

Treated versus non-treated subjects with depression from a 30-year cohort study: prevalence and clinical covariates

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Abstract The aim of this study was to determine prevalence rates of several components of depression (unipolar and bipolar major, minor, recurrent brief depression, and dysthymia) and to identify covariates of treatment. We analysed a representative population-based, long-term prospective cohort study from age 20 to 50. Across the seven semi-structured interviews, generalized estimating equations examined the associations between diagnoses and treatment status during the course. The results show that the mean annual treatment rate across 30 years in persons with MDE was 39.2 %. The weighted treatment prevalence for any depressive disorder was 23.4 % (15.7 % for MDE, 4.3 % for minor depressive disorders and 3.4 % for non-diagnosed subjects). Persons were more likely to seek treatment as they grew older. Women with MDE had triple the treatment prevalence of men (23.8 vs. 7.4 %). Variables of distress/suffering under depression (OR 1.36–1.52) and the number of diagnostic depressive symptoms (OR 1.47) were statistically significant

predictors of treatment, as were episode duration (OR 2.21) and various variables assessing impairment due to depression (OR 4.65–8.02). In conclusion, only a minority of persons with depressive disorders seek professional treatment in the year of disorder onset. Women and subjects suffering from high levels of depressive symptoms, frequent episodes, long episode duration and consecutive high distress and impairment were more likely to seek treatment.

Keywords Depression · Treatment seeking · Prevalence · Distress · Gender

Introduction

The rates of professional treatment for depressive disorders and characteristics differentiating treatment-seekers from the depressed who are not treated are of considerable interest for clinical practice and public mental health policies. A systematic review of the literature on treatment-seeking rates has demonstrated that only some people who suffer from depression actually seek treatment [1]. It was also found that various socio-demographic variables, such as age and gender, and clinical characteristics, such as severity of impairment and comorbidity, influence treatment-seeking rates.

The findings from 15 countries across five continents from the World Health Organization's World Mental Health Survey Initiative reported by Wang et al. [2] varied widely: only 6.0–52.1 % of patients with mood disorders were treated in the year of the onset of their disorder. Older cohorts and men more often failed to seek professional treatment or delayed doing so. The National Comorbidity Survey Replication (NCS-R) [3] reported that 37.4 % of

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patients with major depressive episodes (MDE) and 41.6 % with dysthymia had treatment contact in the year of disorder onset. In correspondence, the Netherlands Mental Health Survey and Incidence Study (NEMESIS) [4] found that 59.3 % of subjects with MDE and 32.5 % with dysthymia were treated in the year of onset. Again, in both surveys, older cohorts and men were less likely to seek treatment.

A recent, large epidemiological study using data from the American National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) applied a latent class analysis to adults with major depression [5]. Three classes of treatment seeking were identified: highly active, partially active and inactive. Positive associations with greater degrees of active treatment seeking were, among others, confirmed for female gender and higher levels of education. The clinical associations were the number of depressive episodes, other mood disorders, anxiety disorders, drug use disorders and personality disorders, which indicate higher psychopathological impairment. Finally, analysis of the Zurich Cohort Study found a treatment rate of 43 % in subjects with major depressive disorder and/or dysthymia diagnosed in the past year [6]. More recent findings from the same study followed up to 2008 established that subjects with *major depressive syndromes* (defined by the presence of 5+/9 DSM-5 criterial symptoms) had equivalent rates of treatment irrespective of episode lengths (4+ days or 2–4 weeks) [7]. These findings suggest that current definitions of episode duration may well be arbitrary.

The current study is based on the Zurich cohort sample interviewed seven times between 1979 and 2008 (from ages 20/21 to 49/50). The sample includes all subjects with any kind of depression, whether or not they sought and received professional treatment for depression. Continuing our earlier investigations and integrating the data from the further interview (2008), we analysed in greater detail the predictors of treatment, the clinical features of depressive disorders and their direct consequences for the person concerned. This may contribute to a better definition of depression and towards more accurate identification of help-seeking depressed individuals in the general population. Note that the Zurich Study is a comprehensive epidemiological survey that includes a broad and comprehensive assessment of various mental disorders (for an overview see [13]). However, in the present study, we focused exclusively on depression. This was mainly an exploratory study, but based on the literature, we also hypothesized that (1) only a minority would seek treatment in the year of disorder onset, (2) women would be more likely to seek treatment and (3) severe impairment and distress would increase treatment rates.

