



Healthcare use for major depressive disorders among middle-aged and older adults in the community

Jean-Pierre Schuster¹ · Marie-Pierre F. Strippoli² · Nicolas Hoertel^{3,4,5} · Pedro Marques-Vidal⁶ · Caroline L. Vandeleur² · Frédéric Limosin^{3,4,5} · Martin Preisig² · Armin von Gunten¹

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Abstract

Purpose There is a substantial gap between people having a mental disorder and those treated for this disorder. Studies that assessed the influence of age on healthcare use for major depressive disorder (MDD) have provided inconsistent results. We aimed to assess healthcare use in terms of treatment-seeking and psychotropic medication use in four age groups of 45- to 85-year-old community dwellers meeting criteria for MDD.

Methods Data stemmed from CoLausPsyCoLaus, a population-based prospective cohort study. Diagnostic information on mental disorders, utilization of professional healthcare and psychotropic drugs was elicited using a semi-structured interview. Associations between age groups and healthcare use were established using logistic regression models with serial adjustments for socio-demographic and depression characteristics as well as comorbid mental disorders and cardio-metabolic features.

Results Compared to participants of the youngest age group (ages 45 to 54 years), (1) those older than 75 years were less likely to use healthcare from psychiatrists or psychologists (OR: 0.4 [95% CI 0.17–0.96]), although the frequency of using any professional health care did not vary across age groups; (2) those older than 55 years used any psychotropic medication more frequently; and (3) those aged 55–64 years used antidepressants more frequently (OR: 1.61 [95% CI 1.07–2.44]), whereas those aged 65–74 years used anxiolytics more frequently (OR: 2.30 [95% CI 1.15–4.58]).

Conclusion Age is a complex biological and social factor that influences healthcare use.

Keywords Healthcare use · Depression · Antidepressant · PsyCoLaus · Population-based study · Old-age psychiatry

✉ Jean-Pierre Schuster
jean-pierre.schuster@chuv.ch

¹ Service of Old Age Psychiatry, Department of Psychiatry, Lausanne University Hospital (CHUV) and University of Lausanne, Prilly, Switzerland

² Centre for Research in Psychiatric Epidemiology and Psychopathology, Department of Psychiatry, Lausanne University Hospital and University of Lausanne, Lausanne, Switzerland

³ Assistance Publique-Hôpitaux de Paris (AP-HP), Hôpital Coirentin-Celton, Service de Psychiatrie, Issy-les-Moulineaux, France

⁴ Université Paris Descartes, PRES Sorbonne Paris Cité, Paris, France

⁵ Centre Psychiatrie Et Neurosciences, Inserm Umr 894, Paris, France

⁶ Department of Medicine, Internal Medicine, Lausanne University Hospital (CHUV) and University of Lausanne, Rue du Bugnon 46, 1011 Lausanne, Switzerland

Introduction

Major depressive disorder (MDD) is a psychiatric disorder associated with a serious decrease of functioning, quality of life, and an increased risk of suicide [1–3]. According to the ESEMeD study conducted in 6 European countries, the 12-month prevalence of this disorder in adults aged 18 years or older is 3.9% [4]. In addition, the European MentDis ICF65+ study focusing on elderly people aged 65 to 84 estimated the 12-month prevalence of MDD at 11.6%, suggesting that among the elderly more than one out of ten people had a MDD within the past year [5, 6].

There is a substantial gap between people exhibiting a mental disorder and those treated for this disorder. Based on service utilization data in community-based surveys, Kohn et al. estimated that 56.3% of depressed people remain untreated worldwide [7]. However, the proportion of people with MDD that did not use healthcare varied widely across these surveys [7]. Healthcare use is a complex variable,

referring simultaneously to a patient's behavior and to the supply of care [8, 9].

Specific data on older people suggest that MDD is also often undetected or inadequately treated in this age group [10, 11]. According to the Survey on Health, Ageing and Retirement in Europe, a population-based cohort study of older adults from 17 European countries, almost 80% of people with current depression did not receive a correct diagnosis or adequate treatment [12]. Moreover, according to the data of the MentDis ICF 65+, only half of elderly people with any depressive disorder were treated with psychotherapy or pharmacotherapy [13].

