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Medication of adults in Germany

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

Background and purpose

Medication is an essential pillar in the prevention and therapy of illnesses. Detailed knowledge of medication at population level is indispensable for estimating morbidity and the related health care needs for the population, and thus of great relevance for public health [1]. Information on the use of medicine is also interesting in terms of health economics. Roughly 17% of the expenditure of the statutory health insurance funds went towards medication therapies in 2010 [2]. It should be noted that in addition to the therapeutic effect, medicinal products can also cause adverse effects which can impair or even endanger the health of users to a greater or lesser extent. In particular, the simultaneous use of several preparations can produce risks. Studies have demonstrated the correlation between the number of preparations used and the risk of drug interactions as well as adverse drug reactions [3, 4, 5, 6]. In addition to prescription drugs, over-the-counter (OTC) drugs acquired without a prescription are also used. According to information provided by the pharmaceutical manufacturers' association "Bundesverband der Arzneimittelhersteller e. V.", people in Germany spent an average of roughly 60 € per person on OTC preparations in 2010 [7]. The use of self-medication and dietary supplements on top of prescribed medicinal products is proven to increase the risk of drug interactions [8, 9, 10]. Drug interactions may not only impair the health and quality of life of drug

users, they also result in unnecessary costs within the health system and for the individuals. To estimate the use of medicinal products, it is of decisive importance to include the entire spectrum of drugs in the observation. The data provided by the health insurance funds can only reflect the segment of medication prescribed by a physician and reimbursed by the insurance funds but information on preparations used for self-medication cannot be derived from this data.

A further restriction when assessing medication via prescription data is that actual consumption cannot be derived directly from the available data. Patient compliance with and adherence to the prescribed medication is decisive of what is actually consumed [11, 12, 13]. Against this background, the medication data collected in the first wave of the German Health Interview and Examination Survey for Adults (DEGS1) proves to be suitable for filling information gaps on the use of drugs because it reflects all medicinal products (prescribed and self-medicated) as well as the extent and patterns of actual usage behaviour. Because of the linkage of this data with health-relevant information on living conditions and behaviour, it is also possible to provide a description of the determinants and profiles of medication use.

The objective of this study is to describe the prevalence and spectrum of medication among the adult population in Germany. The focus of this study is the evaluation of the use of drugs and dietary

supplements in association with sociodemographic and socioeconomic parameters stratified by self-medication and prescribed medication.

Materials and methods

The German Health Interview and Examination Survey for Adults ("Studie zur Gesundheit Erwachsener in Deutschland", 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 [14, 16, 17, 18]. The first wave (DEGS1) was conducted from 2008–2011 and comprised interviews, examinations and tests [19, 20]. The target population comprises the residents of Germany aged 18–79 years. DEGS1 has a mixed design which 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. There were 8,152 persons who participated, including 4,193 first-time participants (response rate 42%) and 3,959 revisiting participants of GNHIES98 (response rate 62%). A total of 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 for the age range of 18–79 years in comparison with GNHIES98 (n=7,124). The data of the revisiting participants can be

Tab. 1 Prevalence of medication use by sex, age and social status, DEGS1 2008–2011

Age Group	n	18–29 years	30–39 years	40–49 years	50–59 years	60–69 years	70–79 years	Total
Sex								
Women	3,692	81.9%	78.1%	83.0%	83.9%	92.3%	96.3%	85.4%
		(77.6–85.6%)	(72.8–82.5%)	(79.4–86.0%)	(80.9–86.6%)	(88.5–94.9%)	(93.8–97.8%)	(83.9–86.9%)
Men	3,400	41.2%	52.7%	58.8%	67.0%	85.4%	94.9%	63.8%
		(36.2–46.4%)	(46.4–58.9%)	(53.7–63.7%)	(62.3–71.4%)	(82.0–88.2%)	(92.0–96.8%)	(61.6–66.1%)
Total	7,092	61.2%	65.2%	70.6%	75.5%	88.9%	95.7%	74.7%
		(57.4–64.9%)	(60.9–69.2%)	(67.3–73.7%)	(72.6–78.1%)	(86.4–91.0%)	(94.0–96.9%)	(73.3–76.0%)
Social status								
<i>Women</i>								
Low	611	79.4%	65.7%	75.7%	85.8%	89.1%	93.2%	83.0%
		(70.3–86.3%)	(45.4–81.6%)	(63.8–84.5%)	(76.1–91.9%)	(76.9–95.2%)	(85.7–96.9%)	(78.8–86.4%)
Medium	2283	84.1%	82.2%	85.1%	81.7%	93.3%	98.3%	86.9%
		(78.9–88.2%)	(75.8–87.2%)	(80.9–88.6%)	(77.2–85.5%)	(89.2–95.9%)	(96.4–99.2%)	(85.0–88.7%)
High	774	80.0%	73.5%	81.1%	88.8%	94.0%	93.1%	83.5%
		(68.1–88.3%)	(62.6–82.1%)	(73.0–87.2%)	(81.2–93.6%)	(87.2–97.3%)	(83.2–97.4%)	(79.4–86.9%)
<i>Men</i>								
Low	545	41.5%	60.3%	60.9%	65.1%	85.5%	95.8%	65.4%
		(32.0–51.7%)	(44.9–73.9%)	(47.8–72.6%)	(54.7–74.3%)	(76.0–91.7%)	(87.9–98.6%)	(60.8–69.8%)
Medium	1919	40.9%	49.4%	57.2%	69.0%	84.9%	94.0%	62.7%
		(34.8–47.2%)	(41.2–57.5%)	(51.0–63.3%)	(63.2–74.3%)	(79.6–89.1%)	(89.4–96.7%)	(59.8–65.5%)
High	896	41.6%	56.1%	63.0%	62.2%	86.4%	98.4%	66.1%
		(29.7–54.6%)	(44.5–66.9%)	(54.5–70.7%)	(51.7–71.7%)	(80.1–91.0%)	(95.7–99.4%)	(61.6–70.4%)