Methods

Sample

The Zurich Study originally comprised a cohort of 4547 subjects ($m = 2201$; $f = 2346$) representative of the canton of Zurich in Switzerland, who were screened in 1978 with the Symptom Checklist-90-R of Derogatis (SCL-90-R) [8], when the men were 19 and the women 20 years old. In order to increase the probability of the development of psychiatric syndromes, a stratified subsample of 591 subjects (292 men and 299 women) was selected for interview, with two-thirds consisting of high-scorers (defined by the 85th percentile or more of the Global Severity Index (GSI) of the SCL-90-R) and one-third being a random sample of subjects with scores below that 85th percentile. A detailed description of the sampling method has been provided elsewhere (see for instance [9]). Such a two-phase procedure, i.e. initial screening and subsequent interview with a stratified subsample, is fairly common in epidemiological research [10]. Altogether seven interview waves have been conducted: in 1979 ($n = 591$), 1981 ($n = 456$), 1986 ($n = 457$), 1988 ($n = 424$), 1993 ($n = 407$), 1999 ($n = 367$) and 2008 ($n = 335$). The initial allocation to the two groups, above and below the 85th percentile of the GSI, remained stable throughout the study; the dropouts were more frequent among the extremely high and extremely low GSI scorers [11]. We repeated the attrition analyses at the latest interview. There we found, in addition, no significant difference between subjects who had left the study and those who remained with regard to socio-economic status and education as measured at the study outset, nor in their initial psychopathological impairment according to the nine SCL-90-R subscales. However, there was a moderate gender bias, with more dropouts being male (OR 1.82; 95 % CI 1.31–2.53; $p < 0.001$).

Instruments and measures

Interviews were conducted using the “Structured Psychopathological Interview and Rating of the Social Consequences of Psychological Disturbances for Epidemiology” (SPIKE) [12]. This semi-structured interview collects data on socio-demography, somatic syndromes, psychopathology, substance use, medication, health services, impairment and social activity. Its good reliability and validity have been reported previously [13].

The interview section on depression concentrated on the past 12 months and started with a broad question on loss of joy and energy and on low mood, followed by a list of 28 or more questions on symptoms. In addition to the frequency and maximum duration of episodes, we assessed

the cumulative total number of days spent in depression over the previous 12 months, their recency, seasonality and consequences, i.e. distress/suffering (scaled 0–100), help seeking, treatment, work impairment (0–100), impairment in leisure/social activities, and, retrospectively, the annual occurrence of depressive symptoms and treatment since the previous interview.

Treatment was defined as having consulted MDs or psychologists in the 12 months immediately prior to the interview and was analysed as a dichotomous variable (yes/no). Treatment was assessed separately for each syndrome. It is important to note that treatment is readily available in Switzerland. Every resident has mandatory basic private health insurance and access to general and other practitioners, including psychotherapists.

The diagnoses of depression comprised unipolar and bipolar major depressive episodes (MDE) (DSM-III-R, DSM-IV) and minor depressive disorders (MinDD) consisting of dysthymia (Dysth) DSM-IV, minor depression (MinD) and recurrent brief depression (RBD). Minor depression was defined by 3–4 of 9 criterial symptoms with a minimum duration of 2 weeks [14]. A diagnosis was routinely made for the 12 months immediately prior to all seven interviews.

Consequences of depression, such as distress/suffering, impairment and treatment seeking, were not included in the syndromal definition of depression, but were used as validators of the clinical relevance of this syndrome, alongside a positive family history of depression (first-degree relatives), age at onset and course. This is compatible with the original recommendations of Robins and Guze [15].

Aspects of the course included age at onset of depressive symptoms and a vector comprising all 30 years from 1978 to 2008 with the annual assessments of presence of any depressive symptoms and treatment. We compared (1) the means of the total number of years with symptoms or treatment and (2) the average of % years with symptoms, taking the individual observation time into account.

An independent measure of the severity of depression, hereafter referred to as symptom distress, was derived from the self-assessment by the SCL-90-R, which was administered nine times from 1978 to 2008. We selected all 13 items of the depression subscale and added 11 further items: eating (items 19, 60), sleep problems (items 44, 64, 66), cognition (items 09, 46, 55), thoughts of death and dying (item 59), feelings of inferiority (item 41) and guilt feelings (item 89).

