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ORIGINAL PAPER

Lifetime and 12-month prevalence estimates for mental disorders in northeastern Germany: findings from the Study of Health in Pomerania

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Abstract

Few epidemiological studies presented 12-month and lifetime prevalence estimates for DSM-IV mental disorders in the adult general population by sex and age up to very old age. From 2007 to 2010, DSM-IV mental disorders were assessed with the DIA-X/M-CIDI among $N = 2400$ participants (aged 29–89 years) from the Study of Health in Pomerania, an epidemiological study based on a two-stage stratified cluster sample randomly drawn from the adult general population in northeastern Germany. 36.3% of the sample was affected by any 12-month and 54.8% by any lifetime mental disorder. The most frequent diagnostic groups were anxiety (12-month: 14.8%, lifetime: 23.4%), substance use (12-month: 14.5%, lifetime: 25.0%), somatoform (12-month: 12.9%, lifetime: 20.4%) and depressive (12-month: 7.3%, lifetime: 18.6%) disorders. Except for substance use (higher prevalence in men) and bipolar disorders (comparable prevalence in men and women), higher 12-month and lifetime prevalence estimates were found in women vs. men. Moreover, lower 12-month and lifetime prevalence estimates were found in older (aged 60–74 or 75–89 years) vs. younger (aged 29–44 or 45–59 years) age groups. 22.6% (men: 21.1%, women: 23.9%) of those affected by any 12-month disorder met criteria for two and 13.6% (men: 9.6%, women: 16.9%) for three or more 12-month diagnoses. Similarly, 26.4% (men: 25.7%, women: 26.9%) of those affected by any lifetime disorder met criteria for two and 22.7% (men: 19.6%, women: 25.2%) for three or more lifetime diagnoses. Our findings demonstrate the frequency of mental disorders in northeastern Germany and emphasize the need for continued prevention and intervention efforts.

Keywords Epidemiology · Community · Psychopathology · Frequency · Comorbidity

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Introduction

Mental disorders—especially substance use, affective and anxiety disorders—constitute the leading cause of years lived with disability worldwide [37]. They are associated with considerable individual burden and impairment, unfavorable course characteristics (such as high persistence, risk of recurrence and comorbidity), adverse long-term outcomes (such as lower socioeconomic status, lower educational and occupational attainment) as well as tremendous direct and indirect societal costs [5, 7, 12, 19, 27, 39].

Findings from epidemiological studies suggest that about one-third of the general population in Germany and Europe is affected by mental disorders each year [15–17, 39]. The highest 12-month and lifetime prevalences are generally found for substance use, affective and anxiety disorders [1, 8, 15, 20, 21, 25, 31, 33, 39]. For instance, in the adult German general population, 34.5% met criteria

for any 12-month mental disorder, of whom 44% were affected by two or more and 22% by three or more conditions [15]. Most frequently reported were 12-month substance use (16.7%), anxiety (15.4%) and affective (9.8%) disorders.

Moreover, the prevalence estimates for mental disorders were shown to partially vary by demographic characteristics such as sex and age: With respect to sex, there is consistent evidence that women are more often affected by internalizing disorders (e.g., affective and anxiety disorders), while men are more often affected by externalizing disorders (e.g., substance use disorders) [1, 15, 17, 21, 28].

With respect to age, a series of epidemiological studies revealed lower 12-month and lifetime prevalence estimates of mental disorders in older vs. younger age groups [18, 20, 22, 23, 32]. Several explanations were proposed for these findings, including not only cohort and aging effect, but also methodological artifacts such as age-related memory and reporting biases, confounding with somatic diseases, exclusion of institutional residents and selective mortality [9, 13, 18, 20, 22, 23, 32, 42].

So far, few epidemiological studies from northeastern Germany reported prevalence estimates for various DSM-IV mental disorders in different age groups from young until very old adulthood (> 80 years) from one homogeneously drawn sample. In particular, little research investigated 12-month and/or lifetime prevalence in the total adult general population in northeastern Germany, taking into account sex, age group and comorbidity of individual diagnoses [10, 14, 16, 28, 31]. Northeastern Germany is characterized by relatively low population density and high population average age, given an increased outward-migration of younger and well-educated individuals. Prevalence estimates for individual mental disorders in different age groups from young adulthood to very old age thus seem to be particularly important in this region.