used for longitudinal analyses. The cross-sectional and trend analyses are conducted with a weighting factor which corrects deviations in the sample from the population structure (as of 31 Dec 2010) with regard to age, sex, region and nationality, as well as community type and education [18]. A separate weighting factor was prepared for the examination part. Calculation of the weighting factor also considered re-participation probability of GN-HIES98 participants, based on a logistic regression model. 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 residential population aged 18–79 years of Germany [18]. To take into account the weighting as well as the correlation of the participants within a community, the confidence intervals were determined with the survey procedures for complex samples of SPSS-20 procedures for complex samples. Differences are regarded as statistically significant, if the respective 95% confidence intervals do not overlap.

Social status was determined using an index which includes information on school education and vocational training,

professional status and net household income (weighted by household needs), allowing for a classification into low, middle and high status groups [21].

Current medication intake is recorded via a computer-assisted personal interview (CAPI) by an appropriately trained interviewer. In the letter of invitation, the survey participants are asked to bring with them all of the original packages of the medicines they have used in the last 7 days prior to the examination date. With the question: “Have you taken any medicinal products or dietary supplements within the last 7 days, such as vitamins or minerals? Please don’t forget any painkillers, insulin preparations, medications issued by a physician, injections or plant-based medicinal products and please also list preparations from the supermarket or drugstore” it is ensured that not only the intake of drugs but also dietary supplements are recorded, irrespective of whether they were prescribed or purchased over the counter.

A medication database (WIDo master data file) provided and constantly updated by the Research Institute of Local Healthcare Funds (WIDo) and a supplements database of the National Nutrition Survey

(NVS) are integrated into the data recording program (“Arzneimittel Erfassungs-Datenbank”, AmEDa, Medication Recording Database) [19]. The supplements database enables the collection of information on vitamin and mineral preparations which are not authorised medicinal products. The “Central Pharmaceutical Number” (PZN) is scanned at the study centre, thereby automatically recording the name of the preparation, the “Anatomical Therapeutic Chemical” (ATC) code, the indication group, the dosage form and the standard package size. If there is no PZN available, the brand name is documented. In addition to this, the indication and origin (prescribed vs. self-medicated) are recorded for every preparation (medicinal products and dietary supplements). All medications prescribed by a physician or alternative practitioner and all previously prescribed medicinal products kept at home in the medicine cabinet are pooled and categorized as prescription medication. Self-medication comprises preparations purchased independently without a prescription (“Over The Counter”, OTC) and non-prescription preparations kept at home in the medicine cabinet. Polypharmacy is defined as the use of five or more

preparations (medicines and dietary supplements), prescribed polypharmacy as the use of five or more prescribed preparations. The duration of usage, dosage, frequency of use (regularly or as required) and use in the last 24 hours are also documented for every recorded preparation. If a preparation cannot be reliably identified at the study centre, an arrangement is made for the survey participant to be contacted by telephone or mail so that the missing information can be acquired [19].

Sociodemographic and socioeconomic parameters from the questionnaires completed by the participants are included to assess correlation to medication [21]. In addition to age, gender and social status, medication is also stratified according to the size of the place of residence. Municipality size is classified into the categories rural (<5,000 inhabitants), small town (5,000 to <20,000 inhabitants), medium-sized town (20,000 to <100,000 inhabitants) and city (>100,000 inhabitants).

A total of 7,092 persons (3,692 women and 3,400 men) participated in the medication interview. Most of the data were collected on the basis of the original packages the participants brought into the study centres. Only 1.5% of the men and women had to be subsequently contacted per telephone or mail. By scanning the PZN, the relevant information including ATC code was provided for 73% of the preparations, 27% had to be subsequently researched.

