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ORIGINAL RESEARCH ARTICLE

Prevalence and Risk Factors for Psychotropic Medication Use in Older Adults in Australia: A Nationwide Data Linkage Study

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Abstract

Background and Objectives Psychotropic medications are associated with an increased risk of adverse drug events in older adults, yet national data on their use in Australia remain limited. This study aims to estimate the prevalence of psychotropic medication use among older Australians and to examine the sociodemographic factors associated with their use.

Methods A retrospective cross-sectional study was conducted using national linked data from the 2021 Census and the Pharmaceutical Benefits Scheme (PBS). The study included all individuals aged 65+ years who responded to the 2021 Census and received at least one PBS medication between 1 August and 31 October 2021. Prevalence of psychotropic medication use was calculated across 5-year age groups, and sociodemographic factors associated with each psychotropic subclass were assessed by logistic regression model.

Results Among the 3,850,281 older adults, 31.1% received at least one psychotropic medication. Prevalence increased with age across all subclasses except antiepileptics. Antidepressants were the most commonly used psychotropics (19.9%). Those needing assistance with core activities (odds ratio, OR 2.05, 95% confidence intervals, CI 2.03–2.06) and living in non-private dwellings (OR 2.02, 95% CI 1.99–2.05) were more likely to receive psychotropics. Conversely, higher educational level, socioeconomic status and non-English speaker were associated with a lower use of all psychotropic subclasses. Aboriginal and Torres Strait Islander people were linked to increased use of benzodiazepines (OR, 1.15; 95% CI 1.10–1.20) and opioids (OR, 1.20; 95% CI 1.16–1.23). Dementia was strongly associated with antipsychotic (OR, 2.59; 95% CI 2.52–2.66) and antidepressant (OR, 1.42; 95% CI 1.40–1.44) use. Arthritis significantly increased the likelihood of opioid use (OR, 2.03; 95% CI 2.02–2.05).

Conclusions Almost one third of the study population used psychotropic medications between August and October 2021. Aboriginal and Torres Strait Islander people, individuals with dementia and those with arthritis had an increased likelihood of using certain psychotropic medications. Future research should evaluate the clinical appropriateness of psychotropics in these populations, with immediate implementation of strategies to ensure that their use is limited to evidence-based indications.

Key Points

Approximately one third of older adults in Australia use psychotropic medications, with 8.4% experiencing psychotropic polypharmacy.

Needing assistance with activities and living in non-private dwellings increased the likelihood of psychotropic use, while higher education and socioeconomic status were linked to lower use.

Dementia was strongly associated with the use of antipsychotics and antidepressants, while arthritis significantly increased the likelihood of opioid use.

1 Introduction

Mental health conditions contribute significantly to the disease burden of older adults worldwide [1]. In Australia, it is estimated that the number of older people aged 65 years and over will increase from 4.2 million in 2020 to 10.2 million by 2066 [2], and about 17.3% of people aged 60–85 years are affected by at least one mental health condition [3], with depression and anxiety being the most common [1, 3].

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Psychotropic medications are a broad term for medicines that affect cognition, emotions and behaviours and are commonly prescribed to treat mental health conditions in older adults. While psychotropics are commonly used for the management of mental health conditions, they can also be used for other conditions such as pain and insomnia. However, psychotropics are not without risks, with previous studies showing that psychotropic medications increase the risk of falls [4, 5], strokes [6], hospitalisation [7] and even mortality in older adults [4].

Prior studies in Australia have utilised Pharmaceutical Benefits Scheme (PBS) dispensing data to investigate the prevalence of psychotropic use in older adults, but were limited to specific populations, such as people with dementia and residents of aged care homes [8–10]. Population-based studies on the prevalence of psychotropic use in community-dwelling older adults in Australia are limited to specific psychotropics classes (e.g., antipsychotics and opioids) by region in the Australian Atlas of Healthcare Variation, without deeper investigation of sociodemographic or clinical associations [11]. Similarly, while there are some studies on the prevalence of psychotropic medication use in the general older adult population conducted internationally [12–14], few have looked at the socioeconomic, sociodemographic and cultural factors associated with their use. This is important to ensure judicious use of these potentially high-risk medications and identify subgroups at a higher risk. This study is the first to use nationwide data from 2021 Census and PBS dispensing records to investigate the prescribing practices of psychotropic medications across the entire population of Australians aged 65 years and over. The aims of this study are to (1) estimate the national prevalence of psychotropic medication use among older Australians and (2) determine risk factors associated with the use of different psychotropic classes in this population.

2 Methods

2.1 Study Design

We conducted a cross-sectional study using national data from the Person Level Integrated Data Asset (PLIDA) at the Australian Bureau of Statistics (ABS) [15]. This study used linked data from the 2021 Census and the PBS [15]. Participants aged 65 years and over who received medications in the PBS from 1 August to 31 October 2021 were linked with respondents of Census 2021 through the same scrambled identifier. The study flow chart is presented in Supplementary Material Fig. 1.

2.2 Data Sources

The PBS offers subsidised access to prescribed medications for Australians. When a PBS medication is dispensed at an approved pharmacy, data such as patient demographics, prescriber information and the supplying pharmacy are recorded [16]. Each PBS item code, which details the active ingredient, dosage and dosage form, was mapped to the corresponding code in the Anatomical Therapeutic Chemical (ATC) Classification system [17]. Combination products were classified according to the ATC codes of their individual active ingredients.

Census 2021 was conducted on 10 August 2021 to estimate the overall population and provide information on the social, economic and cultural characteristics of Australians [18]. The variables used in this study included registered marital status, aboriginality, country of birth, language spoken at home, selected long-term health conditions, highest educational attainment, remoteness, need for assistance with core activities, living status, living conditions and socioeconomic status. Selected self-reported health conditions in this study comprised arthritis, cancer, diabetes, dementia, heart disease, stroke, kidney disease, lung conditions, asthma and mental health conditions. Details of variables included are listed in Supplementary Material Table 1.

2.3 Medication Use

Medication use was defined as having at least one dispensing of a specific active ingredient during the 3-month period (1 August to 31 October 2021). Vaccines (ATC J07), blood substitutes and perfusion solutions (ATC B05) and other miscellaneous items coded as Z and D were excluded from our study. Psychotropic medications were categorised as antidepressants (N06A), antipsychotics (N05A), benzodiazepines (N05BA, N05CD), Z-drugs (N05CF), antiepileptics (N03), opioids (N02A) and psychostimulants (N06B). Prochlorperazine (ATC N05AB04) was excluded, as its main use is an antiemetic agent. Polypharmacy was defined as the dispensing of five or more medications during the study period, while hyperpolypharmacy was defined as the dispensing of ten or more medications [19]. Psychotropic polypharmacy was defined as the dispensing of at least two different classes of psychotropic medications during the study period [19].