A recent review that identified 17 different datasets assessing the association between age and healthcare use among people with MDD provided conflicting results. Age was found to be associated with healthcare use in only eight of these datasets. Within the eight datasets with positive results, two reported a positive association between age in years and healthcare use whereas in the other datasets, middle-aged people revealed higher healthcare use [14]. Heterogeneity across studies, the cross-sectional design of the majority of studies and the lack of adjustment for potential confounders in analyses make it difficult to draw sound conclusions.

The goal of the present study was to assess healthcare use for MDD in terms of treatment-seeking and psychotropic medication use in four age groups of 45- to 85-year-old community dwellers meeting criteria for MDD taking into account several potential confounder variables including sociodemographic variables, characteristics of depressive episodes, comorbid mental disorders and cardio-metabolic risk factors. In addition, in case of a significant association between one age group and one of the healthcare use variables, we also tested whether there was a dose–response association between age and this healthcare use variable.

Methods

Participants

The present data stem from CoLausPsyCoLaus, a longitudinal population-based study designed to investigate cardiovascular risk factors and mental disorders in the community and to determine their associations. The methodological features of this study were previously described in detail [15, 16]. Briefly, CoLausPsyCoLaus includes a random sample of 6734 participants (age range: 35–75 years) selected from the residents of the city of Lausanne (Switzerland) according to the civil register between 2003 and 2007 and followed up after 5 (Follow-up 1) and 9 years (Follow-up 2). The present analyses (Fig. 1) included participants aged 45 to 85 years at their last psychiatric evaluation either at follow-up 1 or

follow-up 2, and who met criteria for a major depressive episode (MDE) during the time interval since the previous evaluation (mean duration: 4.9, s.d. 0.7). For participants who completed the initial baseline and the second follow-up evaluations but missed the first follow-up evaluation, the 5-year period preceding the second follow-up was considered as the interval of interest. Among the 3883 participants with at least two evaluations, 205 were excluded because they were younger than 45 years, met lifetime criteria for schizophrenia, schizoaffective disorders or bipolar disorders or had incomplete data on healthcare use, resulting in a final sample of 759 participants with a MDE during the interval of interest. Participants were subdivided into four age groups: 45–54 years, 55–64 years, 65–74 years and 75 years and older.

Assessments

Information on mental healthcare use and psychiatric symptoms was collected using the semi-structured Diagnostic Interview for Genetic Studies (DIGS) [17]. The DIGS elicits a wide spectrum of DSM-IV Axis I criteria as well as information on treatment for all assessed disorders. The French version of the DIGS [18] revealed excellent inter-rater reliability for major mood and psychotic disorders [19] as well as for substance use disorders [20], whereas the 6-week test–retest reliability was slightly lower. The DIGS was completed with anxiety disorder sections of the French version [21] of the Schedule for Affective Disorders and Schizophrenia-lifetime and anxiety disorder version (SADS-LA) [22]. At the follow-up evaluations, a shortened version of the DIGS focusing on the period since the last assessment was used. The DIGS also assesses a series of clinical features such as the current global functioning (GAF score), which provides an estimation of the subject's level of psychological, social and occupational functioning. Diagnoses were assigned according to the Diagnostic and Statistical Manual of Mental Disorders-fourth version (DSM-IV) [23], which also includes specifiers for atypical or melancholic features during MDE. According to the specifier for atypical features, mood reactivity and two of the following symptoms defined these features: weight gain or increase in appetite, hypersomnia, leaden paralysis and interpersonal rejection sensitivity. A loss of pleasure or lack of reactivity and three of the following symptoms defined the melancholic depression features: a distinct quality of mood (despair), depression worse in the morning, early-morning awakening, psychomotor agitation or retardation, weight loss, guilt. MDE were subtyped according to these specifiers. Episodes that did not meet criteria for atypical or melancholic subtypes were classified as unspecified.