Results

Prevalence of medication use and number of preparations used

Of all adults aged 18–79 years, 74.7% (63.8% of men and 85.4% of women) had taken at least one preparation (medicinal product or dietary supplement) in the last 7 days. Prevalence rates among women are considerably and statistically significantly higher than among men. An increase in prevalence rates can be observed for both sexes with increasing age and it is more pronounced for men than for women. The greatest differences in the use of medicinal products are between men and women in the younger and middle age groups. These differences reduce with in-

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Abstract

The first wave of the German Health Interview and Examination Survey for Adults, 2008–2011 (DEGS1), assesses current medicine use among participating adults aged 18–79 years in the 7 days prior to the medical examination as part of a standardised interview. About three quarters (74.4%) of all men and women state that they used at least one preparation. Prevalence is highest among 70–79 year olds (men 94.9%; women 96.3%). Overall women have a significantly higher prevalence rate (85.4%) than men (63.8%). Preparations for the treatment of cardiovascular diseases are the most frequently used medicines (men 27.2%; women 29.5%). Polypharmacy (the use of 5 or more preparations) increases continuously with age and is observed significantly more often

in women than in men in all age groups with the exception of the age group 70–79. Of the 20,084 recorded preparations, 71.8% are prescribed by a doctor and 27.7% are self-medicated. While there are no differences in overall medication linked to social status, a social gradient is observed in prescribed preparations and self-medication. The results presented here describe key indicators of medication use representative of the German adult population. Based on the extensive data of DEGS1, further analyses into aspects such as co- and multimедication will be addressed in the future.

Keywords

Medicine use · Men · Women · Germany · Health survey

Arzneimittelanwendung von Erwachsenen in Deutschland. Ergebnisse der Studie zur Gesundheit Erwachsener in Deutschland (DEGS1)

Zusammenfassung

In der ersten Erhebungswelle der Studie zur Gesundheit Erwachsener in Deutschland, 2008–2011 (DEGS1), wird die aktuelle Arzneimittelanwendung in den letzten 7 Tagen vor der Untersuchung bei Erwachsenen (Alter: 18 bis 79 Jahre) durch ein standardisiertes ärztliches Interview erfasst. Etwa drei Viertel (74,7%) aller Männer und Frauen geben an, in diesem Zeitraum mindestens 1 Präparat angewendet zu haben. Bei den 70- bis 79-Jährigen ist die diesbezügliche Prävalenz am höchsten (Männer 94,9%; Frauen 96,3%). Bei Frauen findet sich mit 85,4% eine signifikant höhere Prävalenzrate als bei Männern (63,8%). Am häufigsten werden Präparate zur Behandlung des Herz-Kreislauf-Systems (Männer 27,2%; Frauen 29,5%) eingesetzt. Polypharmazie (Einnahme von 5 und mehr Präparaten) steigt mit zunehmendem Alter kontinuierlich an und wird – außer in der Gruppe der 70- bis 79-Jährigen – bei Frauen

signifikant häufiger beobachtet als bei Männern. Von 20.084 erfassten Präparaten sind 71,8% vom Arzt verordnet, und 27,7% kommen über den Weg der Selbstmedikation zum Einsatz. Während sich für die Arzneimittelanwendung insgesamt keine sozialschichtspezifischen Unterschiede zeigen, ist für die Selbst- und verschriebene Medikation ein Sozialgradient zu erkennen. Die dargestellten Ergebnisse beschreiben wesentliche Eckpunkte des Arzneimittelgebrauchs repräsentativ für die Erwachsenenpopulation in Deutschland. Basierend auf der umfangreichen Datenbasis werden zukünftig durch vertiefende Analysen weitere Aspekte wie Ko- und Multimедikation thematisiert.

Schlüsselwörter

Arzneimittelgebrauch · Männer · Frauen · Deutschland · Gesundheitssurvey

creasing age until prevalence rates reach a virtually identical level for both sexes in the 70–79 age group. Differentiated by social status, no statistically significant gender or age-specific differences can be observed (■ Tab. 1).

Women not only use medicinal products and dietary supplements more often

than men, they also use more preparations on average (3.1 vs. 2.0 preparations). As for prevalence rates, an age progression can be observed for both sexes concerning the average number of consumed preparations. The 18- to 29-year-old men indicated an average of 0.7 and women 1.6 preparations. Up to the age group 70–