2.4 Statistical Analysis

The characteristics and prevalence of medication use among individuals aged 65 years and older were reported descriptively as proportions or as medians with corresponding

Table 1. Baseline characteristics of study participants (aged 65 years and over by the end of 2021) who have linked Census 2021 and PBS data

Characteristic	Total population[a]	Age group (years)						
		65–69[a]	70–74[a]	75–79[a]	80–84[a]	85–89[a]	90–94[a]	95+[a]
	N = 3,850,281	*N* = 1,077,222	*N* = 1,003,699	*N* = 764,622	*N* = 508,549	*N* = 302,227	*N* = 147,827	*N* = 46,135
Age, years	74 (69, 80)	67 (66, 68)	72 (71, 73)	77 (76, 78)	82 (81, 83)	87 (85, 88)	91 (90, 93)	96 (95, 98)
Sex								
Male	1,781,317 (46%)	510,339 (47%)	480,173 (48%)	363,373 (48%)	232,435 (46%)	127,429 (42%)	54,418 (37%)	13,150 (29%)
Female	2,068,964 (54%)	566,883 (53%)	523,526 (52%)	401,249 (52%)	276,114 (54%)	174,798 (58%)	93,409 (63%)	32,985 (71%)
Polypharmacy	1,872,781 (49%)	371,143 (34%)	442,671 (44%)	411,147 (54%)	314,643 (62%)	202,205 (67%)	100,342 (68%)	30,630 (66%)
Hyper-polypharmacy	515,985 (13%)	80,641 (7.5%)	109,997 (11%)	116,152 (15%)	97,996 (19%)	67,228 (22%)	33,775 (23%)	10,196 (22%)
Remoteness [b,f]								
Major cities	2,560,569 (67%)	708,021 (66%)	656,258 (65%)	505,608 (66%)	343,379 (68%)	209,589 (69%)	104,362 (71%)	33,352 (72%)
Inner regional	883,969 (23%)	246,941 (23%)	237,476 (24%)	179,434 (23%)	114,544 (23%)	65,171 (22%)	31,132 (21%)	9271 (20%)
Outer regional	356,336 (9.3%)	105,133 (9.8%)	96,479 (9.6%)	70,408 (9.2%)	45,243 (8.9%)	24,749 (8.2%)	11,142 (7.5%)	3182 (6.9%)
Remote/very remote or unknown	49,407 (12.8%)	17,127 (15.9%)	13,486 (13.4%)	9172 (1.2%)	5383 (1.1%)	2718 (0.9%)	1191 (0.8%)	330 (0.7%)
Living status[c]								
Occupied private dwelling	3,660,644 (95%)	1,060,988 (98%)	983,919 (98%)	740,587 (97%)	477,038 (94%)	262,452 (87%)	109,491 (74%)	26,169 (57%)
Non-private dwelling	189,637 (4.9%)	16,234 (1.5%)	19,780 (2.0%)	24,035 (3.1%)	31,511 (6.2%)	39,775 (13%)	38,336 (26%)	19,966 (43%)
Living condition								
Living alone in a private dwelling	923,057 (24%)	206,670 (19%)	213,099 (21%)	185,932 (24%)	148,200 (29%)	102,919 (34%)	52,532 (36%)	13,705 (30%)
Living with other people in a private dwelling	2,663,999 (69%)	827,450 (77%)	746,660 (74%)	540,862 (71%)	323,092 (64%)	157,427 (52%)	56,198 (38%)	12,310 (27%)
Living in a non-private dwelling	189,637 (4.9%)	16,234 (1.5%)	19,780 (2.0%)	24,035 (3.1%)	31,511 (6.2%)	39,775 (13%)	38,336 (26%)	19,966 (43%)
Other	73,588 (1.9%)	26,868 (2.5%)	24,160 (2.4%)	13,793 (1.8%)	5746 (1.1%)	2106 (0.7%)	761 (0.5%)	154 (0.3%)
Registered marital status								
Married	2,249,109 (58%)	685,806 (64%)	643,171 (64%)	470,499 (62%)	275,799 (54%)	127,215 (42%)	40,404 (27%)	6215 (13%)
Never married	209,548 (5.4%)	86,941 (8.1%)	55,770 (5.6%)	32,593 (4.3%)	18,290 (3.6%)	9664 (3.2%)	4761 (3.2%)	1529 (3.3%)
Divorced	525,099 (14%)	185,510 (17%)	157,799 (16%)	100,932 (13%)	50,163 (9.9%)	21,508 (7.1%)	7518 (5.1%)	1669 (3.6%)
Separated	116,480 (3.0%)	45,723 (4.2%)	35,311 (3.5%)	20,548 (2.7%)	9700 (1.9%)	3836 (1.3%)	1149 (0.8%)	213 (0.5%)

Table 1. (continued)

Characteristic	Total population[a]	Age group (years)						
		65–69[a]	70–74[a]	75–79[a]	80–84[a]	85–89[a]	90–94[a]	95+[a]
	N = 3,850,281	*N* = 1,077,222	*N* = 1,003,699	*N* = 764,622	*N* = 508,549	*N* = 302,227	*N* = 147,827	*N* = 46,135
Widowed or unknown[d]	750,046 (19.5%)	73,242 (6.8%)	111,648 (11.1%)	140,050 (18.3%)	154,597 (30.4%)	140,004 (46.3%)	93,995 (63.6%)	36,509 (79.1%)
Aboriginality								
Non-Indigenous	3,770,787 (98%)	1,054,097 (98%)	984,276 (98%)	750,174 (98%)	497,669 (98%)	295,369 (98%)	144,263 (98%)	44,939 (97%)
Aboriginal and/or Torres Strait Islander people	40,615 (1.1%)	16,944 (1.6%)	11,658 (1.2%)	6484 (0.8%)	3375 (0.7%)	1542 (0.5%)	511 (0.3%)	101 (0.2%)
Unknown	38,879 (1.0%)	6181 (0.6%)	7765 (0.8%)	7964 (1.0%)	7505 (1.5%)	5316 (1.8%)	3053 (2.1%)	1095 (2.4%)
Country of birth								
Australia	2,388,090 (62%)	704,695 (65%)	623,284 (62%)	468,181 (61%)	297,203 (58%)	174,552 (58%)	91,335 (62%)	28,840 (63%)
Overseas	1,364,092 (35%)	355,327 (33%)	359,714 (36%)	275,409 (36%)	193,203 (38%)	115,192 (38%)	49,971 (34%)	15,276 (33%)
Unknown	98,099 (2.5%)	17,200 (1.6%)	20,701 (2.1%)	21,032 (2.8%)	18,143 (3.6%)	12,483 (4.1%)	6521 (4.4%)	2019 (4.4%)
Language spoken at home								
English	3,133,230 (81%)	885,936 (82%)	834,986 (83%)	634,298 (83%)	400,399 (79%)	229,205 (76%)	113,123 (77%)	35,283 (76%)
Other	640,048 (17%)	180,606 (17%)	155,602 (16%)	115,669 (15%)	93,555 (18%)	60,715 (20%)	26,420 (18%)	7481 (16%)
Unknown	77,003 (2.0%)	10,680 (1.0%)	13,111 (1.3%)	14,655 (1.9%)	14,595 (2.9%)	12,307 (4.1%)	8284 (5.6%)	3371 (7.3%)
Level of highest educational attainment								
Year 9 and below	741,251 (19%)	122,881 (11%)	164,053 (16%)	158,974 (21%)	132,985 (26%)	94,846 (31%)	50,532 (34%)	16,980 (37%)
Year 10 and above	1,203,236 (31%)	352,388 (33%)	327,533 (33%)	242,619 (32%)	148,559 (29%)	83,285 (28%)	38,016 (26%)	10,836 (23%)
Certificate I–IV and Diploma	855,869 (22%)	289,677 (27%)	237,756 (24%)	161,285 (21%)	95,766 (19%)	47,411 (16%)	19,306 (13%)	4668 (10%)
Bachelor and above	616,419 (16%)	228,964 (21%)	178,307 (18%)	111,408 (15%)	58,302 (11%)	26,244 (8.7%)	10,492 (7.1%)	2702 (5.9%)
Unknown	433,506 (11%)	83,312 (7.7%)	96,050 (9.6%)	90,336 (12%)	72,937 (14%)	50,441 (17%)	29,481 (20%)	10,949 (24%)
Area-level disadvantage quintiles								
Q1 (most disadvantaged)	863,542 (22%)	225,938 (21%)	218,760 (22%)	173,359 (23%)	122,653 (24%)	74,781 (25%)	36,859 (25%)	11,192 (24%)
Q2	835,313 (22%)	231,478 (21%)	217,051 (22%)	167,099 (22%)	111,762 (22%)	66,254 (22%)	31,788 (22%)	9881 (21%)
Q3	744,160 (19%)	214,781 (20%)	197,755 (20%)	146,911 (19%)	94,706 (19%)	55,365 (18%)	26,535 (18%)	8107 (18%)