The Study of Health in Pomerania (SHIP) constitutes a prospective-longitudinal epidemiological study based on a two-stage stratified cluster sample randomly drawn from the adult general population (aged 20–79 years) in northeastern Germany. The aim of SHIP was to examine the prevalence, incidence and associated risk/protective factors for various health- and illness-related conditions, primarily somatic diseases [35]. 10 years after baseline, a supplemental study (Life-Events and Gene–Environment Interaction in Depression, SHIP-LEGEND) was conducted to capture additional diagnostic information on mental disorders and psychological risk/protective factors in $N = 2400$ individuals recruited from the original baseline sample [11, 35]. During SHIP-LEGEND, participants were aged 29–89 years. In this paper, we present 12-month and lifetime prevalence estimates for a wide range of DSM-IV mental disorders as well as additional information on comorbidity in the SHIP-LEGEND total sample and split by sex and age group.

Materials and methods

Sample

SHIP is a cohort study based on a two-stage stratified cluster sample randomly drawn from the adult German general population (initially aged 20–79 years) in northeastern Germany (comprising three cities and 29 communities; total population: $N = 212{,}157$ individuals; net sample: $N = 6267$ individuals) [11, 36]. Participants were examined in up to four assessment waves over up to 17 years (baseline: SHIP-0, 1997–2001, $N = 4308$; 5-year follow-up: SHIP-1, 2002–2006, $N = 3300$; 11-year follow-up: SHIP-2, 2008–2012, $N = 2333$; 17-year follow-up: SHIP-3, 2014–2016, $N = 1718$). Information on health- and disease-related conditions was collected using various types of assessment.

From 2007 to 2010, SHIP-LEGEND (Life-Events and Gene–Environment Interaction in Depression) was conducted among $N = 2400$ individuals from SHIP-0 (aged 29–89 during SHIP-LEGEND). In June 2007, $N = 383$ individuals from SHIP-0 were deceased and $N = 256$ refused further study participation, resulting in $N = 3669$ individuals invited for study participation. $N = 92$ individuals deceased during SHIP-LEGEND, $N = 1011$ refused to participate, $N = 132$ did not respond to repeated efforts of contact and $N = 35$ subjects did not show up repeatedly or were not able to arrange an appointment. The response rate in SHIP-0 was 69%; the sub-response rate in SHIP-LEGEND was 67%.

Diagnostic assessment

In SHIP-LEGEND, lifetime diagnostic information on symptoms, syndromes and diagnoses of mental disorders including additional information on age of onset and recency, duration and severity was assessed face-to-face using the fully standardized and computerized Munich-Composite International Diagnostic Interview (DIA-X/M-CIDI) [41]. The DIA-X/M-CIDI is an updated version of the World Health Organization's CIDI version 1.2 [43] with additional questions to cover DSM-IV [2] and ICD-10 [44] criteria. Reliability and validity of the DIA-X/M-CIDI have been shown to be high; more detailed information on the DIA-X/M-CIDI including its psychometric properties has been previously presented [30, 40]. Lifetime diagnostic information on alcohol abuse/dependence was assessed using the Structured Clinical Interview for DSM-IV [38]. Interviewers were initially trained and closely supervised throughout the study.

The collapsed category of any substance use disorder includes alcohol abuse/dependence, illicit drug abuse/dependence and nicotine dependence. The category of any depressive disorder includes major depressive disorder and dysthymia. Any bipolar disorder includes bipolar I and bipolar II disorder. Any anxiety disorder includes panic disorder, agoraphobia, social phobia, specific phobia, phobia not otherwise specified and generalized anxiety disorder. Any somatoform disorder includes somatization disorder, undifferentiated somatization disorder, hypochondria and pain disorder. Any eating disorder includes typical and atypical anorexia and bulimia nervosa.

Diagnostic information on 12-month mental disorders was derived based on age of recency reports. Diagnostic information on 12-month alcohol abuse/dependence was estimated based on reports on remission status (fully remitted cases were given a lifetime, but not 12-month diagnosis). Cases with lifetime diagnoses, but missing information on age of recency/remission status were set to missing for the analyses of 12-month prevalence. The collapsed diagnostic categories were set to missing whenever diagnostic information on any of the included individual disorders was missing.

Statistical analysis

Stata 14 [34] was used for the analyses. The analyses refer to the total SHIP-LEGEND sample ($N = 2400$). However, the number of cases with missing diagnostic information varied by diagnostic outcome, resulting in slightly different sample sizes for individual diagnostic outcomes. Respective sample sizes are presented in online resource 1a and 1b.