Key terms

Prevalence defines the rate of a given disorder in a specific sample. Weighted prevalence rates indicate those rates

representative for the general population. Correspondingly, treatment prevalence describes the frequency of treatment in the respective sample, including all participants, whereas weighted treatment prevalence denotes the treatment frequency extrapolated to the general population. Therefore, a treatment prevalence of 5 % indicates that five out of 100 participants in the total sample (including healthy and disordered participants) received a given form of treatment. In contrast, the treatment rate is defined as the proportion of persons with a given disorder who sought treatment for their disorder. Thus, “a treatment rate for MDD of 40 %” means that 40 out of 100 persons with a diagnosis of MDD sought treatment.

Statistical analysis

In order to provide estimates representative for the general population of the canton of Zurich, Switzerland, frequencies were weighted where necessary. The weight considers that two-thirds of the sample were high-scorers based on the cut-off along the 85th percentile of the GSI. As a result, the underrepresentation of low-scorer participants in the present sample was adjusted by weighting them with a factor of 11.3. By this means, their proportion was adapted to a distribution of low- to high-scorers representative for the general population. Then, we performed longitudinal models based on the repeated dependent measures of treatment-seeking status (yes vs. no) over time, using a series of generalized estimating equations (GEE). These models were introduced to fit regression analyses that account for within-subject correlation, which is an inherent part of longitudinal studies that rely on repeated measures [16]. Owing to the dichotomous structure of the dependent variable (i.e. treatment use vs. non-use), a binomial distribution with a logit link function best fitted the data. The within-subject covariance was specified with the “unstructured” correlation type to avoid having any constraints on the covariance structure. A robust estimator was used to reduce the effects of outliers and influential observations. In all GEE models, in addition, to adjust for the within-subject correlation, the time variable (i.e. slope factor) was also included as between-subject effect to account for the effect of time when participants progressed from age 19/20 to 49/50, which is a common procedure in longitudinal analysis [17]. Treatment status (yes vs. no) was always included as the dependent variable. The various predictor variables considered in the analyses are indicated in Tables 3 and 4. First, we ran a series of GEE analyses for men and women separately and secondly, a series including both men and women jointly while adjusting for gender. The GEE analyses were restricted to persons with a lifetime depressive disorder. Statistical significance was set at $\alpha = 0.05$. All analyses were carried out with SPSS version 20 for Macintosh.

Results

Treatment rates and treatment prevalence

Table 1 shows the annual treatment rates across groups of depressive disorders and the prevalence of treatment in the general population. The mean treatment rate in persons with MDE was 39.2 %. The lowest rate (29.6 %) was

Table 1 Annual treatment rates and treatment prevalence for depression

	MDE (%)	MinDD (%)	Depr.sx (%)	Others (%)	Total (%)
Unweighted annual treatment rates ^a					
1979	36.4	19.5	4.6	0.0	
1981	29.6	20.8	5.1	0.0	
1986	31.9	26.9	7.1	0.0	
1988	33.3	35.9	11.4	0.0	
1993	45.5	28.6	23.5	7.4	
1999	42.0	31.4	23.2	0.6	
2008	56.1	17.7	17.1	0.0	
Weighted annual treatment prevalence ^b					
1979	1.4	1.1	2.1	0.0	4.6
1981	2.2	1.1	0.9	0.0	4.2
1986	2.4	2.5	1.5	0.0	6.4
1988	3.2	1.9	1.8	0.0	6.9
1993	2.6	1.0	3.4	2.2	9.2
1999	4.4	1.3	3.3	0.1	9.1
2008	5.7	1.0	4.0	0.0	11.0

MDE major depressive episode, MinDD minor depressive disorders (comprising dysthymia, minor depression and recurrent brief depression), Depr.sx depression symptoms

^a Estimates refer to the participants with a respective disorder and are representative for all participants with that specific disorder

^b Estimates refer to all participants, including also healthy persons, and are representative for the general population

reported in 1981, and it increased with age, reaching a maximum of 56.1 % in 2008. The annual treatment rates for the minor depressive disorders showed no systematic change: the mean treatment rate was 25.8 %. In 1993, totally 18 persons (7.4 %) with no apparent current depressive symptoms were still being treated, but 15 of these had been diagnosed with depression in earlier interviews and the remaining three as suffering from depressive symptoms. Across all interviews, the annual mean treatment prevalence rate for any kind of depression in the general population was 7.3 %; the lowest rate was reported in 1981 (4.2 %); it increased stepwise with age to reach 11.0 % in 2008. Cumulating the seven interview years, the weighted treatment rate for depression was 23.4 % (14.3 % for men and 32.1 % for women) (Table 2). Taking all information regarding treatment into account, the weighted lifetime treatment prevalence rate for depression up to age 49/50 was 34.1 % (men 24.0 %, women 44.0 %).