In the depression section, the following treatment information was collected for the described episode: (1) seeking

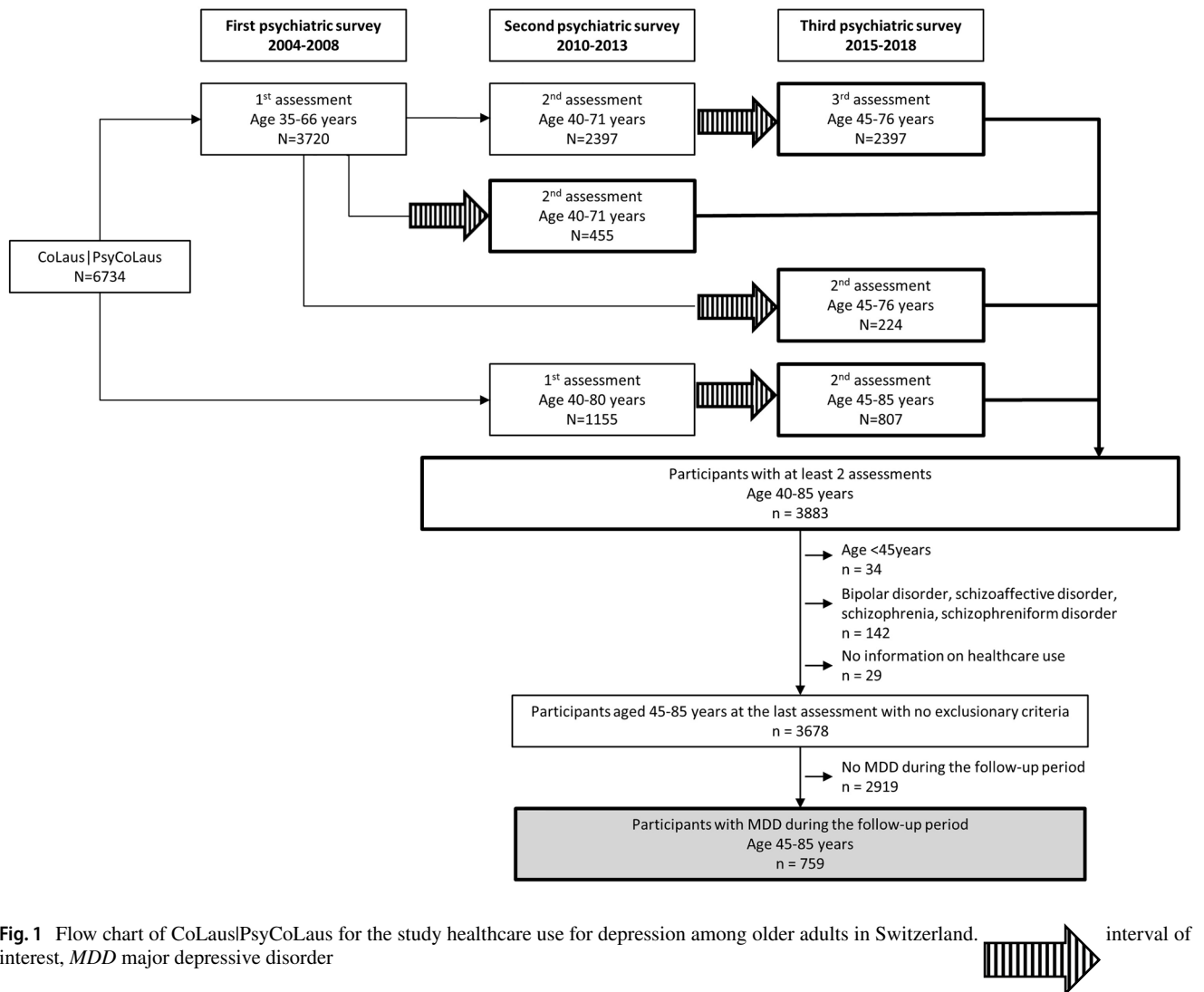
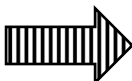


Fig. 1 Flow chart of CoLaus|PsyCoLaus for the study healthcare use for depression among older adults in Switzerland.  interval of interest, *MDD* major depressive disorder

care or having received healthcare by any healthcare professional, (2) seeking care or having received healthcare by a psychiatrist or psychologist, and (3) use and type of specific psychotropic drugs including antidepressants, antipsychotics, mood stabilizers (lithium, carbamazepine, valproate, lamotrigine), anxiolytics (benzodiazepine derivatives intended for treatment of anxiety disorders and buspirone), hypnotics (benzodiazepine derivatives and benzodiazepine related drugs) and stimulants (methylphenidate).