Associations (Odds Ratios, OR) between sample characteristics and sex were tested using logistic regressions with respective sample characteristics as predictor and sex (females vs. males) as outcome.

12-month and lifetime prevalence of mental disorders was estimated for the total sample as well as split by sex (males and females) and age group (age 29–44, age 45–59, age 60–74 and age 75–89). Moreover, the number of individual 12-month and lifetime diagnoses was calculated among those with any 12-month or lifetime mental disorder, respectively.

To examine putative selection effects due to systematic non-response in SHIP-LEGEND, inverse probability weighting was applied using baseline characteristics from SHIP-0. More specifically, gender, age (non-linear via restricted cubic splines using four knots), waist circumference, history of myocardial infarction, diabetes, cancer, hypertension, alcohol consumption, smoking status, employment status, years of education as well as the diagnostic screener (CIDS)/stem questions of the DIA-X/M-CIDI for depression, panic disorder, generalized anxiety disorder and somatoform disorders were included in multiple logistic regressions on participation in SHIP-LEGEND. The predicted probabilities were multiplied by the primary sample weights (see [31] for details). All prevalence measures were then recalculated using inverse probability weighting.

Results

Sample characteristics

Sample characteristics in the total sample as well as separately for men and women are presented in Table 1. Women compared to men were younger (OR = 0.99 per age in years) and more often reported 10 years vs. less than 10 years of education (OR = 1.6). Women reported a lower household monthly income (900–2299€ vs.<900€: OR = 0.7; 2300–3299€ vs.<900€: OR = 0.6; >3299€ vs.<900€: OR = 0.5) and more often indicated to be divorced/married but living separately (OR = 1.8) or to be widowed (OR = 2.6).

12-month and lifetime prevalence in the SHIP-LEGEND total sample

12-month and lifetime prevalence estimates for DSM-IV mental disorders in the total sample and separately for different age groups are presented in Tables 2 and 3, respectively. In the total sample, 36.3% were affected by any 12-month and 54.8% by any lifetime mental disorder. The most frequent diagnostic groups were anxiety (12-month: 14.8%, lifetime: 23.4%), substance use (12-month: 14.5%, lifetime: 25.0%), somatoform (12-month: 12.9%, lifetime: 20.4%) and depressive (12-month: 7.3%, lifetime: 18.6%) disorders. Prevalence estimates for eating (12-month: 0.3%, lifetime: 0.5%) and bipolar (12-month: 0.2%, lifetime: 0.4%) disorders were considerably lower. The most frequent individual diagnoses were specific phobias (12-month: 12.0%, lifetime: 18.3%), alcohol abuse/dependence (12-month: 8.9%, lifetime: 9.5%), undifferentiated somatization disorder (12-month: 8.6%, lifetime: 12.8%), nicotine dependence (12-month: 7.3%, lifetime: 19.5%) and major depressive disorder (12-month: 5.0%, lifetime: 16.9%).

12-month and lifetime prevalence in men and women

12-month and lifetime prevalence estimates for men and women (in the respective total sample and for different age groups) are shown in Online resource 2 and 3, respectively. Compared to men, women were more often affected by any 12-month (men: 34.7%; women: 37.7%) and lifetime mental disorder (men: 51.4%; women: 58.0%). Except for substance use (considerably higher prevalence in men)

Table 1 Sample characteristics in the total sample and by sex ($n = 2400$)

