

# Psychotropic Drug Consumption Among Older People Enrolled in a French Private Health Insurance Plan

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## Abstract

**Background** In France, little information exists on psychotropic drug consumption in the elderly.

**Objective** This study aimed to describe the patterns of psychotropic drug consumption, including the extent of inappropriate prescribing, in elderly subjects enrolled in a large health insurance plan in France (MGEN).

**Methods** In 2011, 5840 MGEN affiliates aged at least 65 years were randomly selected. Reimbursement claims were organized into a 1-year cross-sectional data set. The EphMRA (European Pharmaceutical Market Research Association) classification was used to identify prescriptions of psychotropic drugs, and the Laroche criteria to identify potentially inappropriate medications (PIMs). Treatment duration was estimated using WHO defined daily doses (DDDs). A multivariate analysis was performed to identify factors associated with the prescription of PIMs.

**Results** In 2011, 2213 subjects (37.9 %) made at least one reimbursement claim for a psychotropic drug, with the claims rate increasing with age. The mean annual volume of prescriptions per user was 193 DDDs. General practitioners were found to generate most of these prescriptions (81.8 %). Of these 2213 users, only 137 (6.2 %) had consulted a mental health specialist, and this rate decreased with age. Moreover, 1428 (64.5 %) subjects were prescribed at least one PIM, rising to 1711 (77.3 %) when including concomitant use of psychotropic drugs. Finally,

the number of psychotropic drugs prescribed was associated with a higher odds ratio (OR) of PIM prescription.

**Conclusions** Efforts should be made to reduce psychotropic drug prescriptions in elderly patients. This may contribute to reduce the amount of PIM prescriptions and the occurrence of iatrogenic side effects.

## Key Points

Psychotropic drugs are used by more than one in three subjects aged 65 years and over in a 1-year period.

Consumption is higher for women than for men, and rises with increasing age in both genders.

A majority of psychotropic drug consumers have received at least one PIM prescription.

## 1 Introduction

Psychotropic drug consumption in France is the highest in Europe, whether considered in volume, in delivered defined daily doses (DDDs), in expense per capita, or in prevalence [1–4]. For instance, the 12-month prevalence rate of psychotropic drug consumption in the French general population is around 20 % [2–4], compared to only 6 % in Germany [2], and such consumption increases with age [3, 4]. Psychotropic drug consumption is thus very high in French older adults [3, 4], and this turns out to be an issue as the elderly are especially

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vulnerable to adverse drug events because of a higher risk of comorbid conditions, multiple drug prescriptions, and impaired physical and cognitive functions [5]. These drugs, particularly those listed as inappropriate medications for elderly adults [6], have many potential iatrogenic effects, which may lead to poorer health, for example falls [7–10], confusion or excessive sedation, and to higher use of healthcare resources, notably emergency room visits and hospitalization [11]. In the current context of the aging of the population and of cost-containment policies, it is therefore important to study the use of psychotropic drugs in elderly people in order to reduce adverse health outcomes and their associated costs, particularly since a significant proportion of them may be preventable.

While psychotropic drug consumption in the elderly has been well investigated in the USA [12, 13], little research has been done in this area in Europe, notably in France, despite high psychotropic drug consumption and potentially high inappropriate use in the French elderly population [14, 15]. To our knowledge, the only studies that have been published concern the overall French population without a specific focus on the elderly [2–4], and, moreover, several of these are restricted to a limited number of psychotropic drug classes [16].

Based on the reimbursement claims of a French private health insurance plan (MGEN), the study presented here aimed to establish epidemiological data for the use of psychotropic drugs among older people in France and its characteristics, notably according to age, gender, and drug therapeutic class. Particular attention was paid to more qualitative aspects such as the prescriber's medical specialty, the treatment duration, and the rate of inappropriate prescribing in this population using a list of potentially inappropriate medications (PIMs) adapted to the French medical practice: the Laroche criteria [17].