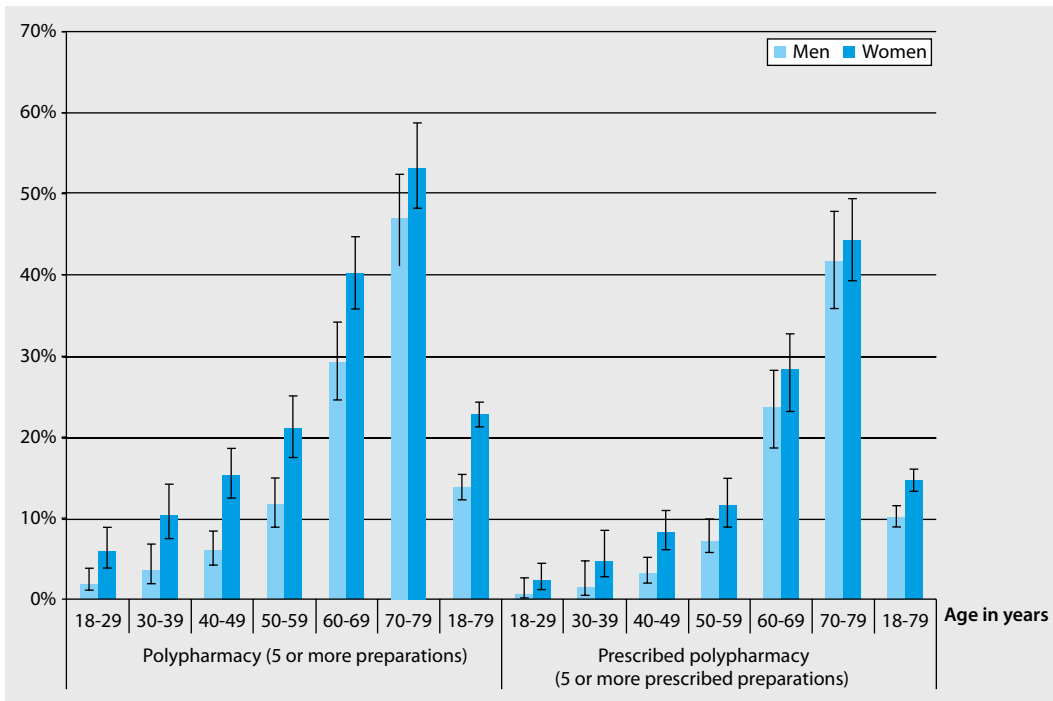


Fig. 1 ◀ Prevalence of polypharmacy by age and sex, DEGS1 2008–2011

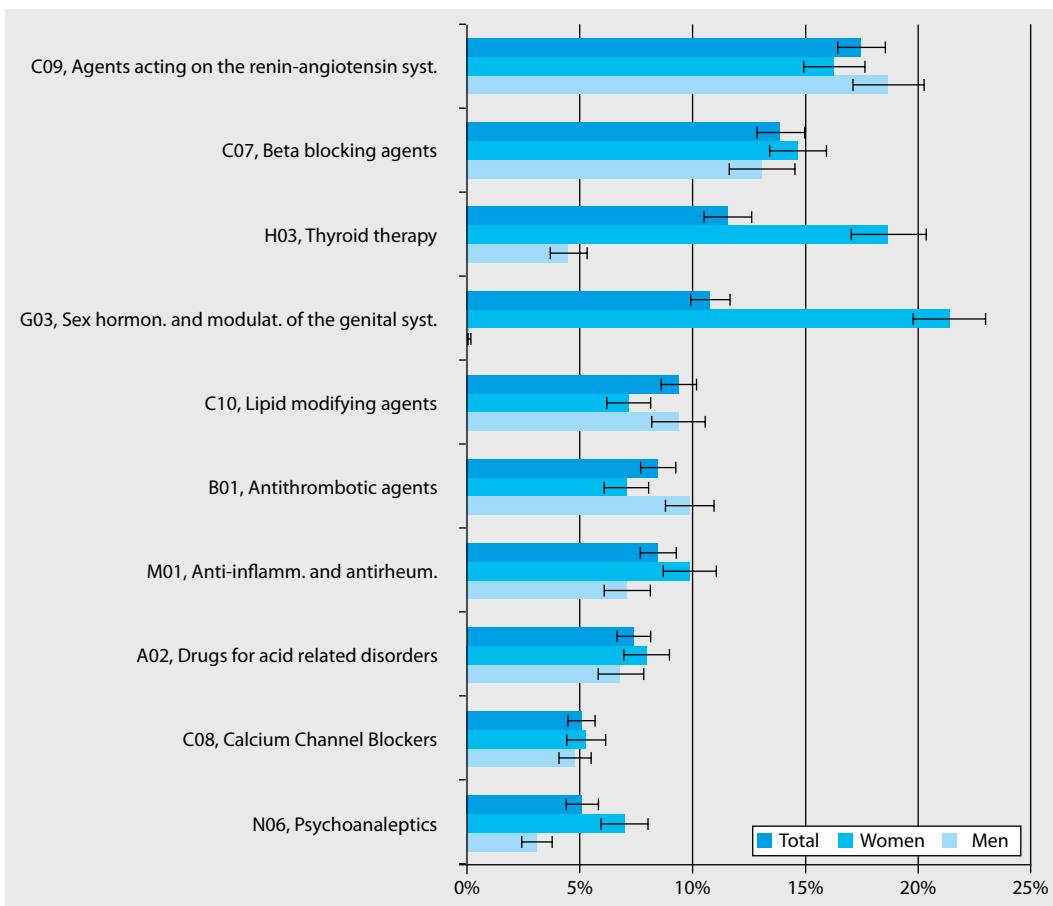


Fig. 2 ◀ Prevalence and ranking (first 10 places) of prescribed medication by ATC group and sex, DEGS1 2008–2011

79 years this increases among men to 4.7 and among women to 5.5 preparations. The continuous increase in the average number of consumed preparations takes

a particularly sharp increase in the 50–59 age group. The level of consumed preparations remains for women above that of men in all age groups (data not shown).

