Original Article

Psychoactive Substance Use in Germany

Findings From the Epidemiological Survey of Substance Abuse (ESA) in 2024

Sally Olderbak, Regina Hollweck, Eva-Maria Krowartz, Justin Möckl, Eva Hoch

IFT Center for Mental Health & Addiction Research, Munich, Germany: Dr. phil. Sally Olderbak, Dipl. Stat. Regina Hollweck, Eva-Maria Krowartz, M. Sc., Dr. rer. biol. hum. Justin Möckl, Prof. Dr. rer. nat. habil. Eva Hoch

Department of Clinical Psychology and Psychotherapy, Charlotte Fresenius University, Munich, Germany: Dr. phil. Sally Olderbak, Prof. Dr. rer. nat. habil. Eva Hoch

Department of Psychiatry and Psychotherapy, University Hospital, LMU Munich, Munich, Germany: Dr. phil. Sally Olderbak, Eva-Maria Krowartz, M. Sc., Prof. Dr. rer. nat. habil. Eva Hoch

Summary

Background: Monitoring the use of psychoactive substances and the prevalence of substance-related disorders in the general population enables estimation of the extent of substance abuse and its effects on health and society.

Methods: Data are from the Epidemiological Survey of Substance Abuse (ESA) for 2024 (n = 7534, aged 18–64 years). Prevalence rates were calculated for the use of tobacco, alcohol, cannabis, illegal drugs, and medications, and for individuals who met the DSM-IV criteria for dependency or abuse. Rates were extrapolated to the German resident population aged 18 to 64 (51 480 168 people).

Results: The most commonly used substance was alcohol, with a 30-day prevalence of 68.6% (35.3 million people), followed by non-opioid analgesics (31.5%) and conventional tobacco products (21.8%). The 12-month prevalence of cannabis use was 9.8% (5.1 million people). Dependence prevalences were 4.2% for alcohol, 8.3% for tobacco, 1.0% for cannabis, 0.1% for amphetamines, 0.1% for cocaine, 2.8% for analgesics, and 1.5% for hypnotics and sedatives. Abuse prevalences were 5.6% for analgesics, 0.5% for cannabis, 0.1% for cocaine, 0.1% for amphetamines, 1.1% for hypnotics and sedatives, and 3.3% for alcohol.

Conclusion: The use of psychoactive substances in Germany is still widespread. Because of the effects of psychoactive substance use on health and society, continual monitoring is essential for the early detection of trends and the institution of targeted preventive and interventional measures.

Cite this as:
Olderbak S, Hollweck R, Krowartz EM, Möckl J, Hoch E: Psychoactive substance use in Germany: Findings from the Epidemiological Survey of Substance Abuse (ESA) in 2024.
Dtsch Arztebl Int 2025; 122: 625–31.
DOI: 10.3238/arztebl.m2025.0157

The use of alcohol, tobacco and other psychoactive substances is one of the leading risk factors for physical and mental disease as well as premature mortality worldwide (1). In Germany, in 2021, approximately 99 000 persons died as a result of smoking or prolonged exposure to secondhand smoke (2) and 21 700 persons aged 15 to 69 years died as a result of their alcohol consumption (3). Since 2017, the number of deaths related to the use of illegal substances, such as heroin, cocaine and synthetic drugs, has been rising continuously. In 2023, the number of drug-related deaths reached an all-time high of 2227 cases, corresponding to an increase of 12% compared to the previous year (4).

Despite the trend of declining alcohol use, which started in the 1990s, Germany remains one of the countries with the highest per capita alcohol consumption worldwide (5). In addition, a decline in tobacco use has been noted over the last decade: The per capita cigarette use in Germany fell from 1022 cigarettes in 2010 to 785 cigarettes in 2022 (6). In recent years, a number of alternative nicotine products, such as e-cigarettes, has been brought to market. The exposure to secondhand smoke is a health risk, regardless of whether the source is conventional tobacco cigarettes or e-cigarettes and related products. About 8% of adult non-smokers are exposed to secondhand smoke at least once a week and about 4% are exposed daily (7). According to estimates from 2005, which are based on data from 2003, approximately 3300 non-smokers died in Germany as a result of secondhand smoke exposure (8).

The purpose of collecting data on the use of psychoactive substances in a systematic way is to create a central resource for developing effective health policy measures. Using this approach, it is possible to estimate the burden on the healthcare system and develop targeted strategies for prevention and treatment. The Epidemiological Survey of Substance Abuse (ESA) is designed to regularly provide representative data on the use of psychoactive substances among the adult population in Germany. The aim of this article is to present information on the frequency of use of tobacco, alcohol, cannabis and illegal

Table 1

The 30-day prevalence of consumption of conventional tobacco products, hookahs and alternative nicotine delivery systems as well as extrapolations to the population aged 18 to 64 years

Total*1			Women			Men			Extrapolation to the entire resident population *2	
%*3	[95% CI]	n*4	%	[95% CI]	n	%	[95% CI]	n	N*5	[95% CI]
Cigarettes, cigars, cigarillos, pipes										
21.8	[20.1; 23.5]	1322	19.7	[17.6; 22.0]	678	23.7	[21.5; 26.0]	638	11.22 million	[10.35; 12.10]
Daily consumption*6										
9.3	[8.1; 10.5]	493	8.5	[7.0; 10.4]	248	10.0	[8.4; 11.7]	244	4.79 million	[4.17; 5.41]
Heavy consumption*7 (only users)										
14.8	[11.9; 18.3]	116	12.7	[9.0; 17.6]	45	16.4	[12.2; 21.8]	70	1.66 million	[1.34; 2.05]
Hookahs										
1.7	[1.4; 2.1]	151	1.0	[0.7; 1.4]	60	2.3	[1.8; 3.0]	90	0.88 million	[0.72; 1.08]
E-cigarettes, e-hookahs, e-pipes, e-cigars										
8.3	[7.2; 9.5]	608	7.8	[6.6; 9.1]	335	8.7	[7.2; 10.6]	267	4.27 million	[3.71; 4.89]
Heat-not-burn products										
1.9	[1.5; 2.4]	156	1.9	[1.4; 2.6]	91	1.9	[1.3; 2.7]	63	0.98 million	[0.77; 1.24]
At least one of these products*8										
28.2	[26.5; 29.9]	1819	26.1	[23.8; 28.4]	950	30.1	[27.9; 32.4]	857	14.52 million	[13.64; 15.39]

*1Includes men, women, and diverse; *2 mean value based on 51 480 168 persons aged between 18 and 64 years (as of 31 December 2023; German Federal Statistical Office); *3% = weighted prevalence [95% CI]; *4n = unweighted number; *5in million; *6daily consumption of at least one cigarette; *7daily consumption of at least 20 cigarettes among cigarette users; *8In the last 30 days, at least once used one of the following: cigarettes, cigars, cigarillos, pipes, hookahs, e-cigarettes, e- hookahs, e-pipes, e-cigars, or heat-not-burn products; 95% CI, 95% confidence interval

substances, as well as medications and to provide an overview of the associated health risks.

Methods

Study design and sampling

The 2024 ESA Survey sampled German-speaking adults aged 18 to 85 years living in private households in Germany. In our analysis, we focused on respondents aged 18 to 64 years (n = 7534) to ensure comparability with previous ESA survey waves. A two-stage selection procedure was used for sampling. The survey was carried out between August and December 2024, allowing respondents to complete the survey in writing, online, or over the phone. The initial sample size was calculated based on an assumed response rate of 25%; the empirical response rate was slightly lower at 22.0%. Our analyses are based on self-reported information by the respondents (For detailed information on methods used for the 2024 ESA survey see the *eSupplement*).

Instruments

Conventional tobacco products, hookahs, and alternative nicotine delivery systems

Consumption of conventional tobacco products (cigarettes, cigars, cigarillos, and pipes), hookahs and alternative nicotine delivery systems (e-cigarettes, e-hookahs, e-pipes, e-cigars, and heat-not-burn products) was recorded for the period of the last 30 days (9). Daily cigarette use was defined as smoking at least one cigarette per day, while heavy cigarette use was defined as smoking at least 20 cigarettes every day in the 30 days preceding the survey.

Alcohol

The amount of alcohol consumed during the last 30 days was determined using a beverage-specific frequency–-quantity index for beer, wine/sparkling wine, spirits, and mixed alcoholic beverages. Binge drinking was defined as consuming five or more alcoholic drinks (approximately 70 g of pure alcohol) on at least one day during the last 30 days. Thresholds for risky alcohol consumption were defined for women and men as daily consumption of more than 12 g and 24 g pure alcohol, respectively (10, 11).