Sample characteristics	Total ($n = 2400$)		Men ($n = 1141$)		Women ($n = 1259$)		OR	95% CI		p
Age, M (SD)	55.9	14.3	57.1	14.5	54.7	13.9				
Age, range	29	89	30	89	29	89	**0.99**	**0.98**	**0.99**	**< 0.001**
Education, *N* (%)[a]										
< 10 years (ref.)	751	31.8	408	36.3	343	27.6				
10 years (junior high)	1140	48.2	478	42.6	662	53.3	**1.6**	**1.4**	**2.0**	**< 0.001**
> 10 years	474	20.0	237	21.1	237	19.1	1.2	0.9	1.5	0.150
Employment, *N* (%)[b]										
Education (ref.)	3	0.2	1	0.1	2	0.2				
Unemployment	68	3.6	36	4.1	32	3.2	0.4	0.04	5.1	0.516
Housewife/maternity leave	28	1.5	1	0.1	27	2.7	13.5	0.6	306.3	0.102
Retired	811	43.2	402	45.2	409	41.3	0.5	0.05	5.6	0.582
Part-time employed	204	10.8	37	4.2	167	16.9	2.3	0.2	25.6	0.511
Full-time employed	765	40.7	412	46.3	353	35.7	0.4	0.04	4.7	0.490
Household monthly income, *N* (%)[c]										
< 900 € (ref.)	219	11.5	83	9.2	136	13.5				
900–2299 €	1097	57.5	506	56.2	591	58.6	**0.7**	**0.5**	**0.96**	**0.026**
2300–3299 €	388	20.3	196	21.8	192	19.1	**0.6**	**0.4**	**0.8**	**0.003**
> 3299 €	205	10.7	116	12.9	89	8.8	**0.5**	**0.3**	**0.7**	**< 0.001**
Marital status, *N* (%)[d]										
Married (ref.)	1569	66.2	807	71.7	762	61.3				
Single/never married	302	12.7	153	13.6	149	12.0	1.03	0.8	1.3	0.806
Divorced/married but living separately	272	11.5	101	9.0	171	13.8	**1.8**	**1.4**	**2.3**	**< 0.001**
Widowed	227	9.6	65	5.8	162	13.0	**2.6**	**1.9**	**3.6**	**< 0.001**

Statistically significant findings (p-value < 0.05) are presented in bold

M mean, *SD* standard deviation, *OR* Odds Ratio from logistic regressions with respective sample characteristic as predictor and sex (females were compared to males) as outcome, *CI* confidence interval

[a]Assessed in SHIP-LEGEND, data available for 2365 participants

[b]Assessed in SHIP-2, data available for 1879 participants

[c]Assessed in SHIP-2, data available for 1909 participants

[d]Assessed in SHIP-LEGEND, data available for 2370 participants

and bipolar disorders (comparable prevalence in men and women), prevalence estimates for each of the major diagnostic classes were about twice as high or higher in women vs. men.

12-month and lifetime prevalence in different age groups

Both, 12-month and lifetime prevalence estimates were considerably lower in older (aged 60–74 or 75–89 years) vs. younger (aged 29–44 or 45–59 years) age groups (see Tables 2, 3). With few exceptions, respective age differences in 12-month and lifetime prevalence estimates were consistently found across the disorders and diagnostic classes as well as in both men and women (online resource 2 and 3).

Comorbidity of mental disorders

The number of individual 12-month and lifetime diagnoses in those with any 12-month or lifetime mental disorder, respectively, in the total sample and split by sex and age group are presented in Table 4. There was evidence for substantial comorbidity of mental disorders, especially in women: 22.6% (men: 21.1%, women: 23.9%) of those affected by any 12-month mental disorder met criteria for two and 13.6% (men: 9.6%, women: 16.9%) for three or more 12-month diagnoses. Similarly, 26.4% (men: 25.7%, women: 26.9%) of those affected by any lifetime mental disorder met criteria for two and 22.7% (men: 19.6%, women: 25.2%) for three or more lifetime diagnoses. With few exceptions, lower proportions of individuals were affected by two or three or more 12-month and/or lifetime diagnoses in older vs. younger age groups.

Table 2 12-month prevalence rates of mental disorders in the total sample and by age group ($n=2400$)