## 2 Methods

### 2.1 Sample

The MGEN is a private organization providing statutory health insurance in France to education, culture, research, and sport professionals, both when in work and after retirement. It also offers voluntary complementary health insurance coverage. In 2011, we randomly selected a sample of 34,630 beneficiaries, who were representative of the total population of more than three million affiliates of the MGEN. The sampling strata used were age, gender, and type of coverage. Among these, we selected for this study the 5840 affiliates aged 65 years or more on 31 December 2011 who had their statutory health insurance managed by

the MGEN, for whom complete information on reimbursement for prescribed drugs was available.

### 2.2 Data Collected

For each participant, data were derived from the MGEN database. Sociodemographic data retrieved included gender, date of birth, and region of residence. Regions were regrouped by European constituency boundaries [18]. Reimbursement data included all reimbursement claims for medical consultations and examinations, and medication prescriptions occurring between 1 January and 31 December 2011. Data collected for each reimbursement claim for a consultation or an examination included the date of medical care delivery and the practitioner's medical specialty. Data collected for each reimbursement claim for medication, corresponding to each individual drug prescribed, included the commercial name of the drug, the presentation identification code (CIP), the relevant ATC (anatomical therapeutic chemical), and EphMRA (European Pharmaceutical Market Research Association) therapeutic classes, the medical speciality of the prescribing practitioner, the date the prescription was filled, and the number of boxes dispensed. The information collected only related to care administered or medication prescribed outside hospitalization (i.e., in outpatient departments, clinics, health centres, dispensaries, or private offices/surgeries).

### 2.3 Psychotropic Drugs

For this study, psychotropic drugs were defined using five main therapeutic classes based on the EphMRA classification with some marginal modifications. These were antipsychotics, hypnotics, anxiolytics, antidepressants, and mood stabilizers. Antipsychotics were defined as all drugs from the N5A class with the exception of Xenazine<sup>®</sup> (tetraabenazine). Vesadol<sup>®</sup> (buzepine), and Prazininil<sup>®</sup> (caripramine) were also included in this class. Hypnotics were defined as the N5B class with the exception of Calci-bronat<sup>®</sup> (calcium bromo-galactogluconate), Hypnomidate<sup>®</sup> (etomidate), Etomidate Lipuro<sup>®</sup>, Narcozep<sup>®</sup> (flunitrazepam), Galirene<sup>®</sup> (calcium bromide), and Pentothal<sup>®</sup> (thiopental)—subdivided into nonherbal hypnotics (N5B1, N5B2, and N5B3), and herbal hypnotics (N5B5). Anxiolytics included all N5C class drugs, together with Librax<sup>®</sup> (chlordiazepoxide). Antidepressants consisted of the N6A2, N6A4, N6A5, and N6A9 class drugs. Mood stabilizers corresponded to the N6A3 class drugs.

### 2.4 Treatment Duration

Treatment durations were calculated using the WHO's DDDs [19]. The DDD is the daily dose recommended for

each drug in its principal indication. The drug composition for each presentation was recovered using the presentation identification code [20]. For each prescription, the amount of DDDs dispensed was obtained by multiplying the number of boxes by the number of units per box and by the unitary dose, and dividing it by the corresponding DDD for the drug in question. We made the assumption that each given DDD was equivalent to one day of treatment.

$$\text{No. of DDDs dispensed} = \frac{\text{No. of boxes} \times \text{No. of units} \times \text{Unitary dose}}{\text{DDD}}$$

## 2.5 Potentially Inappropriate Medications (PIMs)

To evaluate if a given prescription was potentially inappropriate, we used the Laroche criteria published in 2007, which is a PIM list adapted to French prescribing habits by expert consensus [17]. Only criteria independent of posology and diagnosis were retained for our study. For criteria 33, we considered that use was concomitant when at least two treatment time periods overlapped, assuming that a period of treatment began at the delivery date and lasted the number of days corresponding to the amount of DDDs dispensed.