Table 1. (continued)

Characteristic	Total population[a]	Age group (years)						
		65–69[a]	70–74[a]	75–79[a]	80–84[a]	85–89[a]	90–94[a]	95+[a]
	N = 3,850,281	*N* = 1,077,222	*N* = 1,003,699	*N* = 764,622	*N* = 508,549	*N* = 302,227	*N* = 147,827	*N* = 46,135
Q4	705,698 (18%)	204,350 (19%)	186,710 (19%)	138,333 (18%)	90,034 (18%)	52,699 (17%)	25,500 (17%)	8072 (17%)
Q5 (most advantaged)	682,418 (18%)	197,335 (18%)	180,142 (18%)	135,611 (18%)	86,011 (17%)	50,131 (17%)	25,167 (17%)	8021 (17%)
Unknown	19,150 (0.5%)	3340 (0.3%)	3281 (0.3%)	3309 (0.4%)	3383 (0.7%)	2997 (1.0%)	1978 (1.3%)	862 (1.9%)
Count of comorbidities	1.00 (0.00, 2.00)	1.00 (0.00, 1.00)	1.00 (0.00, 2.00)	1.00 (0.00, 2.00)	1.00 (0.00, 2.00)	1.00 (1.00, 2.00)	1.00 (1.00, 2.00)	1.00 (1.00, 2.00)
Unknown	136,942	33,182	31,763	26,413	20,449	14,138	8085	2912
Count of comorbidities (in categories)[e]								
None of the selected condition	1,263,010 (33%)	443,359 (41%)	356,815 (36%)	231,364 (30%)	129,841 (26%)	64,702 (21%)	28,446 (19%)	8483 (18%)
One condition	1,274,739 (33%)	350,573 (33%)	337,708 (34%)	258,437 (34%)	169,953 (33%)	98,032 (32%)	46,209 (31%)	13,827 (30%)
Two conditions	684,981 (18%)	157,355 (15%)	169,004 (17%)	144,290 (19%)	104,242 (20%)	66,142 (22%)	33,255 (22%)	10,693 (23%)
Three or more conditions	490,609 (13%)	92,753 (8.6%)	108,409 (11%)	104,118 (14%)	84,064 (17%)	59,213 (20%)	31,832 (22%)	10,220 (22%)
Unknown	136,942 (3.6%)	33,182 (3.1%)	31,763 (3.2%)	26,413 (3.5%)	20,449 (4.0%)	14,138 (4.7%)	8085 (5.5%)	2912 (6.3%)
Whether need assistance with core activities								
Yes	739,687 (19%)	96,427 (9.0%)	117,214 (12%)	129,648 (17%)	141,687 (28%)	130,759 (43%)	89,124 (60%)	34,828 (75%)
No	3,039,176 (79%)	968,787 (90%)	873,161 (87%)	621,418 (81%)	354,135 (70%)	161,209 (53%)	51,837 (35%)	8629 (19%)
Unknown	71,418 (1.9%)	12,008 (1.1%)	13,324 (1.3%)	13,556 (1.8%)	12,727 (2.5%)	10,259 (3.4%)	6866 (4.6%)	2678 (5.8%)
Self-reported having asthma or lung condition	562,867 (15%)	149,172 (14%)	145,737 (15%)	118,099 (16%)	78,438 (16%)	45,324 (16%)	20,488 (15%)	5609 (13%)
Unknown	136,942	33,182	31,763	26,413	20,449	14,138	8085	2912
Self-reported having diabetes	612,299 (16%)	157,891 (15%)	163,612 (17%)	131,202 (18%)	87,876 (18%)	48,346 (17%)	19,059 (14%)	4313 (10.0%)
Unknown	136,942	33,182	31,763	26,413	20,449	14,138	8085	2912
Self-reported having heart disease or stroke	772,177 (21%)	144,745 (14%)	174,018 (18%)	165,774 (22%)	133,215 (27%)	91,681 (32%)	47,948 (34%)	14,796 (34%)
Unknown	136,942	33,182	31,763	26,413	20,449	14,138	8085	2912

Table 1. (continued)

Characteristic	Total population[a]	Age group (years)						
		65–69[a]	70–74[a]	75–79[a]	80–84[a]	85–89[a]	90–94[a]	95+[a]
	N = 3,850,281	*N* = 1,077,222	*N* = 1,003,699	*N* = 764,622	*N* = 508,549	*N* = 302,227	*N* = 147,827	*N* = 46,135
Self-reported having kidney disease	137,875 (3.7%)	23,133 (2.2%)	28,134 (2.9%)	29,196 (4.0%)	25,632 (5.3%)	18,828 (6.5%)	9925 (7.1%)	3027 (7.0%)
Unknown	136,942	33,182	31,763	26,413	20,449	14,138	8085	2912
Self-reported having cancer	427,817 (12%)	94,280 (9.0%)	110,436 (11%)	96,437 (13%)	66,385 (14%)	38,152 (13%)	17,300 (12%)	4827 (11%)
Unknown	136,942	33,182	31,763	26,413	20,449	14,138	8085	2912
Self-reported having arthritis	1,223,204 (33%)	274,995 (26%)	301,827 (31%)	260,221 (35%)	188,507 (39%)	119,024 (41%)	59,616 (43%)	19,014 (44%)
Unknown	136,942	33,182	31,763	26,413	20,449	14,138	8085	2912
Self-reported having mental health condition (including depression or anxiety)	343,528 (9.3%)	109,509 (10%)	85,402 (8.8%)	59,203 (8.0%)	38,425 (7.9%)	27,339 (9.5%)	16,873 (12%)	6777 (16%)
Unknown	136,942	33,182	31,763	26,413	20,449	14,138	8085	2912
Self-reported having dementia	160,037 (4.3%)	7445 (0.7%)	14,779 (1.5%)	25,414 (3.4%)	35,926 (7.4%)	37,876 (13%)	27,531 (20%)	11,066 (26%)
Unknown	136,942	33,182	31,763	26,413	20,449	14,138	8085	2912