12-month mental disorders	Total ($n=2400$)		Age 29–44 ($n=611$)		Age 45–59 ($n=782$)		Age 60–74 ($n=753$)		Age 75–89 ($n=254$)	
	N	%	*N*	%	*N*	%	*N*	%	*N*	%
Any mental disorder	866	36.3	286	47.2	341	44.0	200	26.6	39	15.4
Any substance use disorder	342	14.5	127	21.0	133	17.2	72	9.7	10	4.3
Alcohol abuse/dependence	203	8.9	63	10.6	73	9.7	60	8.3	7	3.3
Illicit drug abuse/dependence	13	0.6	6	1.0	5	0.7	0	0.0	2	0.9
Nicotine dependence	166	7.3	80	13.6	70	9.4	15	2.1	1	0.4
Any depressive disorder	170	7.3	52	8.6	71	9.2	40	5.4	7	3.0
Major depressive disorder	116	5.0	35	5.8	54	7.0	23	3.1	4	1.7
Dysthymia	93	4.0	25	4.2	35	4.6	26	3.5	7	3.0
Any bipolar disorder	4	0.2	2	0.3	2	0.3	0	0.0	0	0.0
Bipolar I disorder	3	0.1	1	0.2	2	0.3	0	0.0	0	0.0
Bipolar II disorder	1	0.0	1	0.2	0	0.0	0	0.0	0	0.0
Any anxiety disorder	353	14.8	114	18.8	142	18.3	85	11.3	12	4.7
Panic attacks	62	2.6	21	3.5	28	3.6	11	1.5	2	0.9
Panic disorder	41	1.7	13	2.1	19	2.5	8	1.1	1	0.4
Agoraphobia	63	2.7	19	3.2	26	3.4	16	2.2	2	0.8
Social phobia	41	1.8	17	2.8	17	2.2	6	0.8	1	0.4
Specific phobia	283	12.0	96	15.9	111	14.4	67	9.0	9	3.8
Phobia NOS	11	0.5	2	0.3	3	0.4	6	0.8	0	0.0
GAD	17	0.7	3	0.5	5	0.7	9	1.2	0	0.0
OCD	18	0.8	8	1.3	7	0.9	3	0.4	0	0.0
PTSD	16	0.7	6	1.0	7	0.9	1	0.1	2	0.8
Any somatoform disorder	307	12.9	111	18.3	126	16.3	57	7.6	13	5.1
Somatization disorder	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Undifferentiated somatization disorder	195	8.6	66	11.3	79	10.6	39	5.4	11	4.9
Hypochondria	2	0.1	1	0.2	0	0.0	1	0.1	0	0.0
Pain disorder	110	4.7	44	7.3	47	6.1	17	2.3	2	0.9
Eating disorder	6	0.3	3	0.5	2	0.3	1	0.1	0	0.0
Anorexia nervosa	2	0.1	2	0.3	0	0.0	0	0.0	0	0.0
Anorexia nervosa, atypical	1	0.0	0	0.0	0	0.0	1	0.1	0	0.0
Bulimia nervosa	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Bulimia nervosa, atypical	3	0.1	1	0.2	2	0.3	0	0.0	0	0.0

GAD generalized anxiety disorder, *NOS* not otherwise specified, *OCD* obsessive compulsive disorder, *PTSD* posttraumatic stress disorder

There were no major differences in prevalence estimates when using inverse probability weighting. Only with respect to substance use disorders, noticeably higher weighted (25.5%) vs. unweighted (22.2%) 12-month prevalence estimates were found in men, indicating slight selection bias for substance use disorders, with affected individuals being slightly underrepresented in SHIP-LEGEND.

Discussion

We examined 12-month and lifetime prevalence of DSM-IV mental disorders in the SHIP-LEGEND total sample and split by sex and age group from 29 up to 89 years of age. Few previous general population studies reported both 12-month and lifetime prevalence estimates for such a broad range of mental disorders and distinguished between men and women as well as different age groups from young adulthood to very old age. Therefore, our study considerably extends previous research. Our core findings can be summarized as follows: (1) more than one-third and more than half of the sample met criteria for any 12-month and lifetime mental disorder, respectively. (2) The most frequent diagnostic groups were anxiety and substance use disorders, followed by somatoform and depressive disorders. (3) Except for substance use (higher prevalence in men) and bipolar disorders (comparable prevalence in men and women), higher prevalence estimates were found in women vs. men. (4) Lower

Table 3 Lifetime prevalence rates of mental disorders in the total sample and by age group ($n = 2400$)

