes. RKI, Berlin
- Lampert T, Kroll L, Müters S, Stolzenberg H (2013) Measurement of socioeconomic status in the German health interview and examination survey for adults (DEGS1). *Bundesgesundheitsbl Gesundheitsforsch Gesundheitsschutz* 56:631–636
- Kilpeläinen M, Terho EO, Helenius H et al (2001) Validation of a new questionnaire on asthma, allergic rhinitis, and conjunctivitis in young adults. *Allergy* 56:377–384
- Wedi B, Maurer M, Zuberbier T (2011) Neue Urticaria-Leitlinie – ein europäisches Empfehlungsgestützte. *Allergo J* 20:231
- Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften (AWMF) (2011) S2-Leitlinie Dermatologie: atopic dermatitis. http://www.awmf.org/uploads/tx_szleitlinien/013-0271_S2e_Atopic_dermatitis_01.pdf. Accessed 22 Oct 2012
- Stewart W, Brookmyer R, Van Natta M (1989) Estimating age incidence from survey data with adjustments for recall errors. *J Clin Epidemiol* 42:869–875
- Gesundheitsberichterstattung des Bundes (2000) Spezialbericht Allergien. http://www.gbe-bund.de/gbe10/abrechnungprc_abr_test_logon?p_uid=gasts&p_aid=&p_knoten=FID&p_sprache=D&p_suchstring=4318::Allergie. Accessed 22 Oct 2012
- Mutius E von (2002) Environmental factors influencing the development and progression of pediatric asthma. *J Allergy Clin Immunol* 109:S525–S532
- Fuchs O, Mutius E von (2009) Zur Prophylaxe in den Stall? Allergien bei Kindern. *Hausarzt* 16:57–60
- Schmitz R, Atzpodien K, Schlaud M (2012) Prevalence and risk factors of atopic diseases in German children and adolescents. *Pediatr Allergy Immunol*. (epub: Aug 13. doi:10.1111/j.1399-3038.2012.01342.x)
- Schäfer T, Heinrich J, Bohler E et al (2005) Allergien bei Heranwachsenden. *Gesundheitswesen* 67:S187–S192
- Tung J, Barreiro LB, Johnson ZP et al (2012) Social environment is associated with gene regulatory variation in the rhesus macaque immune system. *Proc Natl Acad Sci U S A* 109:6490–6495
- Fabel H, Konietzko N (Hrsg) (2005) Weißbuch Lunge. Thieme, Stuttgart
- Leynaert B, Sunyer J, Garcia-Esteban R et al (2012) Sex differences in prevalence, diagnosis and incidence of allergic and non-allergic asthma: a population-based cohort. *Thorax* 67:625–631
- Hermann-Kunz E (1999) Heuschnupfenprävalenz in Deutschland. Ost-West-Vergleich und zeitlicher Trend. *Gesundheitswesen* 61:S94–S99
- Allgemeine Ortskrankenkasse (AOK) (2012) Essen Women und Men anders? <http://www.aok.de/bundesweit/gesundheit/essen-trinken-ernaehung-unterschied-frau-mann-8555.php>. Accessed 22 Oct 2012
- European Center for Allergy Research Foundation (ECARF) (2012) Insect venom allergy-Symptome und Auswirkungen. http://www.ecarf.org/de/ueber_allergien/allergien/insektengiftallergie/symptome_und_auswirkungen.html. Accessed 22 Oct 2012
- REACH-Verordnung (EG/1907/2006) (2006) Anhang XVII-Beschränkungen Amtsblatt Nr. L 396/396–851 vom 30.12.2006. http://www.reach-helpdeskinfo/fileadmin/reach/dokumente/REACH_DE_XVII.pdf. Accessed 22 Oct 2012
- Bundesministerium der Justiz (1993) Verordnung über Verbote und Beschränkungen des Inverkehrbringens gefährlicher Stoffe, Zubereitungen und Erzeugnisse nach dem Chemikaliengesetz (Chemikalien-Verbotsverordnung-ChemVerbotsV). <http://www.gesetze-im-internet.de/chemverbotsv/BjNR172010993.html>. Accessed 22 Oct 2012
- Hausen BM, Kaatz M, Jappe U et al (2001) Henna/p-Phenylendiamin-Kontaktallergie: Folgeschwere Dermatosen nach Henna-Tätowierungen. *Dtsch Arztebl* 98:A1822–A1825
- Bundesinstitut für Arzneimittel und Medizinprodukte (BfArM) (2006) Voten des Sachverständigen-Ausschusses für Verschreibungspflichten nach § 53 AMG – 57. Sitzung, 19.06.2006 zu Positionen, deren Änderung zugestimmt wurde. <http://www.bfarm.de/cae/servlet/contentblob/1021344/publicationFile/79622/anlage1.pdf>. Accessed 22 Oct 2012
- Marco R de, Cappa V, Accordini S et al (2012) Trends in the prevalence of asthma and allergic rhinitis in Italy between 1991 and 2010. *Eur Respir J* 39:883–892
- Simpson CR, Sheikh A (2010) Trends in the epidemiology of asthma in England: a national study of 333,294 patients. *J R Soc Med* 103:98–106
- Global Initiative for Asthma (GINA) (2011) Global strategy for asthma management and prevention. http://www.ginasthma.org/uploads/users/files/GINA_Report2011_May4.pdf. Accessed 22 Oct 2012
- Komlos J, Lauderdale BE (2007) The mysterious trend in American heights in the 20th century. *Ann Hum Biol* 34:206–215
- Schneider HJ, Sievers C, Klotsche J et al (2009) Prevalence of low male testosterone levels in primary care in Germany: cross-sectional results from the DETECT study. *Clin Endocrinol (Oxf)* 70:446–454
- Mintel Press Release (2012) Women more likely to visit a salon, but a growing number of men interested in these services. <http://www.mintel.com/press-centre/press-releases/902/women-more-likely-to-visit-a-salon-but-a-growing-number-of-men-interested-in-these-services>. Accessed 22 Oct 2012