[a]Median (IQR); *N* (%)

[b]Remoteness is based on the Accessibility/Remoteness Index of Australia Plus (ARIA+) provided by the ABS

[c]ABS has noted that mix occupancy could occur with living status

[d]Unknown values accounted for < 0.1% in each age group

[e]The selected long-term health conditions include arthritis, asthma, cancer (including remission), diabetes (excluding gestational diabetes), dementia, heart disease (including heart attack or angina), kidney disease, lung condition (including chronic obstructive pulmonary disease (COPD) or emphysema), mental health condition (including depression or anxiety) and stroke

[f]Unknown values accounted for < 0.3% in each age group

interquartile ranges (IQRs). Prevalence of psychotropic use in the study period (August–October 2021) was reported across 5-year age strata. Additionally, annual prevalence (January–December 2021) for each psychotropic class was calculated as a sensitivity analysis. Separate multivariate logistic regression models were utilised to examine factors associated with the use of psychotropics and specific psychotropic subclasses. Missing data were managed using listwise deletion in the logistic regression model. Age, sex, registered marital status, aboriginality, country of birth, language spoken at home, various self-reported medical conditions (explored as dichotomous factors individually), education level, remoteness, needing assistance with core activities, living condition and socioeconomic level were initially included in the model based on the research team's clinical and research expertise and supporting evidence from previous literature [12]. Backward elimination was applied for variable selection, including covariates in the final model if their association with the outcome was significant ($p \leq 0.05$). Age, sex, education level and self-reported mental health conditions were considered potential confounders based on clinical reasoning and were included in all models regardless of p value. The final multivariable logistic regression model for each psychotropic class included the following factors: socioeconomic status, remoteness, living condition, needing assistance with core activities, selected self-reported health conditions, aboriginality, country of birth and language spoken at home. The

variance inflation factor (VIF) for each included variable was checked to ensure the absence of multicollinearity (VIF < 5) [20]. All statistical analyses were conducted using R version 4.3.0.

3 Results

3.1 Baseline Characteristics of Cohort

A total of 3,850,281 participants were eligible for this study. The median age was 74 years (IQR: 69–80), with half being female (54%). The majority of participants were born in Australia (62%) and spoke English at home (81%). The median number of comorbidities was 1 (IQR: 0–2), with around one third of participants having two or more selected conditions. Almost half of the cohort were exposed to polypharmacy (49%), and 13% were exposed to hyperpolypharmacy. The proportion of individuals needing assistance with core activities, having long-term medical conditions (e.g., kidney disease, cancer and dementia) and residing in non-private dwellings increased with age. Arthritis was the most frequently reported condition, with 1,223,204 individuals (33%). Further cohort characteristics can be found in Table 1.

3.2 Prevalence of Psychotropic Use

The prevalence of psychotropic medication use among older people in Australia is presented in Table 2. Overall, 31.1% of the study cohort used at least one psychotropic medication, with 8.4% having psychotropic polypharmacy. Among psychotropic subclasses, antidepressants (83%) and opioids (65%) contributed the majority to psychotropic polypharmacy (Supplementary Material Table 3). The prevalence of psychotropics, psychotropic polypharmacy and its subclasses generally increased with age. The distribution of psychotropic medication use by age group and sex is further presented in Supplementary Material Fig. 2. Antidepressants were the most prevalent subclass, used by 19.9% of the cohort. Serotonin selective reuptake inhibitors (SSRIs) were the most common subclass of antidepressants across all age groups. Combined antidepressant therapy was used by 1.6% of the cohort. Opioids were the second-most-common psychotropic medication in this demographic (11.1%), followed by benzodiazepines and Z-drugs (6.2%). Antipsychotic use was most prevalent in people over 95 years old (4.2%), with second-generation antipsychotics being the most common (3.3% of the overall cohort). Sensitivity analysis showed that the 12-month prevalence in the 2021 calendar year had a similar pattern as the 3-month prevalence with higher prevalence of benzodiazepine (12%) and opioid (22%) use (Supplementary Material Table S2).

3.3 Factors Associated with Psychotropic Use

Factors associated with psychotropic use are presented in Tables 3, 4 and 5**.** After adjusting for all variables, age no longer predicted psychotropic use in a linear fashion, with likelihood of psychotropic use increasing until age 80–84 years and then decreasing from 85 years onwards. Factors such as being female, living alone, living in a non-private dwelling, needing assistance with core activities and various health conditions were associated with greater likelihood of psychotropic use. Among these, self-reported mental health conditions had the highest odds ratio (OR: 8.65; 95% confidence intervals, CI 8.57–8.74; $p < 0.001$). Conversely, those with higher socioeconomic status, living outside metropolitan areas, higher education levels, being born overseas and speaking a language other than English at home had lower odds of psychotropic use. The predictors for psychotropic polypharmacy were similar.

Older age and being female were associated with increased use of benzodiazepines and Z-drugs and lower use of antiepileptics. In addition, females had 72% higher odds of using antidepressants compared with males. Higher education level, socioeconomic status and speaking a language other than English were associated with a lower likelihood of use across all psychotropic classes. Conversely, individuals needing assistance with core activities and those living alone or in non-private dwellings had a higher risk of using all psychotropic classes compared with their counterparts. Aboriginal and Torres Strait Islander people were associated with higher use of benzodiazepines and opioids. Older individuals with self-reported dementia were more likely to receive antipsychotics (OR: 2.59; 95% CI 2.52–2.66; $p < 0.001$), antidepressants (OR: 1.42; 95% CI 1.40–1.44; $p < 0.001$) and antiepileptics (OR: 1.25; 95% CI 1.21–1.29; $p < 0.001$). Self-reported asthma or lung conditions were associated with higher likelihood of using opioids (OR: 1.34; 95% CI 1.33–1.35; $p < 0.001$), benzodiazepine and Z-drugs (OR: 1.29; 95% CI 1.28–1.31; $p < 0.001$) and antidepressants (OR: 1.22; 95% CI 1.21–1.23; $p < 0.001$). Self-reported heart disease or stroke, cancer and arthritis increased the odds of using all psychotropics but lowered the odds of using antipsychotics. Kidney disease was associated with 20% higher odds of using opioids (OR: 1.20; 95% CI 1.18–1.22; $p < 0.001$). Having mental health conditions was significantly associated with the use of antipsychotics (OR: 9.96; 95% CI 9.78–10.16; $p < 0.001$) and antidepressants (OR: 10.19; 95% CI 10.10–10.28; $p < 0.001$).