The DIGS also elicits information on socio-demographic characteristics including income and whether a participant is living alone or not. The level of socio-economic status (SES) was determined using the Hollingshead scale [24]. Interviewers were master-level psychologists trained over a one- to two-month period. An experienced senior psychologist reviewed all interviews and diagnostic assignments.

The cardio-metabolic characteristics including body mass index (BMI), diabetes, hypertension and dyslipidemia were assessed using anthropomorphic and biochemical measures.

Diabetes was defined as fasting glucose ≥ 7 mmol/L and/or the use of antidiabetic drug treatment. Hypertension was defined by systolic blood pressure ≥ 140 and/or diastolic blood pressure ≥ 90 mm Hg and/or the use of antihypertensive drug treatment. Dyslipidemia was defined by HDL-cholesterol < 1 mmol/l and/or LDL-cholesterol ≥ 4.1 mmol/l and/or triglycerides ≥ 2.2 mmol/l and/or the use of hypolipidemic drug treatment.

Data analysis

Univariate analyses to compare the four age groups were performed using Chi-square tests for categorical variables and ANOVA for continuous variables. For the association between age groups and healthcare use variables, serially adjusted logistic regression models were computed: Model 1 was adjusted for socio-demographic characteristics (sex, SES, living alone, income); Model 2, adjustment was also made for characteristics of major depressive episodes (first

episode, duration, number of symptoms, subtype, GAF score), and comorbid mental disorders (anxiety disorders (agoraphobia, panic disorder, generalized anxiety disorder, social phobia), alcohol abuse or dependence); and Model 3 was additionally adjusted for cardio-metabolic characteristics (BMI, diabetes, hypertension, dyslipidemia). Statistical significance was evaluated using an alpha risk at 0.05. Statistical analyses were computed using the Statistical Analysis System, version 9.4 (SAS Institute, Inc., Cary, NC, USA). In case of a significant association between one age group and one of the healthcare use variables, we also tested for a dose–response association between age and this healthcare use variable using logistic regression Model 3 with replacement of the four-level age variable by age as a continuous variable.

Ethics

The institutional Ethics Committee of the University of Lausanne, which afterwards became the Ethics Commission of the Canton of Vaud (www.cer-vd.ch) approved the baseline CoLausPsyColaus study (reference 16/03). The approval was renewed for the first (reference 33/09) and the second (reference 26/14) follow-ups. The study was performed in agreement with the Helsinki declaration and its former amendments, and in accordance with the applicable Swiss legislation. All participants signed a written informed consent.

Results

The characteristics of participants meeting criteria for a MDE during the follow-up across the four age groups are provided in Table 1. The four groups differed significantly with respect to sex, the proportion of participants living alone and that of participants with a yearly income lower than CHF 50'000.-. Distribution differences across age groups were also found for the number of depressive symptoms during episodes, the proportion of melancholic and unspecified subtypes and the prevalence of diabetes, hypertension and dyslipidemia.

Table 2 presents the associations between the four age groups and healthcare variables. In total, 63.2% of participants who had experienced a MDE reported that they had used any professional healthcare during the follow-up period. This proportion did not differ across age groups. Over a third of the cohort also indicated having used mental healthcare provided by a psychiatrist or psychologist during the MDE. Compared to participants of the youngest age group, those of the oldest age group reported consulting a mental healthcare professional less frequently according to the model adjusted for SES, characteristics of MDE and