Cannabis

Data on the use of cannabis (hashish, marijuana, and other cannabis products containing more than 0.3% THC) was collected in relation to the period of the last 12 months preceding the survey. Thus, the new legal regulation, under which cannabis is no longer classified as an illegal substance in Germany as of 1 April 2024, fell within the survey period (12).

Illegal drugs

The use of amphetamine and methamphetamine, MDMA (“ecstasy“), LSD, heroin, other opioids (e.g., codeine, methadone, opium, morphine), cocaine/crack, hallucinogenic mushrooms, and new psychoactive substances (NpS) was recorded for the period of the last 12 months preceding the survey. The variable “at least one of these drugs“ included the consumption of at least one illegal

Table 2

The 30-day prevalence of alcohol consumption and extrapolation to the population aged 18 to 64 years

Total*1			Women			Men			Extrapolation to the entire resident population*2	
%*3	[95% CI]	n*4	%	[95% CI]	n	%	[95% CI]	n	N*5	[95% CI]
Consumption prevalence										
68.6	[66.9; 70.3]	5336	64.0	[61.9; 66.1]	2 902	73.2	[70.6; 75.6]	2 415	35.32 million	[34.44; 36.19]
Binge drinking*6 (only users)										
27.0	[24.8; 29.2]	1340	16.9	[14.8; 19.3]	493	35.5	[32.3; 38.9]	842	9.54 million	[8.76; 10.31]
Consumption of risky amounts*7 (only users)										
24.4	[22.6; 26.3]	1177	23.8	[21.6; 26.2]	641	24.9	[22.2; 27.8]	536	8.62 million	[7.98; 9.29]

*1Includes men, women and diverse; *2based on 51 480 168 persons aged between 18 and 64 years (as of 31 December 2023; German Federal Statistical Office);
*3 % = weighted prevalence [95% CI]; *4n = unweighted number; *5in million;
*6binge drinking: consumption of five or more alcoholic drinks on at least one of the last 30 days;
*7risky consumption: average consumption of more than 12 g and 24 g (women and men, respectively) pure alcohol per day; 95% CI, 95% confidence interval

substance within the last 12 months. Two operationalizations of this variable were considered: one with and one without cannabis to ensure comparability with previous survey waves.

Medication

The use of non-opioid analgesics, opioid analgesics, hypnotics or sedatives, analeptics (stimulants), anorectics, antidepressants, neuroleptics, and medicinal cannabis (cannabis flowers or cannabis products) was recorded for the period of the last 30 days preceding the survey. Data on which medications were taken daily was also collected. Using a list of the most commonly used medications, the respondents independently assigned these medications to the respective medication groups.

Dependence and abuse according to DSM-IV

The Munich Composite International Diagnostic Interview (M-CIDI) was used to assess abuse of and dependence on conventional tobacco products, alcohol, cannabis, cocaine, amphetamine, analgesics (non-opioid and opioid-containing), as well as hypnotics and sedatives (13). For conventional tobacco products, only dependency was recorded.

Statistical analyses

Descriptive data on substance use and data on substance abuse and dependence are presented as prevalence estimates with corresponding 95% confidence intervals and reported both for the total population and stratified by gender. Projections for the total German resident population aged 18–64 years are based on the current population statistics (as of 31 December 2023) reporting 51 480 168 persons (14). Given the small number of persons who stated their gender as “diverse“ (n = 33), gender-stratified analyses were performed for men and women only. Since the total results include all persons, female and male case numbers do not add up to the total sample size (n). We used post-stratification weights to adjust the data to the distribution of the underlying German adult population with regard to age, gender, education, federal state, and municipality size. Given the complex sample design, we estimated the standard error using Taylor series linearization which allows robust variance estimation for weighted and stratified samples (15) (for further details see the *eSupplement)*. The statistical software Stata 15.1 SE was used for the data analyses (16).

Results

Conventional tobacco products, hookahs and alternative nicotine delivery systems

The 30-day prevalence of the use of conventional tobacco products was 21.8% (11.2 million persons), while the proportion of daily users was 9.3% (4.8 million) *(Table 1)*. Of the persons consuming conventional tobacco products, 14.8% (1.7 Mio.) stated that they smoke at least 20 cigarettes daily and 8.3% (4.3 Mio.) of the total population met the criteria for dependence on conventional tobacco products *(eTable)*. During the last 30 days, 1.7% of the respondents (875 000 persons) had used hookahs, while 8.3% (4.27 million) had used e-cigarettes/e-hookahs/e-pipes/e-cigars and 1.9% (978 000) had used heat-not-burn products. In all product categories, except heat-not-burn products, prevalence rates were higher in men compared to women. Across all categories, 28.2% (14.5 million persons) stated that they had used at least one product type in the last 30 days.

Alcohol

68.6% of the respondents (35.3 million persons) reported to have consumed alcohol in the last 30 days *(Table 2)*. Of these, 27.0% (9.5 million) reported at least one episode of binge drinking, with a higher prevalence among men (35.5%) compared to women (16.9%). 24.4% of the respondents (8.6 million persons) reported to have consumed risky amounts of alcohol during the last 30 days. 4.2% (2.2 million) of the total population met the criteria for alcohol dependence. The prevalence of alcohol abuse was 3.3% (1.7 million) *(eTable)*.

Cannabis

The 12-month prevalence of cannabis use was 9.8% (5.0 million persons); it was higher in men (12.3%) compared to women (7.1%) *(Table 3)*. 1.0% percent of the total population (515 000) met the criteria for

Table 3

The 12-month prevalence of drug consumption and extrapolation to the population aged 18 to 64 years

Total[*1]			Women			Men			Extrapolation to the entire resident population [*2]	
%[*3]	[95% CI]	n[*4]	%	[95% CI]	n	%	[95% CI]	n	N[*5]	[95% CI]
Cannabis										
9.8	[8.6; 11.0]	896	7.1	[6.0; 8.4]	399	12.3	[10.7; 14.2]	485	5.05 million	[4.43; 5.66]
Amphetamine/methamphetamine										
0.7	[0.5; 1.1]	87	0.5	[0.3; 0.8]	39	0.9	[0.6; 1.4]	45	0.36 million	[0.26; 0.57]
Amphetamine										
0.7	[0.5; 1.1]	86	0.5	[0.3; 0.8]	38	0.9	[0.6; 1.4]	45	0.36 million	[0.26; 0.57]
Methamphetamine										
0.0	[0.0; 0.2]	3	0.0	[0.0; 0.1]	1.0	0.0	[0.0; 0.1]	1	0.02 million	[0.00; 0.10]
MDMA ("ecstasy")										
1.0	[0.7; 1.5]	125	0.7	[0.5; 1.2]	56	1.3	[0.9; 2.0]	68	0.51 million	[0.36; 0.77]
LSD										
0.7	[0.5; 1.0]	77	0.4	[0.2; 0.7]	25	1.0	[0.6; 1.4]	50	0.36 million	[0.26; 0.51]
Heroine/other opioids										
0.8	[0.5; 1.1]	55	0.9	[0.5; 1.4]	32	0.6	[0.4; 1.0]	22	0.41 million	[0.26; 0.57]
Cocaine/crack										
1.1	[0.7; 1.7]	133	0.7	[0.4; 1.3]	61	1.4	[0.9; 2.2]	71	0.57 million	[0.36; 0.88]
Hallucinogenic mushrooms										
0.5	[0.3; 0.7]	62	0.3	[0.2; 0.6]	30	0.6	[0.4; 1.0]	31	0.26 million	[0.15; 0.36]
New psychoactive substances (NpS)										
0.8	[0.6; 1.1]	91	0.6	[0.3; 0.9]	36	1.0	[0.7; 1.5]	54	0.41 million	[0.31; 0.57]
At least one of these drugs (with cannabis)[*6]										
11.2	[9.9; 12.6]	1 201	8.4	[7.1; 9.8]	464	13.8	[12.0; 15.7]	543	5.77 million	[5.10; 6.49]
At least one of these drugs (without cannabis)[*7]										
3.7	[3.0; 4.7]	390	2.7	[2.0; 3.7]	178	4.6	[3.7; 5.8]	209	1.90 million	[1.54; 2.42]

*1Includes men, women; and diverse; *2 based on 51 480 168 persons aged between 18 and 64 years (as of 31 December 2023; German Federal Statistical Office);
*3 % = weighted prevalence [95% CI]; *4n = unweighted number; *5in million;
*6cannabis, amphetamines, methamphetamines, ecstasy, LSD, heroine/other opioids, cocaine/crack, hallucinogenic mushrooms, and new psychoactive substances (NPS);
*7amphetamine, methamphetamine, ecstasy, LSD, heroine/other opioids, cocaine/crack, hallucinogenic mushrooms, and new psychoactive substances (NPS);
95% CI, 95% confidence interval

cannabis dependence and 0.5% (257 000) for cannabis abuse *(eTable)*. The findings on cannabis use are presented in greater detail in the article by Hoch et al. (17).