Table 2. Prevalence of psychotropic use (at least one dispensing) between the 1 August and 3 October 2021

Characteristic	Total population*	Age groups, years*						
		65–69	70–74	75–79	80–84	85–89	90–94	Age 95+
	N = 3,850,281	*N* = 1,077,222	*N* = 1,003,699	*N* = 764,622	*N* = 508,549	*N* = 302,227	*N* = 147,827	*N* = 46,135
Any psychotropics	1,196,545 (31.1%)	293,638 (27.3%)	287,003 (28.3%)	239,446 (31.3%)	175,283 (34.5%)	116,851 (38.7%)	62,911 (42.6%)	21,413 (46.4%)
Psychotropic polypharmacy**	323,586 (8.4%)	72,742 (6.8%)	73,373 (7.3%)	63,929 (8.4%)	49,779 (9.8%)	35,458 (11.7%)	20,878 (14.1%)	7427 (16.1%)
Any antipsychotics[#]	76,232 (2.0%)	18,678 (1.7%)	16,569 (1.7%)	13,593 (1.8%)	11,194 (2.2%)	8755 (2.9%)	5515 (3.7%)	1928 (4.2%)
First-generation antipsychotics	9531 (0.2%)	2107 (0.2%)	1906 (0.2%)	1566 (0.2%)	1407 (0.3%)	1205 (0.4%)	912 (0.6%)	428 (0.9%)
Second-generation antipsychotics	68,200 (1.8%)	17,066 (1.6%)	15,014 (1.5%)	12,229 (1.6%)	9972 (2.0%)	7673 (2.5%)	4704 (3.2%)	1542 (3.3%)
Combined antipsychotic medication use	1499 (< 0.1%)	495 (< 0.1%)	351 (< 0.1%)	202 (< 0.1%)	185 (< 0.1%)	123 (< 0.1%)	101 (< 0.1%)	42 (< 0.1%)
Any antidepressants	764,307 (19.9%)	197,798 (18.4%)	189,371 (18.9%)	153,337 (20.1%)	107,448 (21.1%)	69,670 (23.1%)	35,700 (24.1%)	10,983 (23.8%)
TCA	175,467 (4.6%)	43,871 (4.1%)	44,855 (4.5%)	37,317 (4.9%)	26,106 (5.1%)	14,995 (5.0%)	6493 (4.4%)	1830 (4.0%)
SSRI	362,437 (9.4%)	97,471 (9.0%)	92,261 (9.2%)	72,458 (9.5%)	48,601 (9.6%)	31,070 (10.3%)	15,753 (10.7%)	4823 (10.5%)
SNRI	153,587 (4.0%)	48,901 (4.5%)	41,602 (4.1%)	30,187 (3.9%)	17,785 (3.5%)	9853 (3.3%)	4234 (2.9%)	1025 (2.2%)
Other antidepressants	137,589 (3.6%)	24,429 (2.3%)	26,819 (2.7%)	26,625 (3.5%)	24,112 (4.7%)	19,471 (6.4%)	12,064 (8.2%)	4047 (8.8%)
Combined antidepressant medication use	62,915 (1.6%)	16,326 (1.5%)	15,679 (1.6%)	12,883 (1.7%)	8919 (1.8%)	5588 (1.8%)	2787 (1.9%)	733 (1.6%)
Any benzodiazepines and Z-drugs	240,609 (6.2%)	48,496 (4.5%)	53,887 (5.4%)	50,190 (6.6%)	39,665 (7.8%)	27,379 (9.1%)	15,467 (10.5%)	5525 (12.0%)
Long-acting benzodiazepines[##]	82,180 (2.1%)	22,347 (2.1%)	21,188 (2.1%)	17,203 (2.2%)	11,105 (2.2%)	6551 (2.2%)	2923 (2.0%)	863 (1.9%)
Short-very short acting benzodiazepines	166,101 (4.3%)	28,264 (2.6%)	34,453 (3.4%)	34,503 (4.5%)	29,648 (5.8%)	21,591 (7.1%)	12,886 (8.7%)	4756 (10.3%)
Combined benzodiazepine and Z-drug medication use	8882 (0.2%)	2266 (0.2%)	2254 (0.2%)	1858 (0.2%)	1179 (0.2%)	809 (0.3%)	387 (0.3%)	129 (0.3%)
Any opioids	428,406 (11.1%)	96,175 (8.9%)	96,290 (9.6%)	83,518 (10.9%)	65,826 (12.9%)	47,129 (15.6%)	28,378 (19.2%)	11,090 (24.0%)
Any antiepileptics	86,375 (2.2%)	22,291 (2.1%)	21,142 (2.1%)	17,324 (2.3%)	12,443 (2.4%)	7873 (2.6%)	4080 (2.8%)	1222 (2.6%)

SNRI serotonin–noradrenaline reuptake inhibitor, *SSRI* serotonin-selective reuptake inhibitor, *TCA* tricyclic antidepressants

*Median (IQR); *N* (%)

**Psychotropic polypharmacy was defined as at least two different psychotropic drug classes dispensed between 1 August and 31 October 2021

[#]Any antipsychotic medication use was defined as the use of any first- and second-generation antipsychotics

[##]The medium length of action benzodiazepine bromazepam was included in the long-acting benzodiazepines

4 Discussion

To our knowledge, this study is the first to use linked national data from 2021 Census and PBS dispensing records to investigate the prescribing practices of psychotropic medications in older Australians. Overall, 31.1% of older adults used psychotropics, with the most common being antidepressants (19.9%), opioids (11.1%) and benzodiazepines (6.2%). Certain factors, such as medical conditions, living conditions, sociodemographic and socioeconomic status, were found to influence the use of psychotropics.

The present study found that almost a third of older adults aged 65 years or above were using at least one psychotropic medication during the 3-month study period, which aligns with a previous study of a similar cohort in the USA [12]. In both studies, antidepressants were the most used psychotropic subclass [12]. The frequent use of antidepressants can be due to a high prevalence of depression in older adults, affecting more than one third of this population [21]. The second most commonly used psychotropic medications in our study were opioids, used by more than one in ten individuals, which aligns with previous research on community-dwelling older adults in the USA [22]. However, the 12-month prevalence of benzodiazepines and Z-drugs in our study was lower than what Luta reported among a Swiss cohort of older adults [23]. This difference might be

Table 3 Multivariable logistic regression analysis results of risk factors for any psychotropic use and psychotropic polypharmacy between 1 August and 31 October 2021 among all people in the study population