comorbid mental disorders (Model 2), as well as according to the fully adjusted model (Model 3). However, complementary analyses shortly failed to show a significant negative association between age as a continuous variable and use of mental healthcare (OR = 0.98, 95% CI 0.96–1.00, $p = 0.05$). Regarding the use of psychotropic medication, approximately a third of the cohort reported use. Compared to participants of the youngest age group, those of the three older age groups reported the use of any psychotropic medication for MDE more frequently regardless of the number of adjustments. The logistic regression model including age as continuous variable provided evidence for a strong association between increasing age and increased reporting of psychotropic medication use (OR = 1.03, 95% CI 1.01–1.05, $p = 0.005$). Around a quarter of the cohort reported the use of antidepressants, one out of eight reported the use of anxiolytics and one out of 30 reported the use of hypnotics during a depressive episode. A proportion of 21.5% of participants reported using antidepressants alone, 3.6% antidepressants in combination with anxiolytics and 7.9% anxiolytics without antidepressants. Use of antipsychotics ($n = 10$), mood stabilizers ($n = 3$) and stimulants ($n = 1$) was rarely reported and therefore these data could not be used in logistic regression analyses. According to these analyses, participants aged 55–64 years and those aged 65–74 years reported the use of antidepressants and anxiolytics more frequently, respectively, than those of the youngest age group, whereas for hypnotics distribution differences did not reach the level of statistical significance despite ORs larger than 2.0 for the two oldest age groups. Age as a continuous variable was not associated with the use of antidepressants (OR = 1.02, 95% CI 1.00–1.04, $p = 0.104$) or anxiolytics (OR = 1.02, 95% CI 0.99–1.05, $p = 0.174$).

An additional analysis revealed that the higher use of psychotropic drugs in participants of 55 years and older was not attributable to the choice of the type of caregiver. Indeed, the proportion of psychotropic medication use of participants treated by a mental healthcare professional and other healthcare professionals did not differ (55.8% and 53.3%, respectively, chi square = 0.28; $p = 0.59$).

Discussion

Using population-based data elicited through semi-structured interviews, our major findings were that, compared to the participants of the youngest age group, (1) those older than 75 years were less likely to use healthcare provided by psychiatrists or psychologists for MDD, although the frequency of using any professional healthcare did not vary across age groups, (2) those older than 55 years used any psychotropic medication more frequently, and (3) those aged 55–64 years used antidepressants more frequently whereas

Table 1 Characteristics of the sample of participants with episodes of major depressive disorder during the 5 years since the last psychiatric evaluation (PsyCoLaus, Lausanne, Switzerland)

	Total (<i>N</i> =759)	[45–54] y (<i>N</i> =287)	[55–64] y (<i>N</i> =301)	[65–74] y (<i>N</i> =127)	[75+] y (<i>N</i> =44)	χ^2/F	<i>p</i>
Socio-demographic characteristics							
Female, %	69.7	67.2	67.1	77.2	81.8	$\chi^2=8.2$	0.042
SES ^a , mean (s.d.)	3.4 (1.3)	3.4 (1.3)	3.5 (1.2)	3.4 (1.2)	3.0 (1.2)	F=2.0	0.107
Living alone, %	35.6	27.9	32.2	55.1	52.3	$\chi^2=35.4$	<0.001
Income < CHF 50'000.-, %	26.1	18.2	26.4	41.8	32.4	$\chi^2=23.0$	<0.001
Characteristics of major depressive episodes							
First episode, %	25.7	29.3	21.6	23.6	36.4	$\chi^2=7.5$	0.058
Duration (weeks), median (IQR)	38.6 (13.0–104.3)	38.6 (12.9–104.3)	42.9 (14.0–107.9)	34.3 (12.9–107.1)	44.3 (16.3–81.6)	$\chi^2=0.5$	0.925
Number of symptoms, mean (s.d.)	6.7 (1.2)	6.9 (1.2)	6.7 (1.2)	6.4 (1.2)	6.3 (1.2)	F=5.7	<0.001
Subtypes, %							
Atypical	20.0	21.6	22.3	13.4	13.6	$\chi^2=6.0$	0.112
Melancholic	24.6	30.0	23.6	17.3	18.2	$\chi^2=9.2$	0.027
Unspecified	55.3	48.4	54.2	69.3	68.2	$\chi^2=18.7$	<0.001
Suicide attempts, %	1.7	1.7	2.3	0.8	0.0	$\chi^2=2.1$	0.555
GAF score, mean (s.d.)	65.3 (10.3)	64.6 (10.2)	64.9 (10.6)	67.3 (9.6)	65.8 (10.2)	F=2.2	0.086
Comorbid disorders							
Any anxiety disorder ^b , %	11.3	10.8	12.0	9.4	15.9	$\chi^2=1.6$	0.668
Alcohol abuse or dependence, %	4.7	4.5	4.7	5.5	4.5	$\chi^2=0.2$	0.977
Cardio-metabolic features							
BMI (kg/m ²), mean (s.d.)	26.4 (5.2)	25.9 (5.2)	26.7 (5.1)	27.1 (5.5)	25.9 (4.1)	F=2.0	0.116
Diabetes ^c , %	7.3	3.3	7.2	13.4	16.7	$\chi^2=18.5$	<0.001
Hypertension ^d , %	36.9	22.6	38.4	51.6	75.0	$\chi^2=63.1$	<0.001
Dyslipidemia ^e , %	37.9	31.2	40.0	44.4	47.7	$\chi^2=9.9$	0.019