Illegal drugs

A total of 3.7% of respondents (1.9 million persons) reported to have consumed at least one illegal drug in the last 12 months. Of these, 1.1% (566 000 persons) reported the use of crack/cocaine and 1.0% (515 000) reported the use of ecstasy. The 12-month prevalence of other illegal drugs was less than 1% *(Table 3)*. The criteria for cocaine dependence were met by 0.1% (51 000) and for cocaine abuse also by 0.1% (51 000) *(eTable)*. The criteria for amphetamine dependence were met by 0.1% (51 000) and for amphetamine abuse also by 0.1% (51 000).

Medications

A total of 40.6% of respondents (21 million persons) reported having used at least one of the medications listed in the survey in the last 30 days. With a 30-day prevalence of 31.5% (16.2 million), non-opioid analgesics were the most commonly used medication, followed by hypnotics/sedatives (6.3%; 3.2 million), antidepressants (6.3%; 3.2 million) and opioid analgesics (3.8%; 2.0 million). Among users of drugs included in the various medication groups, 89.6% of the respondents (2.9 million) reported taking antidepressants on a daily basis, followed by neuroleptics (87.0%; 761 000), analeptics (51.4%; 291 000), and opioid analgesics (40.7%; 796 000). Daily intake of medications such as antidepressants is generally prescribed for therapeutic purposes and not associated with abuse or dependence. Analgesic abuse was noted in 5.6% (2.9 million), while 2.8% (1.4 million) met the DSM-IV criteria for dependence. In the hypnotics/sedatives group, 1.1% (566 000) had symptoms of abuse and 1.5% (772 000) symptoms of dependence *(eTable)*.

Table 4

The 30-day prevalence of medication use and daily use; extrapolation to the population aged 18 to 64 years

Total[*1]			Women			Men			Extrapolation to the entire resident population[*2]	
%[*3]	[95% CI]	n[*4]	%	[95% CI]	n	%	[95% CI]	n	N[*5]	[95% CI]
Non-opioid analgesics										
31.5	[29.9; 33.1]	2417	38.0	[36.0; 40.0]	1609	25.2	[22.8; 27.8]	793	16.22 million	[15.39; 17.04]
Opioid analgesics										
3.8	[3.1; 4.7]	183	3.6	[2.7; 4.9]	97	4.0	[2.9; 5.3]	86	1.96 million	[1.60; 2.42]
Hypnotics/sedatives										
6.3	[5.4; 7.3]	390	6.3	[5.2; 7.6]	232	6.3	[5.0; 7.9]	153	3.24 million	[2.78; 3.76]
Analeptics (stimulants)										
1.1	[0.8; 1.5]	99	1.1	[0.7; 1.7]	51	1.2	[0.8; 1.7]	46	0.57 million	[0.41; 0.77]
Anorectics										
0.3	[0.1; 0.6]	14	0.3	[0.1; 0.5]	11	0.3	[0.1; 1.2]	3	0.15 million	[0.05; 0.31]
Antidepressants										
6.3	[5.4; 7.3]	388	7.8	[6.6; 9.2]	263	4.7	[3.5; 6.2]	115	3.24 million	[2.78; 3.76]
Neuroleptics										
1.7	[1.3; 2.3]	89	2.0	[1.4; 2.9]	52	1.4	[0.9; 2.3]	36	0.88 million	[0.67; 1.18]
Medicinal cannabis										
2.7	[2.2; 3.3]	230	1.5	[1.0; 2.0]	86	4.0	[3.1; 5.0]	143	1.39 million	[1.13; 1.70]
At least one of these medications										
40.6	[38.8; 42.6]	2989	46.4	[44.2; 48.7]	1 904	35.0	[32.0; 38.0]	1 065	20.90 million	[19.97; 21.93]
Daily use[*6]										
Non-opioid analgesics										
8.9	[7.0; 11.1]	149	8.0	[6.0; 10.6]	86	10.1	[7.0; 14.5]	62	1.44 million	[1.14; 1.80]
Opioid analgesics										
40.7	[30.5; 51.8]	53	41.0	[27.4; 56.2]	31	40.4	[25.9; 56.9]	22	0.80 million	[0.60; 1.01]
Hypnotics/sedatives										
26.5	[20.2; 34.0]	87	26.8	[19.6; 35.5]	49	25.8	[16.9; 37.4]	34	0.86 million	[0.66; 1.10]
Analeptics (stimulants)										
51.4	[36.9; 65.6]	41	64.0	[42.8; 80.9]	23	39.5	[23.1; 58.6]	16	0.29 million	[0.21; 0.37]
Anorectics										
22.6	[5.2; 61.2]	5	47.4	[15.3; 81.9]	5	0.0	[0.0; 0.0]	0	0.03 million	[0.01; 0.09]
Antidepressants										
89.6	[84.3; 93.3]	345	91.0	[86.3; 94.2]	234	87.0	[73.8; 94.1]	101	2.91 million	[2.73; 3.03]
Neuroleptics										
87.0	[77.5; 92.9]	74	90.2	[78.8; 95.8]	45	82.6	[64.3; 92.6]	28	0.76 million	[0.68; 0.81]
Medicinal cannabis										
28.7	[19.9; 39.6]	48	37.3	[21.0; 57.1]	19	25.7	[16.0; 38.6]	29	0.40 million	[0.28; 0.55]
At least one of these medications										
26.5	[23.9; 29.2]	616	25.6	[22.4; 29.0]	382	27.4	[23.1; 32.1]	223	5.54 million	[5.00; 6.10]

[*1] Includes men, women, and diverse;
[*2] Mean based on 51 480 168 persons aged between 18 and 64 years (as of 31 December 2023; German Federal Statistical Office);
[*3] % = weighted prevalence [95% CI]; [*4] n = unweighted number; [*5] in million;
[*6] reference: users of the respective medication group;
95% CI. 95% confidence interval

Discussion

Conventional tobacco products, hookahs, and alternative nicotine delivery systems

While the proportion of persons aged 18 to 64 years who consumed conventional tobacco products during the last 30 days has declined compared to 2021, it remains at a high level (18). The proportion of daily smokers in Germany was 9.3% which is below the European average of 18.4% (19). According to scientific evidence, there is no risk-free exposure to tobacco and the mortality risk is higher even in persons with low tobacco consumption (20–22). In Germany, nicotine is the substance associated with the highest rates of dependence. Yet only 7.6% of smokers reported that they had made at least one serious attempt to quit smoking in the last 12 months (23).

Alcohol

The most used psychoactive substance in Germany is alcohol. Alcohol consumption is an established causal risk factor for more than 200 different disease entities, including cancer, cardiovascular diseases, and mental health impairments (24). Alcohol is the second most common reason for a diagnosis of substance dependence in Germany: According to extrapolations, approximately 2.2 million people met the DSM-IV criteria for dependence and 1.7 million people met the criteria for abuse in 2024. The World Health Organization (WHO) points out that there is no such thing as “low-risk” alcohol consumption, since even low alcohol consumption contributes to alcohol-related physical illnesses (25). In this article, we use the term “low-risk consumption” solely for the purpose of consistency with the terminology used in previous ESA survey waves.

Cannabis

Cannabis is the most commonly used recreational drug after alcohol and tobacco. Some European countries have reported a rise in the prevalence of cannabis use in recent years (26), a trend that was also observed in Germany until 2021 (18, 27). In this survey wave, which was carried out in the months after cannabis legalization in Germany, no significant increase was noted (17). One reason for the absence of an increase could be that only a few Cannabis Social Clubs had received a permit in the early period immediately after legalization. While the use of home-grown cannabis was permitted, it may have been almost unavailable due to the duration of the vegetation period until flowering. Overall, it may have been too early to identify any obvious effects of the change in the legality of cannabis.