## 2.6 Data Analysis

The statistical analysis was performed using Stata<sup>TM</sup>/SE 13. The Chi square test was used to evaluate differences in distributions of categorical variables, Student's *t* test to compare means of continuous variables, and Cuzick's test to detect a trend across age groups. We also used logistic regressions. A *p* value less than 0.05 was considered as statistically significant, and all quoted confidence intervals (CIs) were calculated at the 95 % confidence level.

## 3 Results

### 3.1 Sample Description

The sociodemographic characteristics of the sample are presented in Table 1. A majority of subjects were female (65.6 %). The men included in the sample were significantly younger than the women (*p* < 0.001). The geographic distribution also differed between genders, with notably a larger proportion of women living in the Paris area (*p* = 0.016).

### 3.2 Twelve-Month Prevalence Rate of Psychotropic Drug Consumption

Of the 5840 subjects included, 2213 had filed at least one reimbursement claim for a psychotropic drug during the

year 2011 (Table 2), corresponding to an annual prevalence rate of 37.9 % (CI 36.6–39.1) with 428 (7.3 %) having only one claim. It is worth noting that, even if herbal medicines were excluded, this did not change the prevalence of any psychotropic drug use (37.6 %; CI 36.3–38.8).

The most frequently used psychotropic drug class was anxiolytics (23.5 %; CI 22.4–24.6). The prevalence of hypnotics use was 15.9 % (for both herbal and non-herbal hypnotics, CI 15.0–16.8; 15.1 % for non-herbal only, CI 14.2–16.0), followed by antidepressants (15.4 %; CI 14.5–16.3). The least used were antipsychotics (2.5 %; CI 2.1–2.9) and mood stabilizers (0.8 %; CI 0.6–1.1). The use of psychotropic drugs was found to increase with age, irrespective of drug class. Moreover, the rate of psychotropic drug consumption turned out to be significantly higher in women for all therapeutic classes except antipsychotics, yielding an overall prevalence rate for men of 28.6 % (CI 26.7–30.6) and of 42.7 % for women (CI 41.2–44.3).

### 3.3 Prescribers' Speciality

Most psychotropic drugs (81.8 %; CI 81.4–82.3) were prescribed by general practitioners (GPs), psychiatrists being responsible for only 7.7 % of drug prescribing (CI 7.4–8.1). This pattern of prescription was observed for all therapeutic classes. The psychotropic drugs least often prescribed by GPs were mood stabilizers (57.0 %; CI 52.3–61.7), which were more frequently prescribed by psychiatrists (21.6 %) or practitioners practising in medical institutions (14.9 %). On the other hand, hypnotics were most often prescribed by GPs (87.0 %; CI 86.0–87.9).

### 3.4 Medical Consultations

Almost all psychotropic drug users (98.6 %) had visited at least one physician during the year 2011, irrespective of medical specialty and of drug class. When the type of professional consulted was examined, we found that only 6.2 % of psychotropic drug users had consulted a psychiatrist at least once in the year 2011. However, this rate varied a lot with age, decreasing from 12.7 % in the youngest age group (65–69 years) to about 4.0 % among those aged 80 years old and over.

### 3.5 Treatment Duration

Considering only psychotropic drug users, the mean annual DDD ratio was 83 (median 38) for antipsychotics, 134 (median 84) for hypnotics, 82 (median 47) for anxiolytics, 198 (median 146) for antidepressants, and 124 (median

**Table 1** Sociodemographic characteristics of the sample

Characteristics	Overall sample N = 5840		Men N = 2007 (34.4 %)		Women N = 3833 (65.6 %)	
	n	%	n	%	n	%
Age, years			<i>p</i> < 0.001			
65–69	2006	34.3	714	35.6	1292	33.7
70–74	1503	25.7	548	27.3	955	24.9
75–79	996	17.1	364	18.1	632	16.5
80–84	624	10.7	201	10.0	423	11.0
≥85	711	12.2	180	9.0	531	13.9
Region			<i>p</i> = 0.016			
North-West	609	10.4	202	10.1	407	10.6
West	701	12.0	255	12.7	446	11.6
East	787	13.5	285	14.2	502	13.1
South-West	1133	19.4	415	20.7	718	18.7
South-East	1136	19.4	385	19.2	751	19.6
Centre	450	7.7	157	7.8	293	7.7
Ile de France <sup>a</sup>	840	14.4	242	12.0	598	15.6
DOM-TOM <sup>b</sup>	184	3.2	66	3.3	118	3.1