Bold values indicates $p < 0.05$

SES socio-economic status, s.d. standard deviation, IQR interquartile range, GAF global assessment of functioning, BMI body mass index, y years

^aA value of 3 represents an SES of III (middle class) on the Hollingshead scale

^bGeneralized anxiety disorder, social phobia, panic disorder, or agoraphobia

^cDiabetes was diagnosed in the case of fasting blood glucose ≥ 7 mmol/l, or if the subject was treated for diabetes

^dHyper-tension was diagnosed in the case of systolic blood pressure ≥ 140 mm Hg and/or diastolic blood pressure ≥ 90 mm Hg, or if the subject was treated for hypertension

^eDyslipidemia was diagnosed in the case of HDL-cholesterol < 1 mmol/l and/or LDL-cholesterol ≥ 4.1 mmol/l and/or triglycerides ≥ 2.2 mmol/l, or if the subject was treated for dyslipidemia

those aged 65–74 years used anxiolytics more frequently. These results were adjusted for socio-demographic variables, characteristics of depressive episodes, comorbid mental disorders and cardio-metabolic risk factors.

Regardless of the age, approximately two-thirds of our participants affected with MDD used any healthcare for this disorder, which is high compared to those of other studies [7, 12, 25] and may be due to the fact that our sample was selected in an urban area [26]. Although several studies

documented lower healthcare-seeking in the elderly as compared to middle-aged people [14, 27, 28], our results, which do not support differential care use from any health professional across age groups, are in line with those of the cross-sectional National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) conducted in 2002 in the US. Indeed, this study relied on an extensive structured diagnostic interview and did not reveal differences in care-seeking for MDD within the 12 months prior to the survey between

Table 2 Associations between age and mental healthcare use among participants with episodes of major depressive disorder during the 5 years since the last psychiatric evaluation (PsyCoLaus, Lausanne, Switzerland)