Illegal drugs

In previous surveys, cannabis was the most commonly used illegal drug in Germany. In the period covered by the current survey, the substance was no longer classified as an illegal drug. For this reason, the current prevalence of the use of illegal substances (without cannabis) is correspondingly lower compared to previous survey waves (18). Currently, the most commonly used illegal drug is cocaine/crack. Wastewater analyses point to a significant increase in cocaine use and record quantities of cocaine have been seized by police (28). The current findings show no specific increase in cocaine consumption in the last 12 months (18). One explanation for this difference is that surveys representative of the population reflect the proportion of substance users in the total population. In contrast, wastewater analyses capture substance use within a confined geographical area and a limited time period, mainly in individual towns. The quantities of drugs seized by police forces is indicative of the availability and market volume of a substance. Thus, a rise in these indicators could indicate intensified consumption within a stable user group, without any change in the overall prevalence in the population.

Medication

With a 30-day prevalence of daily use of 31.5%, non-opioid analgesics are the most commonly used medication group in Germany. Pharmacy-only over-the-counter analgesics for relief of mild to moderate pain can cause significant side effects if used incorrectly (29, 30). The prevalence is higher in women compared to men. The use of antidepressants is significantly more common in women. Symptoms of depression are more frequently diagnosed and treated in women, while such symptoms are less frequently identified in men (31).

The use of medicinal cannabis was first assessed in 2024. The rate of consumption was 2.7% among the population. About one-third of users (28.7%) consumed medicinal cannabis daily. The proportion of male users was more than double that of women.

Limitations

Survey data on consumption prevalence are subject to bias as a result of various limitations. With a response rate of 22.0%, there is a risk that certain groups may be underrepresented, potentially skewing the results. Self-reported survey data may lead to an underestimation of substance use, because respondents may prefer to answer in a socially acceptable way (32, 33). Contactability by telephone and in writing is not equally guaranteed for all population groups; in particular, persons with a limited command of German, persons without a permanent residence, and persons receiving inpatient treatment may not be covered (34). In addition, studies have shown that persons with low levels of education, low incomes, and poor health are less likely to participate in population-based health surveys (31, 35). Since these characteristics are associated with an increased risk of substance use, this may result in an underestimation of prevalence (35). To assess potential bias introduced by non-response effects, non-participants were asked to complete a short questionnaire on prevalence and/or frequency of use related to five substances *(eSupplement)*.

Conclusion

The use of legal and illegal psychoactive substances remains widespread in Germany. Alcohol is still the most commonly consumed substance, followed by tobacco and non-medicinal cannabis. When taking a patient’s history, substance use in general should be systematically covered. Alcohol is often consumed for many years before dependence develops; in addition, even small quantities can cause harmful effects on health in the long term as

well as interactions with medications. By obtaining a focused history, physicians can identify high-risk patients early and offer specific counselling.

Furthermore, the available data point to certain population groups at an elevated risk, enabling a more targeted implementation of preventive measures and counselling in everyday clinical practice.

Given the significant impact of psychoactive substance use on health and society, continual, differentiated monitoring at all levels of medical care is crucial for the early detection of trends and the development and implementation of targeted preventive and interventional measures.

Funding
The 2024 Epidemiological Survey of Substance Abuse (ESA) was funded by the German Federal Ministry of Health (Bundesministerium für Gesundheit, BMG) (funding code: ZMVI1–2520DSM203). The funding is not subject to any conditions.

Conflict of interest statement
EH, SO, JM, and EK received payments for chapters in the yearbook of the German Center for Addiction Issues (Deutsche Hauptstelle für Suchtfragen e. V., DHS).

RH is a paid statistics consultant for university-based research projects—with no direct relation to addition research—and member of the self-help group Kreuzbund e.V.

JM is currently working at the German Federal Statistical Office (Destatis).

SO is Principal Investigator (PI) for the German part of the European School Survey Project on Alcohol and Other Drugs (ESPAD). She led the German data collection of the European Web Survey on Drugs (EWSD) and is a member of the German Psychological Society.

SO and EH are PIs of the German part of the International Cannabis Policy Study (ICPS).

EH received fees for hosting CANDIS workshops and for the manual CANDIS: A Marijuana Treatment Program for Youth and Adults. She is the president of the German Society for Addiction Research and Addiction Therapy (Deutsche Gesellschaft für Suchtforschung und Suchttherapie, DG-Sucht), a member of the Editorial Board of Addiction and Sucht as well as a member of the Hetzler Foundation's Advisory Board.

JM received fees for presentations atthe Saxony–Anhalt branch of the League for Charitable Care, the Saxony–Anhalt State Office for Addiction Issues, and the Bavarian State Medical Association (BLÄK).

EK is a member of DG-Sucht.

Manuscript received on 16 May 2025, revised version accepted on 29 August 2025

Translated from the original German by Ralf Thoene, M.D.

References (abbreviated)
1. Peacock A, et al.: Addiction 2018; 113: 1905–26.
2. Starker A, et al.: Lengerich: Deutsche Hauptstelle für Suchtfragen e.V.; 2025.
3. Kraus L, et al.: Drug Alcohol Rev 2024; 43: 1662–75.
4. Bundeskriminalamt: Wiesbaden: Bundeskriminalamt 2024.
5. OECD Europe Paris: OECD Publishing 2022.
6. www.dhs.de/suechte/tabak/zahlen-daten-fakten)
7. Starker AHJ: Lengerich: Pabst: Deutsche Hauptstelle für Suchtfragen (DHS); 2024.
8. Deutsches Krebsforschungszentrum (eds.): Heidelberg, 2005.
9. World Health Organization: Geneva: WHO 1998.
10. Seitz HK, et al.: Geesthacht: Neuland 2008; p. 205–9.
11. Burger M, et al.: Prev Med 2004; 39: 111–27.
12. www.bundesgesundheitsministerium.de/themen/cannabis/faq-cannabis gesetz.html
13. Wittchen HU, et al.: München: Max-Planck-Institut für Psychiatrie, Klinisches Institut 1995.
14. www-genesis.destatis.de
15. Heeringa SG, et al.: New York: Chapman and Hall/CRC 2017.
16. StataCorp: College Station, TX: StataCorp LLC 2017.
17. Hoch E, et al.: Dtsch Arztebl Int 2025; 122: 632–7.
18. Rauschert C, et al.: Dtsch Arztebl Int 2022; 119: 527–34.
19. www.ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Daily_smokers_of_cigarettes_among_persons_aged_15_and_over,_2019_HLTH2022.png
20. Inoue-Choi M, et al.: JAMA Netw Open 2020; 3: e206436.
21. Inoue-Choi M, et al.: Int J Cancer 2018; 142: 271–80.
22. Inoue-Choi M, et al.: JAMA Intern Med 2017; 177: 87–95.
23. www.debra-study.info/
24. www.who.int/news-room/fact-sheets/detail/alcohol)
25. www.who.int/europe/de/news/item/28–12–2022-no-level-of-alcohol-consumption-is-safe-for-our-health.
26. Manthey J, et al.: Lancet Reg Health Eur 2021; 10: 100227.
27. Olderbak S, et al.: Addiction 2023; 119: 311–21.
28. EUDA: Luxemburg: Amt für Veröffentlichungen der Europäischen Union; 2024.
29. Bindu S, et al.: Biochem Pharmacol 2020; 180: 114147.
30. Fendrick AM, et al.: Psychol Bull 2017; 143: 783–822.
31. Salk RH, et al.: Psychol Bull 2017; 143: 783–822.
32. Tourangeau R, Yan T: Psychol Bull 2007; 133: 859–83.
33. Krumpal I: Qual Quant 2013; 47: 2025–47.
34. Schraepler J-P: Sociol Methods Res 2004. 33: 118–56.
35. Spitzer S: Eur J Health Econ 2020; 21: 573–605.