The Chi square test was used to assess differences in ratios between men and women

<sup>a</sup> Paris and its suburbs

<sup>b</sup> French overseas territorial possessions

102) for mood stabilizers. Overall, the average length of treatment prescribed was 193 days per user (median 111). Significant differences were found between genders, the length of treatment for men (170 DDDs) being shorter than for women (201 DDDs,  $p < 0.001$ ). The number of DDDs delivered did not significantly increase with age, the oldest subjects (over 84 years) receiving about 181 DDDs of psychotropic drugs during the year (median 121) compared with 201 DDDs (median 102) for the youngest ones (65–69 years).

### 3.6 Twelve-Month Prevalence Rate of PIM Prescriptions

More than half of psychotropic drug users (64.5 %) had received at least one PIM prescription (Table 3). If concomitant use of two or more psychotropic drugs of the same therapeutic class is considered as inappropriate too, which concerned 38.5 % of users, this proportion rises to 77.3 %. The most frequently encountered forms of inappropriate use related to criterion 10 corresponding to long acting benzodiazepine use (53.9 %).

Multiple logistic regression analysis (Table 4) identified a higher odds ratio (OR) for PIM prescription in patients having had more than three psychotropic medications prescribed (OR 4.35; CI 3.40–5.57). In addition, a trend towards a lower odds ratio for PIM prescription was observed with increasing age, although this was not statistically significant in all age groups. Finally, no

differences by gender, region, or type of health professional consulted were observed.

## 4 Discussion

Our results show that in 2011, more than one out of three health insurance affiliates aged 65 years and over received a prescription of psychotropic drugs, principally anxiolytics, hypnotics, or antidepressants, although one in five users received only one prescription in the year. These psychotropic drug users had taken medication on average for 6 months in the year, and more than half of them had received at least one prescription of psychotropic drugs considered not appropriate for the elderly. GPs were found to have delivered most of these prescriptions (82 %). In contrast, only 7.7 % of drug prescribing was attributable to psychiatrists; and with increasing age, consultation with mental health specialists decreased while psychotropic drug consumption increased. Finally, the number of psychotropic prescriptions was associated with a higher odds ratio of PIM prescription.

Previous studies have already shown that France has a higher level of psychotropic drug consumption in adults than other European countries [1–3]. In this study, we estimated the annual rate of psychotropic drug use to be 38 % in subjects aged 65 years or more. In the non-institutionalized general population, an overall 12-month prevalence rate of 19 % for six European countries was

**Table 2** Prevalence rate of psychotropic drug consumption according to sociodemographic and healthcare consumption characteristics