Longitudinal associations of treatment seeking

Table 3 shows the repeated associations between treatment use and various clinical characteristics in persons with any depressive disorder between 1979 and 2008. All associations (except age at onset in both men and women, and number of days ill and episode duration in men) were statistically significant at $p < 0.05$. Most associations were slightly stronger in men. Statistically stronger associations in men relative to women were found for number of symptoms (OR 1.65 vs. 1.40) and symptom distress (OR 2.06 vs. 1.38). Work impairment, social impairment and general impairment were considerably higher in men, approximately twofold, but because of the small number of depressed men, the respective confidence intervals were quite large, resulting in a small overlap with the uncertainty range in women (which restrictively indicates that the difference was statistically not significant). Unfortunately,

Table 2 Weighted prevalence rates (%) across all seven interviews

Any depression	MDE <i>n</i> = 207 (%)	MinDD <i>n</i> = 141 (%)	Depr.sx <i>n</i> = 188 (%)	Others <i>n</i> = 55 (%)	Total <i>n</i> = 591 (%)
Disorder prevalence					
1979–2008 M + W	27.4	20.5	36.2	16.0	
Men	19.7	18.6	43.1	18.7	
Women	34.9	22.3	29.4	13.4	
Treatment prevalence					
1979–2008 M + W	15.7	4.3	3.4	0.0	23.4
Men	7.4	3.1	3.8	0.0	14.3
Women	23.8	5.4	3.0	0.0	32.1

All estimates are representative for the general population

MDE major depressive episode, MinDD minor depressive disorders (comprising dysthymia, minor depression and recurrent brief depression), Depr.sx depression symptoms

Table 3 Associations with seven repeated measures of professional treatment for depression (1979–2008) in persons with a depressive disorder (MDE, Dysth, MinD or RBD)

Predictor	Response category	Women		Men		Both ^a	
		OR	95 % CI	OR	95 % CI	OR	95 % CI
Number of days ill	30-day increase	1.25	1.12; 1.40	1.18	0.96; 1.44	1.18	1.10; 1.27
Number of symptoms	1 symptom increase	1.40	1.32; 1.48	1.65	1.48; 1.85	1.47	1.39; 1.55
Episode duration	>3 days	2.61	1.85; 3.68	1.61	0.87; 2.98	2.21	1.68; 2.91
	1–3 days	Ref.		Ref.			
General distress 0–100 ^b	10-point increase	1.32	1.26; 1.38	1.40	1.30; 1.51	1.36	1.31; 1.41
Symptom distress 0–80 ^b	10-point increase	1.38	1.24; 1.53	2.06	1.74; 2.45	1.52	1.38; 1.66
Work impairment	Yes	3.87	2.84; 5.28	5.99	3.11; 11.53	4.65	3.53; 6.11
	No	Ref.		Ref.		Ref.	
Social impairment	Yes	4.51	3.30; 6.17	9.46	5.36; 16.7	5.77	4.38; 7.60
	No	Ref.		Ref.		Ref.	
General impairment	Yes	5.88	4.15; 8.33	13.84	7.46; 25.7	8.02	5.84; 11.0
	No	Ref.		Ref.		Ref.	
Percentage of years symptomatic 1978–2008	10 % increase	1.29	1.19; 1.39	1.39	1.24; 1.55	1.31	1.23; 1.40
Age at onset	10-year increase	0.80	0.52; 1.21	0.73	0.46; 1.15	0.76	0.56; 1.03

^a Adjusted for gender^b Continuous variable and its possible range**Table 4** Associations with seven repeated measures of professional treatment for depression (1979–2008) in persons with at least one criterial depressive symptom