Factors	Any psychotropic drug classes*			Psychotropic polypharmacy**		
	Odds ratios	CI	*p* value	Odds ratios	CI	*p* value
Age (reference: 65 to < 70 years)						
70 to < 75 years	1.04	1.03–1.05	**< 0.001**	1.03	1.02–1.04	< 0.001
75 to < 80 years	1.11	1.11–1.12	**< 0.001**	1.06	1.05–1.08	< 0.001
80 to < 85 years	1.14	1.13–1.15	**< 0.001**	1.02	1.00–1.03	0.028
85 to < 90 years	1.1	1.08–1.11	**< 0.001**	0.9	0.88–0.92	< 0.001
90 to < 95 years	0.96	0.94–0.97	**< 0.001**	0.76	0.75–0.78	< 0.001
≥ 95 years	0.81	0.79–0.83	**< 0.001**	0.62	0.59–0.64	< 0.001
Sex (reference: male)						
Female	1.46	1.45–1.47	**< 0.001**	1.39	1.37–1.40	< 0.001
Area-level disadvantage quintiles (reference: Q1—most disadvantage)						
Q2	0.94	0.93–0.95	**< 0.001**	0.92	0.91–0.93	< 0.001
Q3	0.89	0.89–0.90	**< 0.001**	0.86	0.85–0.87	< 0.001
Q4	0.84	0.84–0.85	**< 0.001**	0.8	0.79–0.81	< 0.001
Q5 (most advantaged)	0.79	0.78–0.79	**< 0.001**	0.72	0.71–0.73	< 0.001
Remoteness (reference: metropolitan)						
Inner regional	0.98	0.97–0.99	**< 0.001**	0.94	0.93–0.95	< 0.001
Outer regional	0.96	0.95–0.97	**< 0.001**	0.91	0.89–0.92	< 0.001
Remote/very remote	0.84	0.82–0.87	**< 0.001**	0.75	0.72–0.79	< 0.001
Level of highest educational attainment (reference: year 9 or below)						
Year 10 and above	0.93	0.92–0.94	**< 0.001**	0.94	0.93–0.95	< 0.001
Certificate I–IV and diploma	0.82	0.82–0.83	**< 0.001**	0.82	0.80–0.83	< 0.001
Bachelor and above	0.72	0.71–0.72	**< 0.001**	0.72	0.71–0.74	< 0.001
Living status (reference: living with someone in private dwelling)						
Living alone in a private dwelling	1.07	1.06–1.07	**< 0.001**	1.11	1.10–1.12	< 0.001
Living in a non-private dwelling	2.02	1.99–2.05	**< 0.001**	2.57	2.53–2.61	< 0.001
Assistance with core activities (reference: do not require assistance with core activities)						
Need assistance for core activities	2.05	2.03–2.06	**< 0.001**	2.75	2.72–2.78	< 0.001
Self-reported health conditions (reference: without self-reported health condition)						
Dementia	1.23	1.21–1.25	**< 0.001**	–	–	–
Asthma or lung conditions	1.26	1.25–1.27	**< 0.001**	1.34	1.32–1.35	< 0.001
Diabetes	1.1	1.09–1.10	**< 0.001**	1.09	1.07–1.10	< 0.001
Heart disease or stroke	1.07	1.06–1.08	**< 0.001**	1.04	1.03–1.05	< 0.001
Cancer	1.22	1.21–1.23	**< 0.001**	1.25	1.23–1.26	< 0.001
Arthritis	1.39	1.38–1.40	**< 0.001**	1.45	1.44–1.47	< 0.001
Mental health condition(s)	8.65	8.57–8.74	**< 0.001**	4.38	4.33–4.43	< 0.001
Kidney disease	1.08	1.07–1.10	**< 0.001**	1.1	1.08–1.12	< 0.001
Country of birth (reference: Australia)						
Born overseas	0.95	0.94–0.96	**< 0.001**	0.97	0.96–0.98	< 0.001
Language used at home (reference: English)						
Use other language than English at home	0.66	0.65–0.66	**< 0.001**	0.62	0.61–0.63	< 0.001
Aboriginality (reference: non-indigenous)						
Aboriginal and/or Torres Strait Islander people	–	–	–	1.07	1.03–1.11	< 0.001
Intercept	0.25	0.25–0.25	**< 0.001**	0.04	0.04–0.04	< 0.001
Observations	3,157,262			3,140,808		

Bold values indicate statistical significance

*Aboriginality was excluded owing to small number of observations

** Self-reported dementia was excluded owing to the small number of observations

Table 4 Multivariable logistic regression analysis results of risk factors for any antipsychotic, antidepressant and benzodiazepine/Z-drug use between 1 August and 31 October 2021 among all people in the study population

Factors	Any antipsychotics*			Any antidepressants			Any benzodiazepines and Z-drugs		
	Odds ratios	CI	*p* value	Odds ratios	CI	*p* value	Odds ratios	CI	*p* value
Age (reference: 65 to < 70 years)									
70 to < 75 years	0.9	0.88–0.93	**< 0.001**	1.04	1.04–1.05	**< 0.001**	1.18	1.16–1.20	**< 0.001**
75 to < 80 years	0.8	0.78–0.82	**< 0.001**	1.09	1.08–1.10	**< 0.001**	1.39	1.37–1.41	**< 0.001**
80 to < 85 years	0.68	0.66–0.71	**< 0.001**	1.05	1.04–1.06	**< 0.001**	1.55	1.52–1.57	**< 0.001**
85 to < 90 years	0.56	0.54–0.58	**< 0.001**	0.97	0.95–0.98	**< 0.001**	1.6	1.56–1.63	**< 0.001**
90 to < 95 years	0.45	0.43–0.47	**< 0.001**	0.78	0.77–0.79	**< 0.001**	1.61	1.57–1.65	**< 0.001**
≥ 95 years	0.34	0.32–0.37	**< 0.001**	0.57	0.55–0.58	**< 0.001**	1.57	1.51–1.63	**< 0.001**
Sex (reference: male)									
Female	0.98	0.96–1.00	**0.029**	1.72	1.71–1.73	**< 0.001**	1.48	1.47–1.50	**< 0.001**
Area-level disadvantage quintiles (reference: Q1—most disadvantage)									
Q2	0.91	0.89–0.93	**< 0.001**	0.98	0.97–0.99	**< 0.001**	0.95	0.94–0.96	**< 0.001**
Q3	0.88	0.86–0.91	**< 0.001**	0.93	0.93–0.94	**< 0.001**	0.93	0.92–0.95	**< 0.001**
Q4	0.88	0.86–0.91	**< 0.001**	0.89	0.88–0.90	**< 0.001**	0.92	0.90–0.93	**< 0.001**
Q5 (most advantaged)	0.87	0.84–0.90	**< 0.001**	0.84	0.83–0.85	**< 0.001**	0.9	0.89–0.92	**< 0.001**
Remoteness (reference: Metropolitan)									
Inner regional	0.86	0.84–0.88	**< 0.001**	1.04	1.03–1.05	**< 0.001**	0.82	0.81–0.83	**< 0.001**
Outer regional	0.81	0.79–0.84	**< 0.001**	1	0.98–1.01	0.465	0.76	0.74–0.77	**< 0.001**
Remote/very remote	0.71	0.65–0.78	**< 0.001**	0.91	0.88–0.93	**< 0.001**	0.58	0.55–0.62	**< 0.001**
Level of highest educational attainment (reference: Year 9 or below)									
Year 10 and above	0.86	0.84–0.88	**< 0.001**	0.93	0.93–0.94	**< 0.001**	1.03	1.01–1.04	**< 0.001**
Certificate I–IV and diploma	0.71	0.69–0.73	**< 0.001**	0.83	0.82–0.84	**< 0.001**	0.9	0.88–0.91	**< 0.001**
Bachelor and above	0.7	0.68–0.72	**< 0.001**	0.72	0.71–0.72	**< 0.001**	0.92	0.91–0.94	**< 0.001**
Living status (reference: living with someone in private dwelling)									
Living alone in a private dwelling	1.42	1.39–1.45	**< 0.001**	1.05	1.04–1.06	**< 0.001**	1.15	1.14–1.16	**< 0.001**
Living in a non-private dwelling	3.05	2.97–3.14	**< 0.001**	1.36	1.34–1.38	**< 0.001**	1.55	1.52–1.58	**< 0.001**
Assistance with core activities (reference: Do not require assistance with core activities)									
Need assistance for core activities	2.89	2.83–2.96	**< 0.001**	1.68	1.66–1.69	**< 0.001**	1.54	1.52–1.56	**< 0.001**
Self-reported health conditions (reference: Without self-reported health condition)									
Dementia	2.59	2.52–2.66	**< 0.001**	1.42	1.40–1.44	**< 0.001**	0.65	0.64–0.67	**< 0.001**
Asthma or lung conditions	0.93	0.91–0.95	**< 0.001**	1.22	1.21–1.23	**< 0.001**	1.29	1.28–1.31	**< 0.001**
Diabetes	1.09	1.06–1.11	**< 0.001**	1.13	1.13–1.14	**< 0.001**	0.93	0.92–0.94	**< 0.001**
Heart disease or stroke	0.68	0.66–0.70	**< 0.001**	1.03	1.02–1.04	**< 0.001**	1.08	1.07–1.10	**< 0.001**
Cancer	0.97	0.94–0.99	**0.011**	1.03	1.02–1.04	**< 0.001**	1.21	1.19–1.22	**< 0.001**
Arthritis	0.57	0.56–0.59	**< 0.001**	1.19	1.18–1.20	**< 0.001**	1.2	1.19–1.21	**< 0.001**
Mental health condition(s)	9.96	9.78–10.16	**< 0.001**	10.19	10.10–10.28	**< 0.001**	2.26	2.23–2.29	**< 0.001**
Kidney disease	–	–	–	0.96	0.94–0.97	**< 0.001**	1.1	1.07–1.12	**< 0.001**
Country of birth (reference: Australia)									
Born overseas	–	–	–	0.9	0.89–0.91	**< 0.001**	1.02	1.01–1.03	**< 0.001**
Language used at home (reference: English)									
Use other language than English at home	–	–	–	0.64	0.63–0.64	**< 0.001**	0.83	0.81–0.84	**< 0.001**
Aboriginality (reference: non-Indigenous)									
Aboriginal and/or Torres Strait Islander people	–	–	–	0.9	0.88–0.93	**< 0.001**	1.15	1.10–1.20	**< 0.001**
Intercept	0.01	0.01–0.01	**< 0.001**	0.13	0.13–0.13	**< 0.001**	0.03	0.03–0.03	**< 0.001**
Observations	3,228,456			3,140,808			3,140,808		