Characteristics	N	Any psychotropic drug		Antipsychotics		Hypnotics		Anxiolytics		Antidepressants		Mood stabilizers	
		n	%	n	%	n	%	n	%	n	%	n	%
Gender		$p < 0.001$		$p = 0.057$		$p < 0.001$		$p < 0.001$		$p < 0.001$		$p = 0.039$	
Men	2007	575	28.6	40	2.0	235	11.7	338	16.8	208	10.4	10	0.5
Women	3833	1638	42.7	108	2.8	693	18.1	1,035	27.0	691	18.0	39	1.0
Age, years		$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$		$p = 0.007$	
65–69	2006	660	32.9	39	1.9	284	14.2	408	20.3	269	13.4	25	1.2
70–74	1503	546	36.3	35	2.3	242	16.1	356	23.7	200	13.3	12	0.8
75–79	996	365	36.6	21	2.1	146	14.7	242	24.3	132	13.3	8	0.8
80–84	624	296	47.4	18	2.9	110	17.6	177	28.4	132	21.2	1	0.2
≥85	711	346	48.7	35	4.9	146	20.5	190	26.7	166	23.3	3	0.4
Region		$p = 0.004$		$p = 0.064$		$p = 0.001$		$p = 0.014$		$p = 0.122$		$p = 0.274$	
North-West	609	247	40.6	16	2.6	121	19.9	150	24.6	85	14.0	4	0.7
West	701	287	40.9	29	4.1	122	17.4	188	26.8	109	15.5	9	1.3
East	787	305	38.7	18	2.3	141	17.9	198	25.2	104	13.2	5	0.6
South-West	1133	421	37.2	20	1.8	171	15.1	262	23.1	175	15.4	6	0.5
South-East	1136	421	37.1	32	2.8	180	15.8	262	23.1	180	15.8	9	0.8
Centre	450	182	40.4	8	1.8	72	16.0	105	23.3	79	17.6	4	0.9
Ile de France <sup>a</sup>	840	304	36.2	23	2.7	98	11.7	183	21.8	147	17.5	12	1.4
DOM-TOM <sup>b</sup>	184	46	25.0	2	1.1	23	12.5	25	13.6	20	10.9	0	0.0
Medical consultations		$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$	
None	321	32	10.0	4	1.2	13	4.0	17	5.3	12	3.7	1	0.3
Psychiatrist <sup>c</sup>	154	137	89.0	28	18.2	59	38.3	104	67.5	114	74.0	17	11.0
Other <sup>d</sup>	5365	2044	38.1	116	2.2	856	16.0	1252	23.3	773	14.4	31	0.6
Overall sample	5840	2213	37.9	148	2.5	928	15.9	1373	23.5	899	15.4	49	0.8

For each drug class, differences in prevalence rates between modalities were assessed using the Chi square test for all variables with the exception of age, for which Cuzick's test for trend was used

<sup>a</sup> Paris and its suburbs

<sup>b</sup> French overseas territorial possessions

<sup>c</sup> Subjects who had seen at least one psychiatrist in 2011 for a consultation

<sup>d</sup> Subjects who had seen at least one physician other than a psychiatrist in 2011 for a consultation

found in the ESEMeD survey for this age group [2, 3], and a comparable rate was found in 2003 for the USA [12].

Our study reported patterns of consumption very similar to other studies. For example, women in general consume more psychotropic medication than men [2, 3, 12], and in Europe, anxiolytics/hypnotics represent the most frequently used psychotropic drug class in elderly persons, followed by antidepressants [2–4]. In France, Lecadet et al., considering people aged 70 years and over, reported results similar to ours, with a consumption rate of about 33 % for men and 54 % for women in the year 2000 [4], which yielded a 40 % overall prevalence rate. Our results, however, differ from the ESEMeD survey, which collected data from face-to-face interviews carried out in general population. This survey found a consumption rate over the year 2000 that was half that reported in the present study and in Lecadet et al. in general population [4], which are both based on reimbursement claims, being only 23 % for the 65 years and

over age group [3]. This may suggest some under-reporting of psychotropic drug use by consumers.

Interestingly, our study shows that more than half (77 %) of psychotropic drug consumers aged 65 and over had received at least one PIM prescription, which represents more than one in four elderly people (29 %), and the scope of the problem is certainly underestimated since prescriptions that do not fit the PIM criteria are not necessarily documented, for example with respect to drug interactions with other medication, co-morbidities and patient's characteristics. On the one hand, this finding is coherent with previous studies on the prevalence of PIM use in older adults in France: for example, when considering long-acting benzodiazepines, rates vary from 5 to 18 % in community settings to 17–23 % in acute care hospitals [21–24]. In particular, Bongue et al. [22] reported a rate of 18 % in subjects aged 75 years and over using reimbursement claims data and the same set of PIM criteria