Corresponding author
Dr. phil. Sally Olderbak
olderbak@ift.de

Supplementary material
Complete list of full references, eSupplement:
www.aerzteblatt-international.de/m2025.0157

Supplementary material to accompany the article

Psychoactive Substance Use in Germany

Findings From the Epidemiological Survey of Substance Abuse (ESA) in 2024

by Sally Olderbak, Regina Hollweck, Eva-Maria Krowartz, Justin Möckl, and Eva Hoch

Dtsch Arztebl Int 2025; 122: 625–31. DOI: 10.3238/arztebl.m2025.0157

Complete list of full references

1. Peacock A, Leung J, Larney S, et al.: Global statistics on alcohol, tobacco and illicit drug use: 2017 status report. Addiction 2018; 113: 1905–26.
2. Starker A, Olderbak S, Möckl J, et al.: Tabak- und Nikotinprodukte – Zahlen und Fakten zum Konsum. DHS Jahrbuch Sucht 2025. Lengerich: Deutsche Hauptstelle für Suchtfragen e.V. 2025.
3. Kraus L, Möckl J, Manthey J, Rovira P, Olderbak S, Rehm J: Trends in alcohol-attributable morbidity and mortality in Germany from 2000 to 2021: A modelling study. Drug Alcohol Rev 2024; 43: 1662–75.
4. Bundeskriminalamt: Bundeslagebild Rauschgiftkriminalität 2023. Wiesbaden: Bundeskriminalamt 2024.
5. Organisation for Economic Co-operation and Development (OECD): Health at a Glance: Europe 2022. Paris: OECD 2022.
6. Deutsche Hauptstelle für Suchtfragen e.V. (DHS). Tabak – Zahlen, Daten, Fakten. www.dhs.de/suechte/tabak/zahlen-daten-fakten (last accessed on 15 Septermber 2025).
7. Starker AHJ: Tabak – Zahlen und Fakten zum Konsum. DHS Jahrbuch Sucht 2024. Lengerich: Deutsche Hauptstelle für Suchtfragen e. V. 2024.
8. Deutsches Krebsforschungszentrum (eds.): Passivrauchen – ein unterschätztes Gesundheitsrisiko. Heidelberg: 2005.
9. World Health Organization: Guidelines for controlling and monitoring the tobacco epidemic. Geneva: WHO 1998.
10. Seitz H, Bühringer G, Mann K: Grenzwerte für den Konsum alkoholischer Getränke. In: Deutsche Hauptstelle für Suchtfragen (editor), Jahrbuch Sucht 2008. Geesthacht: Neuland 2008; p. 205–9.
11. Burger M, Brönstrup A, Pietrzik K: Derivation of tolerable upper alcohol intake levels in Germany: A systematic review of risks and benefits of moderate alcohol consumption. Prev Med 2004; 39: 111–27.
12. Bundesministerium für Gesundheit (BMG): Fragen und Antworten zum Cannabisgesetz 2024. www.bundesgesundheitsministerium.de/themen/cannabis/faq-cannabisgesetz.html (last accessed on 15 May 2025).
13. Wittchen HU, Beloch E, Garczynski E, et al.: Münchener Composite International Diagnostic Interview (M-CIDI), Paper-pencil 2.2, 2/95. München: Max-Planck-Institut für Psychiatrie, Klinisches Institut 1995.
14. Statistisches Bundesamt (Destatis) (2023). GENESIS-Online. www-genesis.destatis.de/ (Datenlizenz: dl-de/by-2–0) (last accessed on 1 August 2025).
15. Heeringa SG, West BT, Berglund PA: Applied survey data analysis. New York: Chapman and Hall/CRC 2017.
16. StataCorp. Stata Statistical Software: Release 15.1. College Station, TX: StataCorp LLC2017.
17. Hoch E, Krowartz EM, Hollweck R, Möckl J, Olderbak S: Cannabis consumption before and after partial legalization in Germany: Early trends, consumption patterns, and motives. Dtsch Arztebl Int 2025; 122: 632–7.
18. Rauschert C, Möckl J, Seitz NN, Wilms N, Olderbak S, Kraus L: The use of psychoactive substances in Germany—findings from the Epidemiological Survey of Substance Abuse 2021. Dtsch Arztebl Int 2022; 119: 527–34.
19. Eurostat. File: Daily smokers of cigarettes among persons aged 15 and over, 2019 HLTH2022.png: European Union. 2019. www.ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Daily_smokers_of_cigarettes_among_persons_aged_15_and_over,_2019_HLTH2022.png (last accessed on 24 July 2025).
20. Inoue-Choi M, Christensen CH, Rostron BL, et al.: Dose-response association of low-intensity and nondaily smoking with mortality in the United States. JAMA Netw Open 2020; 3: e206436.
21. Inoue-Choi M, Hartge P, Liao LM, Caporaso N, Freedman ND: Association between long-term low-intensity cigarette smoking and incidence of smoking-related cancer in the national institutes of health-AARP cohort. Int J Cancer 2018; 142: 271–80.
22. Inoue-Choi M, Liao LM, Reyes-Guzman C, Hartge P, Caporaso N, Freedman ND: Association of long-term, low-intensity smoking with all-cause and cause-specific mortality in the National Institutes of Health-AARP diet and health study. JAMA Intern Med 2017; 177: 87–95.
23. Heinrich-Heine-Universität Düsseldorf: DEBRA – Deutsche Befragung zum Rauchverhalten: Rauchstoppversuch 2024. www.debra-study.info/ (last accessed on 31 July 2025).
24. World Health Organization (WHO): Fact sheet Alcohol 2024. www.who.int/news-room/fact-sheets/detail/alcohol (last accessed on 31 July 2025).
25. World Health Organization (WHO): No level of alcohol consumption is safe for our health. 2022. www.who.int/europe/de/news/item/28–12–2022-no-level-of-alcohol-consumption-is-safe-for-our-health (last accessed on 7 August 2025).
26. Manthey J, Freeman TP, Kilian C, López-Pelayo H, Rehm J: Public health monitoring of cannabis use in Europe: Prevalence of use, cannabis potency, and treatment rates. Lancet Reg Health Eur 2021; 10: 100227.
27. Olderbak S, Mockl J, Manthey J, et al.: Trends and projection in the proportion of (heavy) cannabis use in Germany from 1995 to 2021. Addiction 2023; 119: 311–21.
28. European Union Drugs Agency (EUDA): Kokain – die aktuelle Situation in Europa. Europäischer Drogenbericht 2024: Trends und Entwicklungen. Luxemburg: Amt für Veröffentlichungen der Europäischen Union 2024.
29. Bindu S, Mazumder S, Bandyopadhyay U: Non-steroidal anti-inflammatory drugs (NSAIDs) and organ damage: A current perspective. Biochem Pharmacol 2020; 180: 114147.
30. Fendrick AM, Pan DE, Johnson GE: OTC analgesics and drug interactions: clinical implications. Osteopath Med Prim Care 2008; 2: 2.
31. Salk RH, Hyde JS, Abramson LY: Gender differences in depression in representative national samples: Meta-analyses of diagnoses and symptoms. Psychol Bull 2017; 143: 783–822.
32. Tourangeau R, Yan T: Sensitive questions in surveys. Psychol Bull 2007; 133: 859–83.
33. Krumpal I: Determinants of social desirability bias in sensitive surveys: a literature review. Qual Quant 2013; 47: 2025–47.
34. Schraepler J-P: Respondent behavior in panel studies. A case study for income nonresponse by means of the German Socio-Economic Panel (SOEP). Sociol Methods Res 2004. 33: 118–56.
35. Spitzer S: Biases in health expectancies due to educational differences in survey participation of older Europeans: It's worth weighting for. Eur J Health Econ 2020; 21: 573–605.

eTable

The 12-month prevalence of substance-related disorders according to DSM-IV and extrapolation to the population aged 18 to 64 years

Substance	Total*1			Women			Men			Extrapolation to the entire resident population*2	
	%*3	[95% CI]	n*4	%	[95% CI]	n	%	[95% CI]	n	N*5	[95% CI]
Conventional tobacco products											
Dependence	8.3	[7.2; 9.5]	442	7.6	[6.2; 9.3]	221	8.8	[7.3; 10.6]	219	4.27 million	[3.71; 4.89]
Alcohol											
Abuse	3.3	[2.8; 3.9]	291	1.5	[1.1; 2.1]	105	5.1	[4.2; 6.2]	185	1.70 million	[1.44; 2.01]
Dependence	4.2	[3.5; 5.0]	329	3.1	[2.4; 4.1]	151	5.2	[4.2; 6.4]	177	2.16 million	[1.80; 2.57]
Cannabis											
Abuse	0.5	[0.3; 0.8]	38	0.4	[0.2; 0.9]	11	0.6	[0.3; 1.2]	26	0.26 million	[0.15; 0.41]
Dependence	1.0	[0.6; 1.5]	72	0.7	[0.4; 1.3]	28	1.2	[0.7; 2.1]	44	0.51 million	[0.31; 0.77]
Cocaine											
Abuse	0.1	[0.0; 0.2]	8	0.0	[0.0; 0.2]	2	0.1	[0.1; 0.3]	6	0.05 million	[0.00; 0.10]
Dependence	0.1	[0.1; 0.2]	14	0.1	[0.0; 0.3]	7	0.1	[0.1; 0.3]	7	0.05 million	[0.05; 0.15]
Amphetamine											
Abuse	0.1	[0.0; 0.2]	6	0.0	[0.0; 0.0]	2	0.0	[0.0; 0.2]	3	0.05 million	[0.00; 0.10]
Dependence	0.1	[0.1; 0.3]	14	0.1	[0.0; 0.2]	5	0.2	[0.1; 0.5]	8	0.05 million	[0.05; 0.15]
Analgesics											
Abuse	5.6	[4.9; 6.5]	410	6.7	[5.7; 7.9]	265	4.6	[3.6; 5.9]	142	2.88 million	[2.52; 3.35]
Dependence	2.8	[2.2; 3.6]	164	2.7	[2.0; 3.7]	101	3.0	[2.1; 4.2]	61	1.44 million	[1.13; 1.85]
Hypnotics/sedatives											
Abuse	1.1	[0.8; 1.5]	63	0.8	[0.6; 1.2]	38	1.3	[0.7; 2.1]	24	0.57 million	[0.41; 0.77]
Dependence	1.5	[1.0; 2.1]	65	1.0	[0.6; 1.6]	34	1.9	[1.1; 3.1]	29	0.77 million	[0.51; 1.08]