Lifetime mental disorders	Total ($n = 2400$)		Age 29–44 ($n = 611$)		Age 45–59 ($n = 782$)		Age 60–74 ($n = 753$)		Age 75–89 ($n = 254$)	
	N	%	*N*	%	*N*	%	*N*	%	*N*	%
Any mental disorder	1308	54.8	374	61.7	483	62.3	370	49.3	81	32.0
Any substance use disorder	589	25.0	185	30.6	219	28.4	153	20.5	32	13.6
Alcohol abuse/dependence	218	9.5	68	11.4	79	10.5	64	8.9	7	3.3
Illicit drug abuse/dependence	39	1.7	20	3.4	15	2.0	2	0.3	2	0.9
Nicotine dependence	446	19.5	146	24.7	167	22.4	109	15.1	24	10.7
Any depressive disorder	437	18.6	131	21.8	166	21.6	122	16.5	18	7.8
Major depressive disorder	395	16.9	117	19.4	152	19.8	109	14.7	17	7.4
Dysthymia	98	4.2	26	4.3	39	5.1	26	3.5	7	3.0
Any bipolar disorder	10	0.4	5	0.8	5	0.7	0	0.0	0	0.0
Bipolar I disorder	7	0.3	3	0.5	4	0.5	0	0.0	0	0.0
Bipolar II disorder	3	0.1	2	0.3	1	0.1	0	0.0	0	0.0
Any anxiety disorder	557	23.4	169	27.9	218	28.2	147	19.6	23	9.1
Panic attacks	179	7.6	54	9.0	79	10.3	43	5.8	3	1.3
Panic disorder	86	3.6	23	3.8	43	5.6	19	2.5	1	0.4
Agoraphobia	113	4.8	27	4.5	47	6.1	34	4.6	5	2.0
Social phobia	68	2.9	25	4.2	26	3.4	16	2.2	1	0.4
Specific phobia	431	18.3	142	23.6	164	21.3	107	14.3	18	7.6
Phobia NOS	21	0.9	5	0.8	8	1.0	7	0.9	1	0.4
GAD	38	1.6	9	1.5	14	1.8	15	2.0	0	0.0
OCD	27	1.2	15	2.5	8	1.1	4	0.6	0	0.0
PTSD	29	1.2	10	1.7	11	1.4	4	0.5	4	1.6
Any somatoform disorder	485	20.4	153	25.3	193	24.9	111	14.8	28	11.1
Somatization disorder	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Undifferentiated somatization disorder	291	12.8	89	15.3	114	15.4	69	9.6	19	8.4
Hypochondria	3	0.1	1	0.2	1	0.1	1	0.1	0	0.0
Pain disorder	191	8.1	63	10.5	78	10.1	41	5.5	9	3.9
Eating disorder	11	0.5	7	1.2	2	0.3	2	0.3	0	0.0
Anorexia nervosa	3	0.1	2	0.3	0	0.0	1	0.1	0	0.0
Anorexia nervosa, atypical	5	0.2	4	0.7	0	0.0	1	0.1	0	0.0
Bulimia nervosa	1	0.0	1	0.2	0	0.0	0	0.0	0	0.0
Bulimia nervosa, atypical	3	0.1	1	0.2	2	0.3	0	0.0	0	0.0

GAD generalized anxiety disorder, NOS: not otherwise specified, *OCD* obsessive compulsive disorder, *PTSD* posttraumatic stress disorder

prevalence findings were obtained in older vs. younger age groups. (5) There was evidence for substantial comorbidity of mental disorders, which tended to be more pronounced in women vs. men and less pronounced in older vs. younger age groups.

Our findings are largely in line with previous reports on 12-month [15–17] and lifetime [17, 28] prevalence estimates for mental disorders within the German general population. However, prevalence estimates for substance use and somatoform disorders in previous studies were sometimes lower, possibly because nicotine dependence [16, 17] and undifferentiated somatization [15, 16, 28] disorder were not considered. More generally, our findings correspond to those from other research in Europe [1, 8, 39] and around the globe [20, 21, 24, 33]. Variations in prevalence with respect to individual disorders in individual studies might result from differences concerning the study sample, design (cross-sectional vs. prospective-longitudinal) and assessment methods [standardized vs. (semi-)structured interview or questionnaire]. For example, our study focused on adults from northeastern Germany, which is characterized by relatively low population density and high population average age.

The detected sex differences in prevalence are consistent with prior evidence, suggesting that women are more often affected by internalizing (such as affective and anxiety)

Table 4 Number of individual (a) 12-month diagnoses among those with any 12-month diagnosis and (b) lifetime diagnoses among those with any lifetime diagnosis in the total sample and split by sex and age group