**Table 3** Prevalence rates of potentially inappropriate prescriptions of psychotropic drugs

Laroche criteria		<i>n</i>	Overall sample ( <i>N</i> = 5840)		Only psychotropic drug consumers ( <i>N</i> = 2213)	
Criterion number	Criterion wording		%	95 % CI	%	95 % CI
Criterion 5	Antipsychotic drugs <sup>a</sup>	35	0.6	0.4–0.8	1.6	1.1–2.1
Criterion 6	Anticholinergic hypnotic drugs <sup>b</sup>	79	1.4	1.1–1.6	3.6	2.8–4.3
Criterion 7	Anticholinergic antihistamines <sup>c</sup>	218	3.7	3.2–4.2	9.9	8.6–11.1
Criterion 8	Anticholinergic muscle relaxants and antispasmodic drugs <sup>d</sup>	0	0.0		0.0	
Criterion 10	Long-acting benzodiazepines (half-life $\geq 20$ h) <sup>e</sup>	1193	20.4	19.4–21.5	53.9	51.8–56.0
Subtotal		1428	24.5	23.4–25.6	64.5	62.5–66.5
Criterion 33	Concomitant use of two or more psychotropic drugs of the same therapeutic class	851	14.5	13.7–15.5	38.5	36.4–40.5
Total		1711	29.3	28.1–30.5	77.3	75.6–79.1

<sup>a</sup> Chlorpromazine, fluphenazine, propericiazine, levomepromazine, pipotiazine, cyamemazine, perphenazine

<sup>b</sup> Doxylamine, aceprometazine, alimemazine

<sup>c</sup> Promethazine, mequitazine, alimemazine, carbinoxamine, hydroxyzine, brompheniramine, dexchlorpheniramine, dexchlorpheniramine-betamethasone, cyproheptadine

<sup>d</sup> Oxybutynin, tolterodine, solifenacin

<sup>e</sup> Bromazepam, diazepam, chlordiazepoxide, prazepam, clobazam, nordazepam, loflazepate, nitrazepam, flunitrazepam, clorazepate, clorazepateacepromazine, aceprometazine, estazolam

[17]. On the other hand, compared to other countries, our findings seem to indicate that PIM use is more frequent in France. Although not restricted to psychotropic drugs, the rates observed in the general aging population of other countries are often similar or lower than those found in our study, although restricted to psychotropic drugs, for example, 24 % in the USA in 1987 [25] and 21 % in 1996 [26], 20 % in the early 2000s by Fialová et al. for eight European countries [27], ranging from 6 % in Denmark to 41 % in the Czech Republic, 17–20 % for 1997–2001 in The Netherlands [28], and 13 % in Finland in 1997 [29]. It should, however, be borne in mind that comparisons are often difficult as the PIM criteria used [30], the inclusion criteria (i.e., age and setting), and the methods of data collection may differ from one study to another.

Concerning the relationship between psychotropic drug prescription and age, some American studies have previously reported that psychotropic drug prescription in the absence of any psychiatric diagnosis is more frequent in elderly subjects than in younger ones [13, 31]. Our results also show an increasing trend in psychotropic drug use with age within older people, even though other studies have shown that the prevalence of psychiatric disorders does not increase with age [32]. On the other hand, in this population, whereas psychotropic drug consumption increases with age, consultation with mental specialists in psychotropic drug users clearly decreases as well as their likelihood of having PIM prescriptions. As regards gender, psychotropic drug consumption was clearly more frequent in women. No such difference was observed for PIMs, although it has been reported in another study population [33].

Our results have, however, to be interpreted in light of the potential limitations of the study. Firstly, our sample is representative of the MGEN population aged 65 years and over, but not necessarily representative of the French aging population. Indeed, the MGEN covers less than a tenth of the French general population, namely members working in France within the national education system or in certain ministries and research institutes. For this reason, the MGEN population is mostly composed of middle class individuals and their relatives. Secondly, the analysis was based on reimbursement claims, but this does not necessarily imply that reimbursed drugs have actually been taken. For example, in France, drugs are delivered in blister packs, which can contain more tablets than prescribed by the practitioner, and all may not have been used. Moreover, a treatment could have been discontinued for intolerance or for perceived lack of efficiency. Some previous studies have shown that compliance to treatment is poor, especially for people suffering for depressive symptoms [34, 35]. On the other hand, certain drugs that may have been prescribed or used do not appear in the MGEN database if they are either not eligible for reimbursement or given during hospitalization. In addition, claims data are generated for accounting purposes, which explains the presence of very few individual characteristics. Additional variables, such as educational level [36], would have been interesting to investigate. Finally, the Laroche criteria related to posology were not taken into consideration since no dosage information was available in the database.