Predictor	Response category	Women		Men		Both ^a	
		OR	95 % CI	OR	95 % CI	OR	95 % CI
Number of days ill	30-day increase	1.28	1.14; 1.45	1.20	0.97; 1.48	1.21	1.13; 1.30
Number of symptoms	1 symptom increase	1.42	1.35; 1.50	1.72	1.55; 1.92	1.51	1.43; 1.59
Episode duration	>3 days	3.34	2.20; 5.09	0.81	0.27; 2.41	2.78	2.09; 3.70
	1–3 days	Ref.		Ref.		Ref.	
General distress 0–100 ^b	10-point increase	1.34	1.28; 1.40	1.42	1.33; 1.52	1.38	1.33; 1.43
Symptom distress 0–80 ^b	10-point increase	1.41	1.28; 1.57	2.18	1.86; 2.56	1.59	1.45; 1.74
Work impairment	Yes	4.47	3.29; 6.07	7.91	4.52; 13.8	5.61	4.28; 7.35
	No	Ref.		Ref.		Ref.	
Social impairment	Yes	5.10	3.75; 6.95	11.8	6.87; 20.4	6.81	5.19; 8.95
	No	Ref.		Ref.		Ref.	
General impairment	Yes	6.64	4.73; 9.31	15.8	8.78; 28.4	9.35	6.88; 12.70
	No	Ref.		Ref.		Ref.	
Percentage of years symptomatic 1978–2008	10 % increase	1.35	1.26; 1.45	1.44	1.31; 1.59	1.38	1.30; 1.46
Age at onset	10-year increase	0.67	0.46; 0.99	0.61	0.39; 0.94	0.64	0.48; 0.86

^a Adjusted for gender^b Continuous variable and its possible range

a direct comparison of the predictive value of the various clinical characteristics is not possible because they rely on different response scales and arbitrary reference values.

Since the associations reported above were restricted to individuals with a diagnosis of any depressive disorder

(MDE, Dysth, MinD and RBD), we repeated the analysis for everyone reporting at least one criterial depressive symptom between 1979 and 2008. This procedure added another 66 persons; the results tended to be similar, but most associations became slightly stronger (see Table 4).

Discussion

Treatment rates and treatment prevalence across diagnoses

This analysis of the Zurich cohort, interviewed seven times between the ages of 20/21 and 49/50, covered all subjects with any kind of depression, irrespective of whether they sought and received professional treatment for depression or not. It is important to note that this was a stratified sample with an overrepresentation of symptomatic participants; thus, the unweighted treatment prevalence is certainly higher than in a mostly healthy community sample. Nevertheless, the weighted treatment prevalence specifically adjusts for the oversampling of symptomatic participants and produces estimates that are representative for the general population. Moreover, the treatment rate is unaffected by the stratified sampling procedure since it considers only participants with a given disorder; thus, here the overrepresentation of symptomatic cases has no effect on the outcome.

The mean annual treatment rate across 30 years in persons with MDE was 39.2 %. Overall, we found a weighted cumulative prevalence rate of 27.4 % of major depressive episodes (MDE) and a corresponding treatment prevalence rate of 15.7 %. In addition, we diagnosed minor depressive disorders (MinDD, comprising dysthymia, minor depression and recurrent brief depression) in 20.5 % of the sample, with a treatment prevalence rate of 4.3 %. A further 36.2 % of the population suffered from only depressive symptoms during the interview years; 3.4 % were treated. Thus, extrapolated to estimates representative of the general population, roughly half of the subjects with MDE, a fifth with MinDD and a tenth with depressive symptoms received professional treatment. The figure of 7.3 % for the average annual prevalence of subjects treated for depression illustrates the need for detailed descriptions and diagnoses of non-major depressive episodes. At least, the classification of these subthreshold conditions has been improved in DSM-5.

Although annual treatment rates for MDE and dysthymia are around 50 % or lower, the lifetime treatment rate for these disorders is rather high. In both the NCS-R [3] and the NEMESIS [4], subjects with MDE or dysthymia reported a lifetime professional treatment rate of 80 % or higher. This means that many persons who do not seek treatment immediately (that is, within 12 months) get professional help at least at a later stage. However, the delay to initial help is substantial and has a detrimental impact on patients' well-being and functioning and on the global burden of disease [18]. It is therefore crucial to close the gap between annual treatment rates and lifetime treatment rates.

Treatment rates and treatment prevalence over time

Age was associated with increasing weighted treatment prevalence on a descriptive level, being about 2 % when subjects were in their twenties, 3 % in their thirties, 5 % in their forties, and 6 % at age 50. While the literature has mentioned that older cohorts are less likely to seek treatment [1, 2, 4], it is important to note that those studies focused on different age cohorts, whereas we followed one single cohort across time. To the best of our knowledge, this is the first study to examine treatment rates longitudinally over a 30-year time period within the same cohort. Unlike those earlier studies, our data show that persons are more likely to seek treatment as they grow older. That is, even older cohorts apparently show longitudinally increasing treatment rates over time, which may point towards an effect of age and/or time period. This is an important contribution to the literature, as it might help to tailor psychiatric services and treatments in relation to age-dependent individual needs. In support of an effect of time period, the NCS and the subsequent wave (NCS-R) revealed an increase in treatment rates from overall 20.3 % in 1990–1992 to 32.9 % in 2001–2003 in the general population [19].