	%	Crude OR (95CI)	Model 1 OR (95CI)	Model 2 OR (95CI)	Model 3 OR (95CI)
Consulting any healthcare professional	63.2				
[75+] years	65.9	1.15 (0.59;2.24)	1.13 (0.57;2.22)	1.68 (0.81;3.52)	1.54 (0.72;3.32)
[65–74] years	61.4	0.95 (0.62;1.46)	0.91 (0.58;1.42)	1.26 (0.78;2.06)	1.24 (0.75;2.05)
[55–64] years	64.1	1.06 (0.76;1.49)	1.07 (0.76;1.50)	1.17 (0.81;1.69)	1.17 (0.80;1.69)
[45–54] years	62.7	ref	ref	ref	ref
Consulting mental healthcare professional	37.6				
[75+] years	20.5	0.37 (0.17;0.80)	0.37 (0.17;0.80)	0.42 (0.18;0.97)	0.40 (0.17;0.96)
[65–74] years	31.5	0.66 (0.42;1.03)	0.62 (0.39;0.98)	0.78 (0.48;1.28)	0.76 (0.46;1.27)
[55–64] years	39.2	0.92 (0.66;1.28)	0.91 (0.65;1.26)	0.94 (0.66;1.35)	0.94 (0.65;1.34)
[45–54] years	41.1	ref	ref	ref	ref
Psychotropic medication	35.6				
[75+] years	43.2	1.72 (0.90;3.28)	1.60 (0.83;3.09)	2.42 (1.18;4.95)	2.13 (1.01;4.53)
[65–74] years	38.6	1.42 (0.92;2.20)	1.38 (0.88;2.17)	2.02 (1.23;3.30)	1.89 (1.14;3.14)
[55–64] years	37.9	1.38 (0.98;1.94)	1.38 (0.98;1.95)	1.54 (1.06;2.23)	1.50 (1.03;2.19)
[45–54] years	30.7	ref	ref	ref	ref
Antidepressants	25.0				
[75+] years	27.3	1.36 (0.66;2.80)	1.27 (0.61;2.64)	1.84 (0.83;4.09)	1.64 (0.71;3.79)
[65–74] years	22.8	1.07 (0.65;1.78)	1.06 (0.63;1.78)	1.50 (0.86;2.63)	1.39 (0.78;2.48)
[55–64] years	28.9	1.48 (1.01;2.15)	1.49 (1.02;2.18)	1.65 (1.10;2.48)	1.61 (1.07;2.44)
[45–54] years	21.6	ref	ref	ref	ref
Anxiolytics	11.5				
[75+] years	11.4	1.19 (0.43;3.25)	1.30 (0.47;3.64)	1.82 (0.63;5.21)	1.57 (0.52;4.73)
[65–74] years	15.8	1.73 (0.93;3.20)	1.75 (0.92;3.31)	2.40 (1.22;4.70)	2.30 (1.15;4.58)
[55–64] years	11.3	1.18 (0.69;2.00)	1.16 (0.68;1.98)	1.31 (0.76;2.27)	1.57 (0.52;4.73)
[45–54] years	9.8	ref	ref	ref	ref
Hypnotics	3.3				
[75+] years	6.8	2.93 (0.73;11.77)	2.40 (0.57;10.02)	3.03 (0.69;13.30)	2.43 (0.49;11.97)
[65–74] years	6.3	2.69 (0.95;7.58)	2.11 (0.72;6.24)	2.70 (0.88;8.33)	2.50 (0.78;8.03)
[55–64] years	2.3	0.95 (0.33;2.75)	0.91 (0.31;2.66)	0.99 (0.33;2.91)	0.95 (0.32;2.87)
[45–54] years	2.4	ref	ref	ref	ref

In bold: $p < 0.05$

OR odds ratio, 95CI 95% confidence interval, ref reference group

Model 1 adjusted for sex, socio-economic status, living alone and income

Model 2 = model 1 additionally adjusted for characteristics of major depressive episode, and comorbid mental disorders

Model 3 = model 2 additionally adjusted for cardio-metabolic features

participants who were younger and those who were older than 65 years of age [29]. Several other studies provided similar results [14]. However, in our study, the proportion of those who were treated by a psychiatrist or a psychologist decreased from approximately 40% of participants aged 45 to 54 years to 20% among those aged 75 years and older, suggesting that this older age group is rather treated by general practitioners, which is consistent with previous research [30, 31]. Indeed, according to the Canadian Community Health Survey conducted between 2000 and 2001, individuals aged over 65 with depression were less likely than middle-aged

adults to report healthcare use provided from a professional other than a family physician [27]. Elderly people seem to be more likely to use healthcare from family physicians than from specialized mental healthcare professionals. Given that our results were adjusted for cardio-metabolic features, which are highly prevalent in the elderly, the higher proneness of this age group to use care from family physicians rather than from mental health specialists can hardly be explained by facilitated treatment by the doctor in charge of the treatment of comorbid physical conditions. Impediments for accessing specialty care for depression in later life

may involve practical barriers, personal beliefs and stigma [32–34]. Unfortunately, our study did not collect information on the participants' rationale for the choice of their health care providers. Given that in the Swiss health care system, people are generally free to choose a general practitioner or a specialist, future studies should address the question of why participants of the oldest age group chose general practitioners rather than mental healthcare specialists for the treatment of their depressive episode by adding questions on the rationale for their choice of healthcare providers [35].