**Table 4** Prevalence rates of potentially inappropriate prescriptions of psychotropic drugs according to sociodemographic and healthcare consumption characteristics among psychotropic drug users and associated odds ratios ( $N = 2213$ )

Characteristics	N	Prevalence		Logistic regression <sup>a</sup>		
		n	%	OR	95 % CI	p
Gender		$p = 0.024$				
Women	1638	1286	78.5	1.00		
Men	575	425	73.9	1.20	0.95–1.52	0.123
Age, years		$p = 0.267$				
65–69	660	500	75.8	1.00		
70–74	546	435	79.7	1.19	0.89–1.60	0.232
75–79	365	291	79.7	1.16	0.83–1.61	0.378
80–84	296	226	76.4	0.82	0.58–1.15	0.251
≥85	346	259	74.9	0.66	0.47–0.91	0.012
Region <sup>b</sup>		$p = 0.285$				
North-West	247	183	74.1	0.90	0.67–1.20	0.469
West	287	219	76.3	1.08	0.82–1.43	0.578
East	305	239	78.4	1.14	0.86–1.50	0.353
South-West	421	332	78.9	1.16	0.90–1.49	0.242
South-East	421	330	78.4	1.15	0.90–1.47	0.262
Centre	182	139	76.4	0.99	0.71–1.39	0.960
Ile de France <sup>c</sup>	304	240	79.0	1.17	0.89–1.55	0.264
DOM-TOM <sup>d</sup>	46	29	63.0	0.58	0.33–1.03	0.063
Medical consultations		$p < 0.001$				
Other <sup>e</sup>	2044	1570	76.8	1.00		
Psychiatrist <sup>f</sup>	137	122	89.1	1.55	0.88–2.72	0.132
None	32	19	59.4	0.47	0.22–1.02	0.055
Number of psychotropic drugs prescribed <sup>g</sup>		$p < 0.001$				
1	428	246	57.5	1.00		
2	189	110	58.2	1.08	0.76–1.53	0.682
≥3	1596	1355	84.9	4.35	3.40–5.57	<0.001

For each characteristic, differences in prevalence rates between modalities were assessed using the Chi square test

<sup>a</sup> The dependent variable is the dummy variable “potentially inappropriate prescriptions of psychotropic drugs” taking the value 1 if the individual had received at least one potentially inappropriate medication prescription for a psychotropic drug in 2011 and 0 otherwise. Odds ratios, confidence intervals (CIs), and  $p$  values are based on a logistic regression model including as covariates all the sociodemographic and healthcare consumption factors listed above

<sup>b</sup> Compared to the overall mean value

<sup>c</sup> Paris and its suburbs

<sup>d</sup> French overseas territorial possessions

<sup>e</sup> Subjects who had seen at least one physician other than a psychiatrist in 2011 for a consultation

<sup>f</sup> Subjects who had seen at least one psychiatrist in 2011 for a consultation

<sup>g</sup> It corresponds to the number of deliveries of a psychotropic drug

## 5 Conclusion

Many psychotropic drug prescriptions to older people may not be justified, or even be dangerous, considering the high proportion of inappropriate drugs prescribed. Considering the extent to which psychotropic drugs are prescribed to elderly subjects in France, efforts should be made notably to warn consumers and doctors about the risks associated with them and to encourage a more rational use of these

drugs. Actions to address this have been proposed in 2007 by a panel of French professionals and institutions.

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### Compliance with Ethical Standards

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**Conflicts of interest** Drs. Semoun and Sevilla-Dedieu have no conflicts of interest or financial ties to report.

**Ethical approval** This project was registered with the French data protection authority (CNIL).

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