*1 Includes men, women and diverse *2 mean based on 51 480 168 persons aged between 18 and 64 years (as of 31 December 2023; German Federal Statistical Office)
*3 % = weighted prevalence [95% CI]; *4 n = unweighted number; *5 in million; 95% CI, 95% confidence interval

eSupplement

Study Design and Methodology

Study design and sampling

The 2024 Epidemiological Survey of Substance Abuse (ESA) sampled German-speaking adults aged 18 to 85 years (born between 1939 and 2006) living in private households in Germany. This corresponds to about 68.0 million people (1) (Date: 31.12.2023). The sampling was carried out as part of a two-stage random selection procedure in which population registers were first randomly selected and then the persons were randomly drawn from them. Based on municipal statistical data from the Federal Statistical Office and the statistical offices of the federal states, municipalities (so-called sample points) were first randomly selected. The number of persons sampled was calculated in proportion to the resident population and the relevant birth cohorts. Thus, large cities could also be represented in the sample with several sample points.

Municipalities were selected on the basis of stratification cells, which was a combination of ten municipality size classes and the federal states. In 2024, state-specific top-up samples were collected as part of the federal sample. A total of 284 municipalities were drawn. Of these, 31 municipalities were unable to provide addresses or refused to participate. In these cases, compensation was made by supplementary draws from comparable municipalities. Finally, persons from 253 municipalities were selected.

The persons were drawn from the population registers of the municipalities as a systematic random sample. The number of target persons per sample point was calculated in such a way that would result in a net sample of n=10,000. It was assumed that 25% of the people contacted would be willing to participate. The draw was made disproportionately by age group in order to over sample young adults. The gross sample included a total of 46,876 people with 37,287 in the group of 18–64-year-olds.

Execution of the field work

The field work was carried out by Ipsos GmbH from August to December 2024. In order to increase the response rate and reduce the selectivity of the sample, a mixed-method design was employed consisting of a written ("Paper-and-Pencil Interview", PAPI), online ("Computer-Assisted Web Interview", CAWI) and telephone portion ("Computer-Assisted Telephone Interview", CATI). Depending on whether a telephone number (landline or mobile) was available, the sample was divided into the study arms "telephone" and "written". Each target received an invitation letter containing study information, a privacy policy, an online access code (for CAWI) and an accompanying letter from the Federal Ministry of Health. Targets from the "written" arm, aged 18 to 59 years, were encouraged in this invitation letter to complete the questionnaire via CAWI, while people aged 60 to 85 years were sent the written questionnaire directly with the invitation letter.

If there was no response, up to two reminder letters were sent at intervals. The target persons in the telephone study arm were contacted by a trained interviewer. After three unsuccessful telephone contact attempts, a reminder letter was sent, together with a written questionnaire.

In the course of the letter, the target persons received a personal QR code with which they could participate in the CAWI survey at any time. This was already sent with the first cover letter, so that a switch to the online survey method was possible at any time. In principle, all participants were free to switch between the survey modes during the entire survey period. In addition, it was possible to request a written questionnaire at any time.

Instruments

The aim of the ESA is to collect data on the consumption of legal and illegal substances, as well as related substance-related disorders in the German resident population. In addition to data on the consumption of conventional tobacco products and tobacco alternatives, as well as

alcohol, cannabis, illegal drugs and medicines, data on sociodemographic characteristics as well as physical and mental health were also collected. The programming of CATI and CAWI was based on the structure and filtering of the written questionnaire, which was created in close cooperation between the research and field institutes. For the CAWI programming, it was necessary in some places to adapt the layout and presentation of individual questions for different mobile devices. The final questionnaire is available at the following link: https://www.esa-survey.de/studie/instrumente/

Socio-Demographics. The survey of socio-demographic characteristics was based on the requirements of the Federal Statistical Office (2). Characteristics that were collected are gender, year and month of birth, migration background (country of birth and citizenship of the respondents, as well as their parents), family situation (marital status, number of children, household size), level of education (school education, vocational training), employment (employment status, occupational status), net household income and possession of a driver's license.

Health and health-related behavior. Physical and mental health was assessed using two 5-point rating scales ("very good" to "very poor"). Chronic diseases were defined as diseases lasting at least four weeks that require constant monitoring and treatment. Applicable diseases could be indicated on the basis of a ready-made list. This included the answer options "cancer", "osteoarthritis", "arthritis", "back pain", "neck complaints", "knee complaints", "headaches (migraines)", "damage to the nervous system", "muscle pain", "neurological disease" and a free field for "others".

Key psychological symptoms in the last 12 months were assessed using an adapted version of the DIA-X-Core Screening Questionnaire (DIA-X-SSQ). The core symptoms of anxiety disorders (panic disorder, generalized anxiety disorder, social phobia, specific phobia, agoraphobia), as well as depression, mania, post-traumatic stress disorder and data on psychiatric,

psychological or psychotherapeutic treatment and on medically diagnosed mental or psychosomatic illnesses were recorded.

Substance use. Both the 30-day and 12-month prevalence were recorded for all substances. Lifetime prevalence was recorded for the use of all substances, except medications.

Consumption of conventional tobacco products, hookahs and alternative nicotine delivery systems. Both conventional tobacco products, such as cigarettes, cigars, cigarillos, or pipes, as well as smoking and electronic inhalation products such as e-cigarettes (including e-cigars, e-hookahs and e-pipes), heated tobacco ("heat-not-burn" products) and hookahs (hookahs), were covered. In addition to the prevalence, the number of days of consumption in the last 30 days was collected for these products. Also the average amount consumed per day of consumption was collected for tobacco products and heat-not-burn products.

Alcohol consumption. The average amount of alcohol consumed was determined using a frequency-quantity index for beer, wine/sparkling wine, spirits, and mixed alcoholic beverages. This was formed based on information on the number of days on which the respective drinks were consumed and the number of units drunk on a typical consumption day. To calculate the gram of pure alcohol, the liter specifications of the beverages using beverage-specific alcohol content and the number of units drunk were used. The beverage-specific alcohol content (beer: 4.8 vol. %; wine/sparkling wine: 11.0 vol. %; spirits: 33.0 vol.) correspond to an alcohol quantity of 38.1 g, 87.3 g and 262.0 g pure alcohol per litre respectively (3). For mixed alcoholic beverages, 0.04 litres of spirits was assumed to be the average alcohol content of a glass (0.3 to 0.4 litres). An individual average daily amount was calculated from the calculated pure alcohol in grams. The category of risky consumption was based on recommended daily limits for alcohol consumption (men > 24 g; women > 12 g) (4). Episodic binge drinking was defined as five or more glasses of alcohol for men or four or more glasses for women. An open-ended response format was used with the number of days binge drinking was assessed. The alcohol type for

binge drinking included beer, wine/sparkling wine, spirits, and alcoholic mixed drinks (approx. 14 g of pure alcohol per glass, i.e. at least 70 g of pure alcohol in total).

Consumption of cannabis. Lifetime prevalence, 12-month prevalence, and 30-day prevalence, as well as 12-month and 30-day frequency of cannabis use was collected. Cannbis included hashish, marijuana, and other cannabis products containing at least 0.3% THC. In addition, other indicators were recorded, including procurement routes, forms of consumption, driving under the influence of cannabis (DUI), average amount consumed, and motivation of use.