With approximately a third and a quarter of the participants reporting any psychotropic and antidepressant medication use during MDE, respectively, psychotropic drug use was comparable to findings of other population-based studies. In the National Comorbidity Replication study, 57.3% of respondents with MDD received treatment in the year prior to the interview [36]. In the Canadian Community Health Survey, 40.4% of participants who had experienced MDD in the past year reported using anti-depressants [37]. Findings from the NESARC indicated that for a lifetime diagnosis of MDD, 45.8% used prescribed medication or drugs by a doctor [38]. Our observed proportion of 25% of people treated with antidepressants lies within the documented range of 20 to 45% for elderly people with depression [31]. Nearly another 8% of the participants indicated the use of anxiolytics without antidepressants, which contrasts with current recommendations for the treatment of MDD according to contemporary guidelines [39].

Also, our findings of an increased proportion of people treated with psychotropic drugs in all age groups older than 55 years are consistent with studies that have documented more common use of antidepressants in the elderly [40–42]. In contrast to the observation of elevated overall psychotropic medication use in all age groups above 55 years, we only observed a significant increase of antidepressant use in participants aged 55 to 64 years and of anxiolytics use in those aged 65 to 74 years. Moreover, in contrast to overall psychotropic medication use that increased with increasing age, we did not find a significant dose–response association between age and the use of antidepressants or anxiolytics. Given that our study does not include indicators of the quality of care, we are not able to determine the adequateness of treatment in the elderly in our sample. Future research should also address questions on the participants' rationale to seek or not to seek help from specific healthcare professionals for depression and on their attitudes towards psychotropic drugs. This would improve our understanding of the reasons of differential use of healthcare providers and medication across age groups. Ideally, the information collected from participants would be completed by that from their healthcare providers.

Our results need to be viewed in the light of several limitations: (1) Information on healthcare use was self-reported

and did not rely on insurance or administrative data. Previous studies suggested that these self-reports can be subject to recall and social desirability bias which may lead to an overestimation of healthcare service utilization for mental disorders [43]. (2) The sample size of participants of 75 years and older was rather small ($n = 44$), which diminished our ability to detect associations (e.g. for antidepressants or hypnotics) for this age group. (3) The use of a sample recruited in an urban area is likely to affect the generalizability of the findings particularly with respect to the established proportion of treated people. (4) Specific features of the Swiss healthcare system were likely to have influenced the healthcare use of our sample which also affects the generalizability of our findings to samples in other countries.

In conclusion, enabling everyone to receive mental healthcare when needed should be a public health priority. Healthcare use modalities are complex, but according to our study increasing age is not a barrier for receiving professional treatment for MDE. However, age is a complex biological and social factor that may influence the choice of a caregiver and the likelihood of prescription of psychotropic drugs independently of the characteristics of depression. The collection of information on the success of healthcare will be critical in future studies to determine whether differential treatment in terms of consulting mental healthcare professional services and the use of psychotropic drugs eventually affects the quality of care for MDE across age groups.

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Author contributions JPS: design, analysis, literature search, manuscript drafting. MPFS: design, analysis, figures, statistical analysis and data visualization, manuscript drafting and review. NH: design, literature search, analysis, manuscript drafting and review. PMV, CLV, FL: analysis, manuscript drafting and review. MP: design, analysis, funding acquisition, manuscript drafting and review. AvG: design, analysis, manuscript drafting and review. All authors approved the final manuscript.

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Data availability Data are available on request.

Code availability Software applications and custom codes are available on request.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval The institutional Ethics Committee of the University of Lausanne, which afterwards became the Ethics Commission of Canton Vaud (www.cer-vd.ch) approved the baseline CoLausPsyColaus study (reference 16/03). The approval was renewed for the first (reference 33/09) and the second (reference 26/14) follow-ups. The study was performed in agreement with the Helsinki declaration and its former amendments, and in accordance with the applicable Swiss legislation.

Consent to participate All participants signed a written informed consent, prior to their inclusion in the study.

Consent for publication Patients signed informed consent regarding publishing their data, provided that individuals could not be identified as a subject.

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