Longitudinal associations of treatment seeking

Of particular interest are the results of the analyses with repeated measures (GEE), without and with separation by gender, across all interviews. The first analysis was restricted to major and minor mood disorders, whereas the second included all subjects who had ever manifested at least one of the nine criterial symptoms of depression. The two analyses gave similar results, but the odds ratios tended to be higher in the second, indicating that the restriction to formal diagnoses omits important information about treatment for depression. In these analyses, we found that distress/suffering from depression was a notably important dichotomous correlate of treatment; this is consistent with our earlier study [6] which referred to a range of syndromes, including anxiety, insomnia, pain, etc. The number of diagnostic depressive symptoms was also a very important covariate (reflecting also severity). Moreover, among the categorical variables, social and work impairment and episode duration stood out, confirming the influence of illness severity mentioned in the literature [1, 20].

Gender differences in treatment seeking

A further significant finding of this study is the marked gender differences. As in other studies, the prevalence rates for major depressive episodes among women were about twice those for men (34.9 vs. 19.7 %) [21, 22], and the treatment prevalence rates of women were triple (23.8 vs. 7.4 %) [4, 5]. The gender gap is still present in treatment rates for minor

depressive disorders (women 5.4 % vs. men 3.1 %), although gender differences are far less pronounced when it comes to the prevalence of minor depressive disorders (women 22.3 % vs. men 18.6 %). Further research is needed in order to establish whether the same diagnostic symptoms and the same number of symptoms are required when diagnosing MDE in men and women. Generally, gender differences are difficult to interpret, and the underlying pathomechanism is still a matter of debate. Women are less apt to deny their emotional states, and they seek treatment for depression at an earlier stage of its development than men [4]. Among men, treatment seeking is more strongly associated with indicators of severity (distress, impairment, number of diagnostic symptoms, etc.). Another important contributing factor is certainly personality. Women score significantly higher on neuroticism [23], a trait that captures stress vulnerability and negative affectivity. Neuroticism is an important predictor of depressive disorders and has a substantive overlap with the genetic liability to depression [24, 25]. Moreover, neuroticism also increases mental health service use [26, 27]. It is therefore plausible to conceive the higher treatment rates in women as a direct effect of their higher scores in neuroticism (for a comprehensive review on neuroticism and its public health significance see Lahey [28]). In accordance with this notion, further research from our group has corroborated the predictive validity of neuroticism with respect to onset and treatment of depression (manuscript in preparation). There is therefore a clear need for further research that specifically considers the personality trait of neuroticism and its detrimental impact on mental health, functioning and service use [29].

Limitations

This study was subject to the following major limitations. First, all analyses were based on cumulative information over the 12 months prior to the interviews (i.e. 12-month prevalence rates). This restriction was necessary in order to collect reliable, comparable data. However, subjects may have suffered from major or minor mood disorders during other years, which, apart from annual presence of depressive symptoms and treatment of symptoms, were not assessed in detail. Second, all data relied on self-report, which may bias disclosure on sensitive topics because of effects of social desirability or reduced self-awareness. Third, as this was a prospectively followed cohort, it cannot disentangle effects of age from the effects of time period. As evidenced by the literature, both age and time period are positively associated with treatment. Fourth, severity of depression was solely based on the participants' subjective appraisal on a scale from 0 to 100, i.e. on self-report. A more objective rating of severity, for instance obtained through the sum score of the Hamilton Rating Scale for Depression, possibly could have produced different results.

Conclusions

In view of the limitations indicated above, this study showed that the mean annual treatment rate across 30 years in persons with MDE was 39.2 %. Treatment rates were higher in women and at a higher age. Moreover, treatment was significantly associated with illness severity, distress and psychosocial impairment. From a public mental health perspective, it is therefore crucial to increase immediate treatment rates and to treat depressed persons as early as possible. Young men appear to be particularly undertreated. Future research should aim to detect the underlying factors that may place young men at increased risk. As a possible mediating factor, we propose that studies should specifically focus on neuroticism.

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Compliance with ethical standards

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

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