Consumption of (illegal) drugs. The prevalence (lifetime, 12 months, and 30 days) as well as frequency of use ("Not at all", "Less often than once a month", "At least once a month", "At least once a week", "(Almost) daily") was determined for the consumption of CBD products with less than 0.3% THC, stimulants (such as amphetamines, speed), methamphetamine (crystal meth), MDMA ("ecstasy"), LSD, heroin, other opiates (e.g. codeine, methadone, opium, morphine), cocaine, crack, inhalants (such as glue, "poppers"), other hallucinogens (such as mushrooms), ketamine, GHB/GBL/BDO ("Liquid Ecstasy"), new psychoactive substances (NpS), and synthetic cannabinoids (e.g. HHC, "Spice").

*M**edication***. Before questions about use, each medication group (hypnotics, sedatives, benzodiazepines, analeptics, anorectics, antidepressants, neuroleptics, anabolic steroids and cannabinoids) was presented using a list of the most common ingredients to make it easier for respondents to classify the medications they were taking. In addition to questions about whether medication was consumed, the frequency of use was assessed using the following response categories: (1) not taken, (2) less often than once a week, (3) once a week, (4) several times a week and (5) daily. Based on the last 30 days, it was asked whether or not the medication was prescribed by a doctor. The prevalence and frequency of use of analgesics were assessed analogously, but separately for opioid-containing and non-opioid analgesics. In relation to the last 12 months, it was asked whether these were prescribed exclusively, partially, or not by a doctor.

Abuse and dependence. Standardised items of the Munich Composite International Diagnostic Interview (M-CIDI) were used to assess the prevalence of abuse and dependence on conventional tobacco products, alcohol, cannabis, and illegal drugs (cocaine, amphetamine), as well as medicines (opioid and non-opioid painkillers, sleeping pills, and tranquilizers) (5). On the basis of the M-CIDI, the diagnostic classification was carried out according to the DSM-IV criteria. The items refered to the last 12 months. In the DSM-IV, a distinction is made between the diagnoses of "dependence" and "abuse", whereby dependence is diagnosed if at least three symptoms of dependence are fulfilled within the last 12 months. For abuse, at least one corresponding abuse criterion must apply. This classification applies to all substances considered in this analysis, apart from tobacco, as DSM-IV does not provide for a diagnosis of abuse for tobacco.

The diagnostic criteria according to DSM-IV were used because, in contrast to the ICD-10, they also allow a diagnosis of dependence for conventional tobacco products. The DSM also offers more differentiated diagnostic criteria, especially for substance-related disorders, and is preferred in many international studies to ensure a comparable and operationalizable survey of use disorders across different substances. This allows it to directly translated into standardized questionnaires. This is particularly relevant because in the present study there was no medical diagnosis, but a self-report by the respondents.

Due to an error in the survey instruments, some people who participated in the survey via PAPI lacked questions for specific DSM criteria for nicotine and alcohol dependence. In the case of nicotine dependence, three items including follow-up questions were missing, and in the case of alcohol dependence, two items including follow-up questions were missing. The results in the manuscript are based on the available data. A sensitivity analysis was carried out to estimate the potential impact of missing values in the DSM-IV criteria. In the worst-case scenario, missing answers were coded as "yes" (criterion met), in the best-case scenario as "no" (criterion not met). In addition, multiple imputation by means of chained equations (MICE) was

performed, in which the probability of an affirmative answer to the DSM-IV criteria was estimated on the basis of demographic characteristics as well as the available answers to other criteria. The results show that the prevalence rates for tobacco and alcohol dependence and alcohol abuse changed only slightly (+/- 0.7%) due to the different imputation strategies, indicating a comparatively robust estimate despite the missing values.

Realized Sample

The baseline sample (number of contacted persons) of the evaluation cohort of 18-64-year-olds comprised a total of 36,243 people, of whom 33,415 (92.2%) were assigned to the written study arm and 2,828 (7.8%) to the telephone study arm. In both study arms, the online questionnaire was used most frequently. In the telephone arm, this was 58.1%, while in the written arm it was 72.4% of the people. In the telephone branch of study, 14.2% of the participants opted for telephone interviews and 27.7% completed the written questionnaire. In the written study arm, 27.6% answered the questionnaire in writing by post, while no telephone interviews were taken. A total of 7,534 people took part in the survey and thus formed the realized sample.

Return

The response rate was calculated by putting the number of cases realized in relation to the adjusted initial sample. Please note that the response status of the participants was not coded as in previous survey waves and not all responses to the non-responder questionnaire could be assigned to the demographic characteristics of the participants. Therefore, the response rate should be considered as an approximation.

Neutral failures that had no systematic influence on the sample selection were excluded. Neutral failures were those cases with the response status "Target person unknown", "Target person not in target group", "Phone number invalid", "Person does not speak German", "Person

does not meet the selection criteria" or "Person has died". The response rate is calculated on the basis of response categories: evaluable questionnaires, responses with unknown status, and systematic failures. Systematic absences were considered to be persons who could have participated in principle but did not do so – whether due to explicit refusal, unavailability during the survey phase, health restrictions, or because they did not respond online, by post or by telephone despite being reminded. In both study arms, explicit refusal was the most common reason for cancellation. Overall, a response rate of 22.0% resulted from a realized number of cases of 7,534 (5 observations with unknown response status) (eTable S1).

eTable S1.

Response by study arm, 18–64 year olds, n (%)

	Study Arm: Written[1]	**Study Arm: Telephone**[1]	**Total**[1]
Initial sample	33,415	2,828	36,243
Evaluable questionnaires after data review[2]	7,261	268	7,529
Non-evaluable questionnaires after data review[3]	0	983	983
Return status unknown[4]	26,108	0	26,108
Neutral failures[5]	2	572	574
Systematic failures[6]	44	1,005	1,049

[1] Participant was contacted up to 3 times.

[2] Due to coding errors, 5 observations are coded with an unknown response status

[3] Less than 5 questions answered in the questionnaire

[4] Includes non-response participants from written (PAPI) surveys.

[5] Target unknown; Target person not in the target audience; invalid phone number; target person does not speak enough German; target person deceased

[6] Refusal; unreachable; health problems; The target person wants to send the questionnaire in writing, fill it out online or answer it by telephone interview; mistake in the interview date

Weights

Three weights were created to allow for results to be representative of the 18 to 64-year-old population in Germany on the basis of ESA 2024 design. These weights included a design weight and two post-stratification weights, one for cross-sectional analyses and one to match trend analyses.

To compensate for distortions caused by the disproportionate drawing of the sample by age group, a design weight was calculated. This is inversely proportional to the respective probability of selection. The weighting factors range between 0.47 and 1.25. To assess the effects of the weighting, the effectiveness measure E and the effective sample size derived from it were taken into account. The effectiveness measure is E = 93.75%, which results in the effective sample size of *n* = 7,534 on *n* = 7,063. The effective sample size describes the number of cases that would have been required in a simple, unweighted random sample to achieve a precision of the results comparable to the complex sample (6-8). The efficiency of the realized sample dropped to 93.75% as a result of the necessary complex design for nationwide representativeness. This effectiveness value is in the range of the values observed in comparable studies (9).

In order to reduce biases due to non-participation, post-stratification weights were calculated that adjust certain characteristics of the sample to the marginal distribution of the population. The basis for this was an Iterative Proportional Fitting algorithm (10). The previously determined design weights were incorporated into the post-stratification weights. For the cross-sectional analysis, the characteristics of the federal state, municipality size, gender, and highest educational attainment were determined according to the distribution in the 18 to 64-year-old population according to the 2023 microcensus (11). The inclusion of other characteristics leads to a dispersion of the weighting factors, which are now between 0.04 and 13.20. As a result of this variance, the effectiveness measure is 38.0%, which corresponds to an effective sample

size of n = 3,442. This means that the effectiveness values are in a range that is also common in comparable studies (9).