The prevalence of polypharmacy increases in both sexes with advancing age. At the age of 70–79, almost half of all men (47.0%) and more than half of

Tab. 2 Prevalence of medication use by ATC class and sex, DEGS1 2008–2011

ATC Group	Total n=7,092	Men	Women
	Prevalence (95% CI)	Prevalence (95% CI)	Prevalence (95% CI)
A Alimentary tract system and metabolism	20.7% (19.4–22.0%)	17.2% (15.6–18.9%)	24.1% (22.4–26.0%)
B Blood and blood-forming organs	11.2% (10.3–12.1%)	11.6% (10.5–12.8%)	10.8% (9.6–12.2%)
C Cardiovascular system	28.4% (27.1–29.7%)	27.2% (25.4–29.1%)	29.5% (27.8–31.3%)
D Dermatologicals	4.7% (4.0–5.5%)	4.8% (3.9–6.0%)	4.6% (3.8–5.4%)
G Genito-urinary system and sex hormones	16.9% (15.9–18.0%)	4.8% (4.1–5.7%)	28.9% (27.3–30.5%)
H Hormones, systemic excluding sex hormones	12.7% (11.7–13.9%)	5.4% (4.5–6.6%)	19.9% (18.2–21.8%)
J Antiinfectives, systemic	1.7% (1.3–2.1%)	1.2% (0.8–1.8%)	2.1% (1.6–2.8%)
L Antineoplastic and immunomodulating agents	1.5% (1.2–1.8%)	1.0% (0.7–1.5%)	1.9% (1.5–2.4%)
M Musculo-skeletal system	17.1% (15.9–18.3%)	15.0% (13.5–16.7%)	19.1% (17.5–20.9%)
N Nervous system	21.2% (20.1–22.3%)	16.6% (15.1–18.3%)	25.7% (23.9–27.6%)
P Antiparasitic products, insecticides, repellents	0.1% (0.1–0.3%)	0.0% (0.0–0.1%)	0.2% (0.1–0.5%)
R Respiratory system	12.1% (11.2–13.2%)	10.0% (8.7–11.3%)	14.3% (12.8–16.0%)
S Sensory organs	4.2% (3.6–5.0%)	2.9% (2.3–3.7%)	5.5% (4.4–6.9%)
V Various	22.5% (21.3–23.8%)	16.6% (15.1–18.2%)	28.3% (26.6–30.1%)

all women (53.2%) state that they have used five or more preparations in the last 7 days. Women show a significantly higher prevalence than men in this regard in almost all age groups, with the exception of the 70–79 year olds. No differences in polypharmacy prevalence are observed in this age group. The prevalence rate of prescribed polypharmacy is 13.6% for women, which is significantly higher than the corresponding rate for men (9.9%).

As with overall polypharmacy, the prevalence of prescribed polypharmacy also increases with age. This increase is particularly conspicuous for the age of 60+. Whereas the prevalence of overall polypharmacy in women of almost all age groups (exception 70–79 year olds), is significantly higher than in men, sex-specific differences for prescribed polyphar-

macy are only recorded for the 40–49 age group (■ Fig. 1).

Medication spectrum

In addition to the prevalence and quantity, the spectrum of preparations used permits conclusions on morbidity, supply and usage patterns of medication. The prevalences described by medication class (ATC class) and stratified for women and men are described in ■ Tab. 1.

Preparations for the treatment of the cardiovascular system (ATC code C) are the most commonly used by both men (27.2%) and women (29.5%). Most dominantly within this ATC code are the use of antihypertensives (ATC code C02), diuretics (ATC code C03), beta blockers (ATC code C07), calcium channel blockers (ATC code C08), ACE inhibitors (ATC

code C09) and cholesterol-lowering medicines (ATC code C10). Second place with 28.3% of women and 16.6% of men is taken up by the ATC class “V Various”, where dietary supplements (ATC code V06) are of greatest significance. Medications for the treatment of alimentary tract and metabolism disorders (ATC code A) and nervous system (ATC code N) follow in third and fourth place. Within the ATC code A it is antidiabetics (ATC code A10) and vitamin and mineral preparations (ATC codes A11, A12) within the ATC code N it is analgesics (ATC code N02) and psychotropic drugs (ATC code N05, N06) mainly determining the quantity of prevalence rates. With the exception of preparations for the treatment of the blood-forming organs (ATC code B) and dermatologicals (ATC code D), women show considerably higher prevalence rates than men for all medication classes. As expected, the greatest sex-specific differences are to be found in the use of hormone preparations (ATC classes G and H). The prevalence rates for women are almost four to six times higher than for men for both classes.

Prescribed medication versus self-medication

As the origin of virtually all preparations (prescribed vs. self-medication) is recorded separately in the medication interview it is possible to quantify both sources. Of 20,084 recorded preparations, information on the origin is available for 97.9%. The results of this study illustrate that medicinal therapy remains a domain of the physician. Accordingly, 71.8% of the preparations were prescribed by a doctor, 27.7% were used by way of self-medication and 0.4% originated from other sources. Within the study population, 38.8% of the women and men have used medicines and dietary supplements without a medical prescription and 58.8% with a medical prescription. Significant differences between men and women can be observed both in self-medication and prescribed medication, whereas higher rates are recorded for women. The prevalence of self-medication and prescribed medication increases in both sexes with advancing age, whereby this increase is considerably stronger for prescribed medication.