Total sample										
Number of 12-month diagnoses	Total		Age 29–44		Age 45–59		Age 60–74		Age 75–89	
	N	%	*N*	%	*N*	%	*N*	%	*N*	%
1	552	63.7	167	58.4	215	63.0	138	69.0	32	82.1
2	196	22.6	75	26.2	75	22.0	41	20.5	5	12.8
≥ 3	118	13.6	44	15.4	51	15.0	21	10.5	2	5.1
Men										
Number of 12-month diagnoses	Total		Age 29–44		Age 45–59		Age 60–74		Age 75–89	
	N	%	*N*	%	*N*	%	*N*	%	*N*	%
1	273	69.3	76	60.8	100	67.1	75	78.9	22	88.0
2	83	21.1	36	28.8	29	19.5	15	15.8	3	12.0
≥ 3	38	9.6	13	10.4	20	13.4	5	5.3	0	0.0
Women										
Number of 12-month diagnoses	Total		Age 29–44		Age 45–59		Age 60–74		Age 75–89	
	N	%	*N*	%	*N*	%	*N*	%	*N*	%
1	279	59.1	91	56.5	115	59.9	63	60.0	10	71.4
2	113	23.9	39	24.2	46	24.0	26	24.8	2	14.3
≥ 3	80	16.9	31	19.3	31	16.1	16	15.2	2	14.3
Total sample										
Number of lifetime diagnoses	Total		Age 29–44		Age 45–59		Age 60–74		Age 75–89	
	N	%	*N*	%	*N*	%	*N*	%	*N*	%
1	666	50.9	155	41.4	239	49.5	214	57.8	58	71.6
2	345	26.4	112	29.9	116	24.0	102	27.6	15	18.5
≥ 3	297	22.7	107	28.6	128	26.5	54	14.6	8	9.9
Men										
Number of lifetime diagnoses	Total		Age 29–44		Age 45–59		Age 60–74		Age 75–89	
	N	%	*N*	%	*N*	%	*N*	%	*N*	%
1	319	54.7	67	45.0	107	52.5	107	60.1	38	73.1
2	150	25.7	44	29.5	47	23.0	51	28.7	8	15.4
≥ 3	114	19.6	38	25.5	50	24.5	20	11.2	6	11.5
Women										
Number of lifetime diagnoses	Total		Age 29–44		Age 45–59		Age 60–74		Age 75–89	
	N	%	*N*	%	*N*	%	*N*	%	*N*	%
1	347	47.9	88	39.1	132	47.3	107	55.7	20	69.0
2	195	26.9	68	30.2	69	24.7	51	26.6	7	24.1
≥ 3	183	25.2	69	30.7	78	28.0	34	17.7	2	6.9

disorders, while men are more often affected by externalizing (such as substance use) disorders [1, 15, 17, 21, 28].

Moreover, our findings for lower prevalence in older vs. younger age groups correspond to and considerably extend previous evidence [18, 20, 22, 23, 32], since few prior studies investigated 12-month and lifetime prevalence for a wide range of DSM-IV mental disorders up to old age (89 years). Respective age differences in prevalence estimates, however,

have been called into question, e.g., because older individuals have longer time periods of risk, and cross-sectional symptom scales and clinical experience suggest that psychopathological symptoms (e.g., depressive symptoms) tend to increase with age [42]. That means, besides cohort and aging effects (such as increased emotional control and psychological immunization), methodological artifacts (such as age-related memory and reporting biases, confounding with somatic diseases, exclusion of institutional residents and selective mortality) might be responsible for our and earlier findings [18, 20, 22, 23, 32, 42]. Our prevalence estimates in older age groups must, therefore, be interpreted with caution and require replication in future studies, which should favorably (additionally) apply age-adapted assessment instruments such as the CIDI65+ [3, 42].

Finally, our finding of substantial comorbidity are in line with previous research [15, 16, 24] and highlight the considerable individual and societal burden of mental disorders [5, 7, 12, 19, 27, 37, 39], especially since higher comorbidity was linked to more unfavorable clinical and course characteristics as well as more adverse short- and long-term outcomes.

Strengths and limitations

Particular strengths of our study are that 12-month and lifetime prevalence estimates were assessed for a variety of mental disorders in the adult general population in northeastern Germany and reported for the total sample and split by sex and age group up to very old age.

However, our study is not without limitations: Alcohol abuse and dependence were assessed with the SKID, while other mental disorders were assessed with the DIA-X/M-CIDI. 12-month mental disorders were derived indirectly (based on age of onset and recency reports and remission status for alcohol abuse/dependence), but not assessed directly from participants. Changes in diagnostic classes and criteria from DSM-IV to DSM-5 (which especially apply to somatoform and substance use disorders) were not considered. A range of diagnostic classes (such as personality or psychotic disorders) was not considered herein.