Mode Effects

As part of ESA 2024, participants were able to choose for themselves whether they wanted to fill out the questionnaire online, in writing (by post), or by telephone, which means that mode effects must be taken into account. In the evaluation cohort 18-64 years, 70.4% used the online format, 27.9% replied in writing by mail and 1.7% took part in a telephone interview. There were clear differences between the groups of participants: CATI (men: 46.9%; Women: 53,1%) and CAWI survey (women: 54.0%; Men: 45.5%; Diverse: 0.6%) showed an almost equal distribution between the sexes. In the PAPI survey (women: 63.5%; men: 36.3%; Diverse: 0.2%), the proportion of women was higher. The age also varied depending on the mode: The average age for the final sample were 44.1 years (CATI), 45.7 years (PAPI) and 37.3 years (CAWI). With regard to the highest level of education, it was found that the proportion of people with a high school diploma in the CAWI (50.1%) and PAPI (40.5%) surveys was higher than that of the CATI respondents (36.7%).

eTable S2 compares substance use between the survey modes. Differences were predominantly observed with the CATI, although it should be noted that this method had a significantly smaller sample size than the CAWI or PAPI methods. In addition, there was a difference in the average number of cigarettes per day between CAWI and PAPI.

eTable S2

Comparison of consumption variables by survey mode, n (weighted%), 18-64 year olds

	Telephone (CATI)	Online (CAWI)	Written (PAPI)
Alcohol consumption			
30-day prevalence	98 (74.4)	3,790 (69.9)	1,448 (65.6)
Episodic binge drinking, last 30 days [1)]	25 (24.7)	977 (27.6)	338 (25.8)
Tobacco consumption			
30-day prevalence	23 (24.2)	844 (19.7)	455 (25.7)
Average number of cigarettes per day, *M* (*SD*) [1), 2)]	11.8 (8.0)	10.6 (8.8)	4.8 (8.9)
Cannabis			
Lifetime prevalence	25 (15.0)	2,083 (35.5)	630 (25.1)
12-month prevalence	6 (2.0)	688 (10.2)	202 (9.2)
Medication use, last 12 months			
Analgesics	60 (39.3)	2,082 (39.0)	948 (42.5)
Sedatives	5 (2.1)	242 (5.8)	150 (8.0)

[1)] Based on 30-day users

[2)] M (mean); SD (Standard Deviation)

Non-response effects

To assess potential bias caused by non-response, the non-participants were asked to complete a short questionnaire. A total of 2,404 completed this questionnaire (*n* = 2,256 in the age group 18-64 or with unknown age). E-Table 3 shows the comparison of selected substance use prevalences between this group and those who completed the main survey. Differences were found in almost all of the characteristics examined. It is notable that non-responders re-ported episodic binge drinking more frequently in the last 30 days. The lifetime prevalence of cannabis use was higher in non- responders, while the 12-month prevalence was lower in non-responders. Differences could also be found in the use of analgesics and sedatives in the last 12 months.

eTable S3.

Comparison of consumption variables by willingness to participate, n (%) 18-64 year olds

	Non-responders[1]	Participants in the Main Study
	n = 2,256	*n* = 7,534
Alcohol consumption		
30-day prevalence	1,210 (55.4)	5,336 (71.5)
Episodic binge drinking, last 30 days [2]	530 (45.6)	1,339 (25.9)
Tobacco consumption		
30-day prevalence	319 (14.7)	1,322 (17.8)
Average number of cigarettes per day, *M* (*SD)* [2), 3)]	9.7 (7.9)	6.9 (7.4)
Cannabis		
Lifetime prevalence	1,041 (46.7)	2,739 (36.5)
12-month prevalence	127 (5.7)	897 (12.0)
Medication use, last 12 months		
Analgesics	1,542 (69.3)	3,090 (42.0)
Sedatives	158 (7.1)	398 (5.4)

[1] Persons who have responded to the non-response questionnaire; Age 18-64 or missing age

[2] Related to 30-day users;

[3] M (mean); SD (Standard Deviation)

Data is unweighted.

Representativity

The ESA 2024 aims to capture a representative picture of substance use and problematic consumption patterns in the German population aged 18 to 85. In order to ensure the most accurate representation of the population, weightings were carried out that adjust the distribution by federal state, BIK municipality size class, gender, age groups and educational level. In addition, possible biases due to non-response were reduced by weighting and providing different survey modes.

The number of participants in ESA 2024 in the 18-64 age group target sample is 7,534 people. The trend of declining participation rates continues: the response rate was 22,0% and was thus lower than in previous cases (ESA 2015: 52.2%; ESA 2018: 41.6%; ESA 2021: 35.0%). Other surveys, such as the General Population Survey of the Social Sciences (ALLBUS) from 2023, also show a slightly higher response rate of 31.2% (11). The GEDA study (2019/2020-EHIS) shows a similar response rate of 21.6% (12).

For ESA 2024, the initial samples had to be significantly expanded compared to 2021 (36,243 in the evaluation population of 18–64-year-olds). This was due to the higher proportion of target persons in the written study arm, for whom there was often no information about the response status (78.1% or *n=33,415* in the evaluation population). In addition, the proportion of interviews conducted by telephone continued to decline: While 10% of ESA surveys were conducted by telephone in 2021, in 2024 it was 3.6% of all evaluable questionnaires in the 18-64 age group. The analysis of the mode effects on substance use prevalences revealed differences between the survey forms, also taking into account sociodemographic characteristics. In particular, the lower prevalence of cannabis use in the telephone surveys points to possible distortions due to social desirability. Since telephone surveys are conducted by interviewers, the social presence could lead to participants being more reluctant to report their consumption than in anonymous written or online surveys.

The non-response analysis revealed differences between participants and non-participants who tend to be in line with the results of the ESA 2021. It can be assumed that people with a stronger interest in the topic were particularly willing to participate. In the case of socially established substances (alcohol, tobacco and cannabis), however, it can be assumed that any distortions in general prevalence estimates are rather small. It is also important that certain highly marginalised groups (homeless people or prisoners in prisons) are not part of the population because they do not live in private households. In such population groups, it can be assumed that there is a sometimes sharp increase in substance use, which cannot be recorded in the context of this survey. Accordingly, it can be assumed that certain prevalence rates in the general population were underestimated.

eMethod eReferences

e1. Federal Statistical Office (Destatis). *Table 12411–0006: Population: Reference Date, Sex, Age Years 2024* [*Bevölkerung: Stichtag, Geschlecht, Altersjahre 2024*]. Available from: www-genesis.destatis.de/genesis/

e2. Federal Statistical Office (Destatis). *Population: Federal States, Reference Date, Age Years, 2022* [*Bevölkerung: Bundesländer, Stichtag, Altersjahre, 2022*].

e3. Bühringer G, Augustin R, Bergmann E, et al., editors. *Alcohol Consumption and Alcohol-Related Disorders in Germany* [*Alkoholkonsum und alkoholbezogene Störungen in Deutschland*]. Publications of the Federal Ministry of Health, Vol. 128. Baden-Baden: Nomos; 2000.

e4. Burger M, Brönstrup A, Pietrzik K. Derivation of tolerable upper alcohol intake levels in Germany: a systematic review of risks and benefits of moderate alcohol consumption. *Preventive Medicine*. 2004;39(1):111–127.

e5. Wittchen H-U, Beloch E, Garczynski E, Holly A, Lachner G, Perkonigg A, et al. *Munich Composite International Diagnostic Interview (M-CIDI), Paper-Pencil Version 2.2 (2/95)* [*Münchener Composite International Diagnostic Interview (M-CIDI), Paper-pencil 2.2, 2/95*]. Munich: Max Planck Institute of Psychiatry, Clinical Institute; 1995.

e6. Gabler S, Hoffmeyer-Zlotnik J, Krebs D. *Weighting in Survey Practice* [*Gewichtung in der Umfragepraxis*]. Opladen: Westdeutscher Verlag; 1994.

e7. Little RJA, Lewitzky S, Heeringa S, Lepkowski J, Kessler RC. Assessment of weighting methodology for the National Comorbidity Survey. *American Journal of Epidemiology*. 1997;146(5):439–449.

e8. Lohr SL. *Sampling: Design and Analysis*. 3rd ed. Boca Raton: CRC Press; 2022.

e9. Robert Koch Institute. *Data and Facts: Results of the Study "German Health Update 2012"* [*Daten und Fakten: Ergebnisse der Studie "Gesundheit in Deutschland aktuell 2012"*]. Contributions to Federal Health Reporting. Berlin; 2014.

e10. Gelman A, Carlin J. Poststratification and weighting adjustments. In: Groves RM, Eltinge JL, Little RJA, editors. *Survey Nonresponse*. New York: John Wiley & Sons; 2002. p. 289–303.

e11. Federal Statistical Office (Destatis). *Microcensus 2023* [*Mikrozensus 2023*]. Wiesbaden: Destatis; 2024.

e12. GESIS – Leibniz Institute for the Social Sciences. *German General Social Survey (ALLBUS) 2023*. Cologne: GESIS. ZA8830, Data File Version 1.1.0. https://doi.org/10.4232/1.14480