Tab. 3 Prevalence of self-medication and prescribed medication by sex, age, social status and municipality size, DEGS1 2008–2011

	Self-medication			Prescribed medication		
	Women	Men	Total	Women	Men	Total
Total n=7092	46.4%	31.1%	38.8%	71.3%	46.1%	58.8%
(95% CI)	(44.1–48.7%)	(29.2–33.1%)	(37.2–40.4%)	(69.4–73.1%)	(44.0–48.3%)	(57.3–60.2%)
Age						
18–29 years	39.4%	29.0%	34.1%	63.6%	16.4%	39.6%
(95% CI)	(34.2–44.9%)	(24.6–33.9%)	(30.6–37.9%)	(58.4–68.6%)	(13.0–20.5%)	(36.1–43.2%)
30–39 years	42.4%	33.5%	37.9%	61.7%	26.6%	43.8%
(95% CI)	(36.7–48.2%)	(28.2–39.3%)	(33.8–42.1%)	(56.1–67.0%)	(21.7–32.0%)	(39.9–47.8%)
40–49 years	50.9%	29.8%	40.1%	63.7%	38.7%	50.9%
(95% CI)	(45.4–56.4%)	(25.7–34.4%)	(36.8–43.6%)	(58.8–68.3%)	(34.3–43.3%)	(47.8–54.0%)
50–59 years	45.2%	29.6%	37.4%	70.2%	49.9%	60.1%
(95% CI)	(41.1–49.3%)	(25.4–34.2%)	(34.4–40.5%)	(66.0–74.2%)	(45.0–54.9%)	(57.0–63.1%)
60–69 years	49.2%	30.7%	40.2%	83.9%	79.8%	81.9%
(95% CI)	(44.3–54.2%)	(25.9–35.8%)	(36.6–43.9%)	(79.4–87.5%)	(75.9–83.1%)	(79.0–84.4%)
70–79 years	51.5%	37.0%	44.9%	91.0%	89.2%	90.2%
(95% CI)	(45.9–57.0%)	(31.9–42.4%)	(41.2–48.7%)	(87.7–93.4%)	(85.5–92.0%)	(87.9–92.0%)
Social status						
Low	38.7%	26.3%	32.7%	70.0%	49.0%	59.7%
(95% CI)	(33.3–44.3%)	(22.0–31.2%)	(28.9–36.7%)	(65.3–74.3%)	(43.6–54.3%)	(56.1–63.3%)
Medium	47.1%	31.2%	39.4%	73.8%	45.5%	60.2%
(95% CI)	(44.3–49.9%)	(28.7–33.9%)	(37.6–43.3%)	(71.5–75.9%)	(43.0–48.1%)	(58.4–61.9%)
High	52.4%	35.4%	43.0%	65.4%	45.7%	54.6%
(95% CI)	(48.1–56.7%)	(31.9–39.2%)	(40.1–50.0%)	(60.6–69.9%)	(41.0–50.2%)	(51.2–57.9%)
Municipality size class						
Rural ^a	41.1%	27.8%	34.2%	76.2%	50.0%	62.6%
(95% CI)	(36.3–46.2%)	(23.9–31.9%)	(30.8–37.7%)	(72.2–79.8%)	(45.1–54.9%)	(59.2–58.8%)
Small town ^b	44.2%	29.0%	36.6%	72.5%	48.5%	60.6%
(95% CI)	(40.2–48.3%)	(25.1–33.1%)	(33.5–39.9%)	(68.8–75.9%)	(44.4–52.6%)	(57.5–63.6%)
Medium-sized town ^c	48.5%	33.8%	41.3%	71.1%	43.5%	57.6%
(95% CI)	(44.1–52.8%)	(30.4–37.4%)	(38.6–44.0%)	(67.6–74.3%)	(39.9–47.3%)	(55.1–60.0%)
City ^d	48.5%	32.0%	40.4%	68.3%	44.8%	56.7%
(95% CI)	(44.1–52.9%)	(28.3–35.9%)	(37.2–43.6%)	(64.7–71.7%)	(40.8–48.9%)	(54.0–59.4%)

95% CI 95% confidence interval. ^a<5,000 inhabitants. ^b5,000 to <20,000 inhabitants. ^c20,000 to <100,000 inhabitants. ^d≥100,000 inhabitants.

While no significant differences can be seen for overall medication regarding social status, a social gradient can be recognised for self-medication and prescribed medication. With prescribed medication, higher usage rates are found among men and women with a lower or middle social status than among persons of high social status; the differences between middle and high social status are statistically significant. With self-medication, prevalence rates increase with increasing social status. The differences in self-medication between low and high social status are statistically significant. Self-medication is observed significantly more often in cities and medium-sized towns than in rural areas. The op-

posite is the case for prescribed medication, where prevalence in the cities and medium-sized towns is significantly lower than in rural communities (<5,000 inhabitants) (■ **Tab. 3**).

Spectrum of prescribed medication and self-medication

The prevalence of prescribed medication is decisively influenced by the intake of ACE inhibitors (ATC code C09: 17.5%) and beta blockers (ATC code C07: 13.9%). This is followed by preparations for thyroid therapy (ATC code H03: 11.6%), sexual hormones and modulators of the genital system (ATC code G03: 10.8%). Conspicuously, medicinal products for

the treatment of cardiovascular diseases are represented five times among the 10 most commonly ingested medication groups (ACE inhibitors: ATC code C09, beta blockers ATC code: C07, lipid modifying agents ATC code: C10, antiplatelet drugs ATC code: B01, and calcium antagonists ATC code: C08). As expected, significantly higher usage rates for thyroid therapy preparations (ATC code H03), sexual hormones and modulators of the genital system (ATC code G03) are to be found among women than men. Contrary to this, the prevalences of ACE inhibitors (ATC code C09), lipid modifying agents (ATC code C10) and antithrombotic agents (ATC code B01) are significantly higher among men.