In general, retrospective reports are subject to recall and memory biases. For instance, prevalence estimates were shown to be considerably higher when obtained from prospective-longitudinal studies with multiple waves of assessments (cumulative lifetime incidences) compared to cross-sectional studies [6, 29]. Especially lifetime prevalence might therefore be underestimated herein, particularly among participants with mild or short-term symptomatology and/or long time intervals between symptom occurrence and reporting (e.g., older participants) [4]. The reported prevalence estimates for some rare disorders with small cell sizes (e.g., bipolar disorders, somatization disorder, hypochondria and eating disorders) must be interpreted with caution, especially when split by sex and age group.

In older participants, the reliability and validity of the DIA-X/M-CIDI might be limited: complex standardized symptom and clinical probe questions as included in the DIA-X/M-CIDI require substantial cognitive efforts and working memory capacity, especially among older individuals, who have to refer to considerably longer lifetime periods and, at the same time, are likely to be affected by age-related cognitive impairments [26, 42]. Modified and simplified standardized diagnostic interview procedures might, therefore, be more suitable to adequately address age-specific memory and reporting biases, and thus obtain more precise diagnostic information from the elderly [3, 42].

The current sample might not be entirely representative of the adult general population in northeastern Germany, e.g., due to a selective participation of healthier individuals and underrepresentation of specific high-risk groups such as non-German speakers, institutionalized and homeless individuals, thus leading to an underestimation of 12-month and lifetime prevalence estimates. Respective biases, however, are assumed to be small in SHIP-LEGEND [31] and sensitivity analyses performed herein support this assumption. Schmidt et al. [31] examined the role of different sociodemographic and clinical characteristics (assessed with the diagnostic screener (CID-S)/stem questions of the DIA-X/M-CIDI) reported in SHIP-0 for subsequent study participation and mental health/disorders reported in SHIP-LEGEND. Here, we extended these analyses by including somatic factors as well and came to very similar conclusions: There was no evidence for considerable selection biases from SHIP-0 to SHIP-LEGEND, except that individuals with substance use disorders might be slightly underrepresented in SHIP-LEGEND. However, of course, due to the sampling procedure in SHIP-0, it is possible that individuals with severely impairing mental disorders (e.g., schizophrenia) could not be reached and are, therefore, underrepresented in SHIP.

Conclusions

Our findings highlight the fact that mental disorders—especially anxiety, substance use, somatoform and depressive disorders—are common in the general population in northeastern Germany and frequently co-occur. These findings are of particular importance, given that mental disorders and associated unfavorable clinical features such as higher comorbidity are associated with substantial individual burden/impairment and other unfavorable sociodemographic, clinical and functional short- and long-term outcomes as well as tremendous societal costs [5, 7, 12, 19, 27, 39].

Additional studies are necessary to replicate our findings and to compare 12-month and lifetime prevalence estimates

concerning a wide variety of mental disorders in different age groups of the adult general population, whilst pertaining to revised diagnostic criteria (DSM-5). Future research should favorably also focus on other mental disorders not assessed herein (e.g., personality and psychotic disorders), consider differences in prevalence estimates by additional sociodemographic factors (e.g., regional and educational group) and examine comorbidity patterns between individual disorders and diagnostic classes as well as mental disorders and somatic diseases. Especially the frequency of mental disorders in the elderly requires further investigation to better explain our and previous findings for considerably lower prevalence in older vs. younger age groups. For instance, mental disorders and other features (e.g., cognitive functioning) in the elderly (and other age groups) could be assessed cross-sectionally and prospectively using different types of assessments, and prevalence estimates could then be compared.

Moreover, epidemiological research needs to determine the health service needs and barriers for service use in the general population to decrease the psychiatric burden and increase public health. Similarly, the developmental trajectories of disorder onset and progression to more severe and comorbid stages need to be examined across the life course to identify favorable time windows for prevention and early intervention. An improved and more detailed knowledge in this field is crucial to further optimize existing targeted prevention/early intervention efforts and thus to effectively lower the prevalence and new incidence rates of mental disorders in the general population on the long run.

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Compliance with ethical standards

Informed consent Written informed consent was obtained from all participants prior to their inclusion in the study.

Ethical standards SHIP was approved by the ethics committee of the University of Greifswald and complies with the Helsinki Declaration of 1975, as revised in 2013.

Conflict of interest The authors declare no conflict of interest.

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