Table 4 (continued)

Bold values indicate statistical significance

*Self-reported kidney diseases, country of birth, language used at home and Aboriginality were excluded owing to small number of observations

attributed to variations in the time period or data sources, or, encouragingly, it may reflect efforts to avoid these medications in older adults owing to their associated risks, including cognitive impairment, delirium and falls [24]. The prevalence of antipsychotics in our study is similar to a previous national dispensing report in Australia [11]. In total, 8.4% of the study participants experienced psychotropic polypharmacy, a rate similar to a study in Finland, where 7% of people exhibited psychotropic polypharmacy prior to an Alzheimer's disease diagnosis [25].

The prevalence of antidepressant, antipsychotic and benzodiazepine use increased significantly with age. However, after adjusting for other variables, older age was associated with a higher likelihood of benzodiazepine use but a lower likelihood of using antipsychotics and antidepressants. Older adults with higher socioeconomic status and higher education levels were less likely to use psychotropics across all subclasses, which is potentially explained by the increased likelihood of having better health literacy [26], enabling them to access and understand drug related information and potentially discuss with physicians the use of non-pharmacological management strategies. Furthermore, higher socioeconomic status and education are associated with improved quality of life [27, 28] and better access to non-pharmacological mental health management strategies, which may also contribute to the lower use of psychotropics observed in this group. People living in remote areas also had a lower likelihood of using psychotropics, which may be linked to reduced access to healthcare services. In contrast, those living in non-private dwellings and those needing assistance with core activities had higher odds of using psychotropics, possibly due to having more comorbidities and more severe disease states requiring pharmacological management. This may explain why the prevalence of psychotropic use in our study is lower than that reported in previous Australian studies focusing on individuals residing in residential aged care facilities [8, 9]. Our study included all Australians from the Census 2021, with the majority living in the community and only a small proportion residing in non-private dwellings such as aged care homes (4.5%). Although the rates of anxiety and mood disorders are higher among Aboriginal and Torres Strait Islander people compared with the general Australian population [29], likely due to the impact of historical trauma, social disadvantage and systemic discrimination, we observed that this population is associated with lower use of antidepressants. This might be attributed to reduced access to care, cultural factors that may discourage seeking help from physicians or the impact of new culturally sensitive guidelines promoting cautious prescribing [30], with a preference for non-pharmacological approaches in practice. Culturally and linguistically diverse (CALD) populations were less likely to use psychotropics, possibly owing to the lower rate of mental health conditions [31] or language barriers, which discourage patients from seeking help [32]. However, those born overseas had a higher likelihood of using opioids and benzodiazepines. Prescribing opioids for pain management and benzodiazepines for insomnia often involves simpler, categorical assessments, such as rating pain on a scale or indicating the severity of insomnia. CALD populations may have lower health literacy [32], which can make it difficult to effectively communicate their symptoms to prescribers or lead to a preference for treatments with immediate effects, potentially resulting in increased use of short-acting agents such as opioids and benzodiazepines. Future research should focus on understanding these differences in prescribing patterns and developing strategies to improve acceptance and health literacy within CALD populations to ensure more appropriate and effective treatment options.

The current study found that dementia status was associated with a higher use of antidepressants, antipsychotics and antiepileptics, likely due to their role in managing behaviours and psychological symptoms of dementia (BPSD) [33, 34]. Although opioids, benzodiazepines and Z-drugs may be prescribed for pain and insomnia in dementia [34, 35], our findings indicate that individuals with dementia had lower odds of using these medications after adjusting for other factors. This aligns with a declining trend in prescribing of these medications for people with dementia in Australia over the past decade [8] due to the findings of previous studies suggesting that benzodiazepines and Z-drugs could increase the risk of dementia [36] or worsen cognitive function. Additionally, opioids are not generally recommended for pain management in dementia owing to limited evidence supporting their effectiveness and the significant risk of adverse effects and drug interactions [37], which may further explain the lower odds observed. However, the prevalence of opioids, benzodiazepines and Z-drugs reported in studies on dementia cohorts [8, 10, 38] is higher than our findings. This difference may be because opioids, benzodiazepines and Z-drugs are often prescribed to people with dementia for conditions beyond BPSD, as these individuals are more likely to have multiple medical conditions, be older and

Table 5 Multivariable logistic regression analysis results of risk factors for any opioid and antiepileptic use between 1st August and 31st October 2021 among all people in the study population