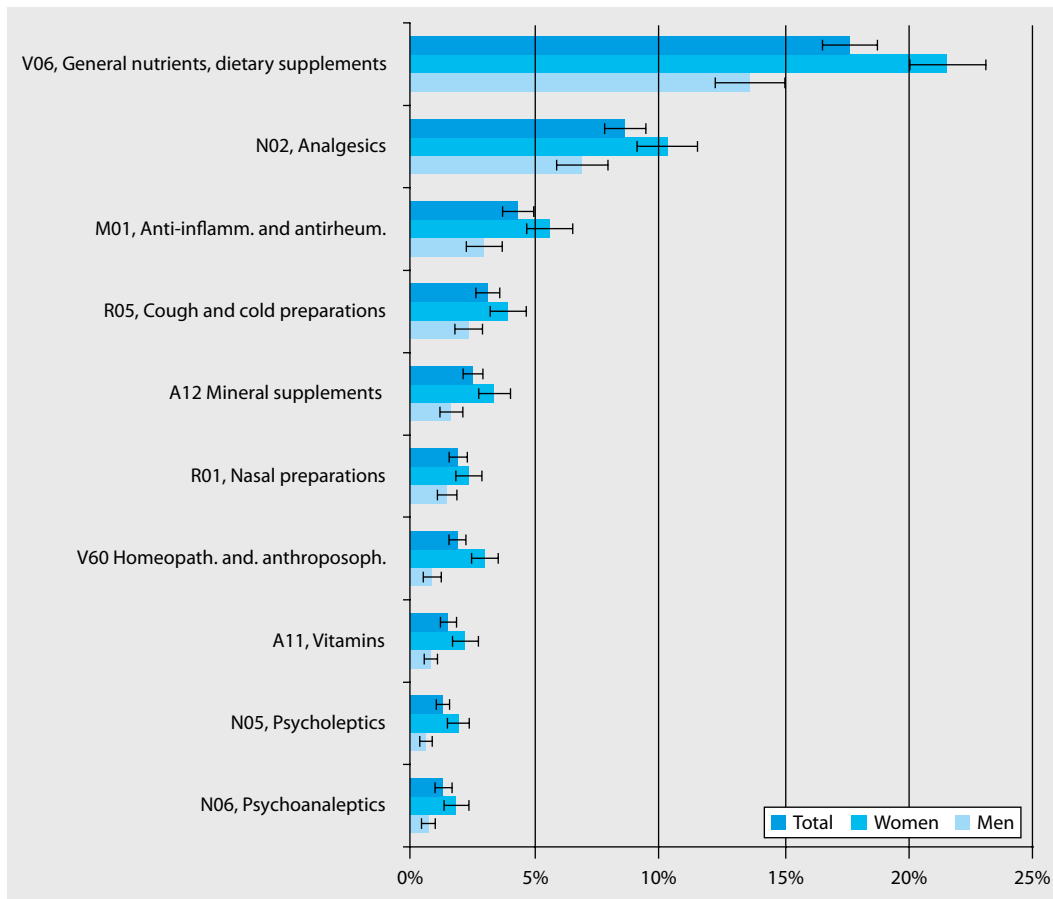


Fig. 3 ◀ Prevalence and ranking (first 10 places) of self-medication by ATC group and sex, DEGS1 2008–2011

In the field of self-medication, preparations of the ATC group V06 (17.6%) are used most frequently. Here, particularly dietary supplements determine the prevalence rate. More than one person in ten has utilized preparations of this group without a medical prescription. This is followed in second place by analgesics (ATC code N02) with 8.6%. Self-medication with antiphlogistics and antirheumatics (ATC code M01) was recorded for 4.3% of the study population, and preparations for the treatment of coughs and common colds (ATC code R05) are used by 3.1% without a medical prescription. Including all ATC groups mentioned above, prevalence rates among women are significantly higher than among men. The differences are particularly striking concerning dietary supplements (ATC code V06) (■ Fig. 3).

Discussion

Almost three quarters of all men and women in Germany currently use medicinal products and/or dietary supplements to treat illnesses, relieve complaints and symptoms or promote health. Prevalence rates are higher among women than men. In addition to this, prevalence rates and the number of preparations used both rise with advancing age. Once pension age has been reached, the gender-specific differences decrease steadily, virtually disappearing among 70- to 79-year-old men and women. Polypharmacy as well as prescribed polypharmacy become continuously more significant with increasing age. These results are confirmed to varying degrees by published data. Data on medication are reported for the USA in the regularly conducted Slone Survey, named after Dennis Slone [22]. In a random sample of telephone numbers, household members are asked about their current use of medicines and dietary supplements within the

last 7 days. Prevalence rates were then already higher in 1998/99 with 81% and 2006 with 82% than in Germany (71.5% in GNHIES98; 74.7% in DEGS1); this also applies to the prevalence of polypharmacy (29% in the Slone Survey; 18.3% in DEGS1, recalculated data not shown in the Results).