Factors	Any opioids			Any antiepileptics*		
	Odds ratios	CI	*p* value	Odds ratios	CI	*p* value
Age (reference: 65 to < 70 years)						
70 to < 75 years	0.97	0.96–0.98	**< 0.001**	0.95	0.93–0.97	**< 0.001**
75 to < 80 years	0.99	0.97–1.00	**0.01**	0.89	0.87–0.91	**< 0.001**
80 to < 85 years	1	0.99–1.01	0.958	0.76	0.74–0.78	**< 0.001**
85 to < 90 years	0.98	0.96–0.99	**0.007**	0.58	0.56–0.60	**< 0.001**
90 to < 95 years	0.95	0.94–0.97	**< 0.001**	0.44	0.42–0.46	**< 0.001**
≥ 95 years	0.96	0.93–0.99	**0.005**	0.31	0.29–0.34	**< 0.001**
Sex (reference: male)						
Female	1.06	1.05–1.07	**< 0.001**	0.88	0.87–0.90	**< 0.001**
Area-level disadvantage quintiles (reference: Q1—most disadvantage)						
Q2	0.91	0.90–0.92	**< 0.001**	0.94	0.92–0.97	**< 0.001**
Q3	0.84	0.83–0.85	**< 0.001**	0.92	0.90–0.94	**< 0.001**
Q4	0.76	0.75–0.77	**< 0.001**	0.92	0.90–0.95	**< 0.001**
Q5 (most advantaged)	0.65	0.64–0.66	**< 0.001**	0.91	0.89–0.94	**< 0.001**
Remoteness (reference: metropolitan)						
Inner regional	1.01	1.00–1.02	**0.022**	0.92	0.90–0.94	**< 0.001**
Outer regional	1.05	1.03–1.06	**< 0.001**	0.84	0.81–0.86	**< 0.001**
Remote/very remote	0.94	0.91–0.98	**0.002**	0.71	0.65–0.77	**< 0.001**
Level of highest educational attainment (reference: Year 9 or below)						
Year 10 and above	0.94	0.93–0.95	**< 0.001**	0.93	0.91–0.95	**< 0.001**
Certificate I–IV and diploma	0.88	0.87–0.89	**< 0.001**	0.86	0.84–0.88	**< 0.001**
Bachelor and above	0.72	0.71–0.73	**< 0.001**	0.85	0.83–0.87	**< 0.001**
Living status (reference: living with someone in private dwelling)						
Living alone in a private dwelling	1.01	1.00–1.02	**0.019**	1.02	1.00–1.04	0.083
Living in a non-private dwelling	2.45	2.41–2.49	**< 0.001**	2.13	2.07–2.20	**< 0.001**
Assistance with core activities (reference: do not require assistance with core activities)						
Need assistance for core activities	2.46	2.43–2.48	**< 0.001**	3.33	3.27–3.39	**< 0.001**
Self-reported health conditions (reference: without self-reported health condition)						
Dementia	0.71	0.69–0.72	**< 0.001**	1.25	1.21–1.29	**< 0.001**
Asthma or lung conditions	1.34	1.33–1.35	**< 0.001**			
Diabetes	1.13	1.12–1.15	**< 0.001**	0.87	0.85–0.89	**< 0.001**
Heart disease or stroke	1.07	1.06–1.08	**< 0.001**	1.28	1.25–1.30	**< 0.001**
Cancer	1.49	1.47–1.50	**< 0.001**	1.07	1.05–1.10	**< 0.001**
Arthritis	2.03	2.02–2.05	**< 0.001**	0.86	0.85–0.88	**< 0.001**
Mental health condition(s)	1.25	1.24–1.27	**< 0.001**	2.36	2.31–2.40	**< 0.001**
Kidney disease	1.2	1.18–1.22	**< 0.001**	–	–	–
Country of birth (reference: Australia)						
Born overseas	1.05	1.04–1.06	**< 0.001**	0.85	0.83–0.87	**< 0.001**
Language used at home (reference: English)						
Use other language than English at home	0.65	0.65–0.66	**< 0.001**	0.62	0.60–0.64	**< 0.001**
Aboriginality (reference: non-Indigenous)						
Aboriginal and/or Torres Strait Islander people	1.2	1.16–1.23	**< 0.001**	–	–	–
Intercept	0.08	0.08–0.08	**< 0.001**	0.02	0.02–0.02	**< 0.001**
Observations	3,140,808			3,157,262		

Bold values indicate statistical significance

*Self-reported kidney diseases and Aboriginality were excluded owing to small number of observations

reside in aged care homes. Individuals with heart disease or stroke were 32% less likely to use antipsychotics which is potentially attributed to prescriber reluctancy due to the risk of myocardial infarction and stroke following antipsychotic use [6]. Our study also revealed that older people with cancer and arthritis were more likely to use opioids. Current pain management guidelines for arthritis [39] do not recommend opioids as first-line treatment and caution their routine use [39] due to their modest benefits, with risks often outweighing benefits [40]. Therefore, future research should investigate the appropriateness of opioid prescribing in this population [41]. It is not surprising that individuals with mental health conditions had higher use of all subclasses of psychotropic medications, with the highest odds observed for antidepressants and antipsychotics. While these medications can be used in the management of mental health conditions in older adults, the risk of adverse drug events, particularly in older age, remains significant [42].

4.1 Strengths and Limitations

This is the first study to utilise PBS and Census data to estimate the prevalence and risk factors of psychotropic use in older Australians. With a large, population-based cohort, our study is representative of the current demographic profile of older Australians. Furthermore, several factors identified, such as living status, language spoken at home, Indigenous status and the need for assistance with core activities, have been under-researched in previous studies. This contributes to a deeper understanding of the factors associated with psychotropic prescribing in older adults and may inform future practice and policy interventions.

However, our study has several limitations. First, prevalent use of psychotropic drugs was defined as having at least one recorded dispensing of a psychotropic medication. Duration of use was not considered owing to the lack of days of supply information in the PBS dataset. Second, as a cross-sectional design, it cannot establish a causal relationship between factors identified and psychotropic use. Third, due to the self-report nature of the census, there is potential for respondent bias in reporting of demographics and factors. Forth, the 2021 Census may have been impacted by coronavirus disease 2019 (COVID-19), particularly in the data collection process for non-private dwellings [43]. Furthermore, the dataset did not capture privately dispensed medications or certain psychotropics, such as Z-drugs, which are reimbursed only through repatriation care and not to the general public. As a result, the prevalence of psychotropic medication use may be underestimated. Finally, PBS data only reflects dispensing records, not actual medication taking or the clinical appropriateness of prescriptions.

5 Conclusions

Almost one third of older adults in Australia are dispensed psychotropic medications, with nearly one in ten experiencing psychotropic polypharmacy. The increased use of certain psychotropic medications among Aboriginal and Torres Strait Islander people, individuals with dementia and those with arthritis highlights potential discrepancies in prescribing quality for these populations. While future research should evaluate the clinical appropriateness of these high-risk medications, immediate action is needed to reduce their use and promote more judicious prescribing.

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Availability of data and material Due to the ethical and legal aspects of the research, supporting data is not available.

Ethics approval This study was conducted in accordance with the Declaration of Helsinki and was deemed as having negligible risk, receiving exemption from ethical approval by the University of Sydney Human Research Ethics Committee.

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