A prevalence niveau for medication comparable with our study is to be found in the data of a Swedish health survey conducted as a population-based cross-sectional study between 2001 and 2005. Medicine use among 2,816 randomly selected men and women aged 30–75 years amounted to 71% [23]. In a census conducted by Morgan et al. [9] in Australia, in which medicine use in the last 24 hours by people aged 50 years and older was recorded in a postal survey, medication prevalence rates came up to 87.1%. This corresponds roughly with the results of DEGS1 (85.4%, recalculated data not shown in the “Results” section), as long as only the over 50s are taken into consideration in the analysis. With 43.3%,

the prevalence of polypharmacy is considerably higher in the survey of Morgan et al. than it is in our study (31.8%, recalculated data not shown in the “Results” section). A similarly high polypharmacy rate as in DEGS1 is seen by Nobili et al. [24] after analysis of the prescription data of the Italian National Health Service (NHS) for persons older than 65 years. In this study polypharmacy was recorded for one year preceding the study and they found that almost half of men (45%) and women (46%) aged over 65 were using polypharmacy. In DEGS1, polypharmacy is found in 42% of the men (recalculated data not shown in the “Results” section) and 51% of women (recalculated data not shown in the “Results” section) of this age group. Data of the Rotterdam study, a population-based prospective cohort study covering 7,983 persons aged 55 and over, show a polypharmacy prevalence (≥ 4 preparations) of 20.3% [6].

The correlation proven in our analysis of age and gender on the one hand and medication on the other is to be found in publications based on survey data [25, 26, 27] and in analyses based on secondary or health insurance fund data [28, 29].

According to the DEGS1 data, the majority of medicinal products are still taken on the advice of a physician. Where prescription medication is concerned, drugs for the treatment of cardiovascular disorders dominate, which means that our data are comparable with published data of national and international studies [9, 30, 31, 32, 33]. However, according to DEGS1 results a considerable number of persons uses medicinal products—above all supplements—by way of self-medication. Dietary supplements and analgesics are the main preparations used for self-medication. Compared to the results of the National Health and Nutrition Surveys (NHANES I–III) [34], the prevalence rates for current use of dietary supplements determined in DEGS1 are lower. However, as the intake of dietary supplements in NHANES was recorded for one whole month, the time frame was here considerably longer than in DEGS1 (7 days).

The increase in the self-medication rate with increasing social status was already asserted in the data of the 1998 Ger-

man National Health Interview and Examination Survey in which a representative random sample of the resident population of Germany aged 18–79 years was questioned about medication in the preceding 7 days. For both genders, simultaneous or exclusive self-medication is associated with a high social status [35]. A Spanish study representative of the population, in which the self-medication rate during acute illness is associated with a higher level of education, which often means a higher social status too, comes to similar results [1].

When comparing the results of these studies with those of DEGS1, however, it should be taken into account that medication use and polypharmacy, prescribed medication and self-medication were defined differently in each instance and that there were differences in the observation and data collection periods which can lead to different estimators. Moreover, the comparability of the study results can be restricted by differences in the study populations regarding age, sex or setting.

Strengths and limitations

Because DEGS1 is a study representative of the population, it permits generalisations on medication usage of the adult population in Germany. In association with health-relevant information from the survey, DEGS1 allows conclusions to be drawn regarding use patterns and user profiles under everyday conditions and independent of the utilisation of medical services. By recording data on overall medication, it is possible to assess self-medication which cannot be done with prescription data. It has a limiting effect because the collected data describe current medication use and are based on self-reporting. It was possible to validate this information as the respondents brought the original packages of the preparations they had used to the study centre, where they were scanned. By scanning in the central pharmaceutical number (PZN), all information on the preparation, such as the name and ATC code, is transferred automatically to the database. Where information on preparation designations is missing, all available medication information systems are

accessed or research is conducted in the internet. If a medication or dietary supplement cannot be clearly identified, an ATC code is issued on an aggregated level. The percentage of misclassified preparations (ATC code) is minimised in this way. Classification remains a problem, however, with unspecific designations which are sold as medicinal products (vitamins and minerals, ATC code A11 and A12 respectively) or as dietary supplements (ATC code V06). A misclassification bias cannot be completely excluded here. This becomes clear when making a comparison with the results on the use of vitamins and minerals from GNHIES98, where the prevalence rates for the use of these preparations (ATC code A11 or A12) given by Beitz et al. [35] are far higher than the prevalence estimates reported here in DEGS1. At the same time, the dietary supplements (ATC code V06) in GNHIES98 with prevalence rates far lower than those determined in DEGS1 are of negligible importance.

The restriction of the survey to drug use of the last 7 days has the effect on the one hand that errors due to poor memory (recall bias) are minimised. On the other hand, however, interruptions in the use of medicinal products that are used cyclically within this time frame can lead to a misclassification and thereby to a potential underestimation of use in general or within individual subgroups.

Conclusion and outlook

With the data from DEGS1, this study presents essential prevalence estimates for the use of medicines and dietary supplements among the adult population in Germany. Thereby, valid information can be obtained on the real current medication exposure as well as the extent of co- and multimедication among non-institutionalised people. The repeated recording of representative cross-sectional data permits estimations of time trends of medicine utilization. The recording of longitudinal information can be used to quantify the effects of exposure to medicinal products, thereby contributing towards drug surveillance.

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