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RESEARCH ARTICLE

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Marijuana use among community-dwelling older adults: A population-based study

Natacha M. De Genna[1,2] | Erin Jacobsen[3] | Mary Ganguli[2,4]

[1]Department of Psychiatry, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania, USA

[2]Department of Epidemiology, University of Pittsburgh School of Public Health, Pittsburgh, Pennsylvania, USA

[3]Department of Psychiatry, University of Pittsburgh Medical Center (UPMC), Pittsburgh, Pennsylvania, USA

[4]Departments of Psychiatry and Neurology, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania, USA

Correspondence
Natacha M. De Genna, 3811 O'Hara St, Pittsburgh, PA 15213, USA.
Email: degennan@pitt.edu

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Abstract

Objectives: There is a paucity of population-level data on marijuana use and mental health and functioning in older adults.

Methods: We analyzed cross-sectional data (n = 910) from a well-characterized cohort, the Monongahela-Youghiogheny Healthy Aging Team (MYHAT) study. MYHAT is an age-stratified random sample of the population age 65 years and older from a small-town in the USA. Half the sample was female and half were over 75 (Mean age = 77). Most participants were non-Hispanic White. Marijuana use was assessed by self-report and symptoms of mood disorders were screened using the modified Centers for Epidemiological Studies-Depression Scale and the Generalized Anxiety Disorder screener. Cognition was assessed by the Mini-Mental State Examination and a neuropsychological test battery; functioning using the OARS Activities of Daily Living and Instrumental Activities of Daily Living; and overall assessment using the Clinical Dementia Rating (CDR®).

Results: One in five MYHAT participants had a history of marijuana use and 5% reported recent use, primarily for pain (41%) and recreation/relaxation (37%). Recent use was associated with cigarette and alcohol use, symptoms of depression or anxiety, and impairments in attention.

Conclusions: Twenty-percent of community-dwelling older adults living in a US state where recreational marijuana use is illegal had a history of marijuana use. Recent marijuana use was less common but, consistent with prior research, associated with other substance use and poorer mental health.

KEYWORDS
anxiety, cannabis, depression, geriatric, marijuana, pain, substance use

Key points

- One in five adults over 65 who live in a state without legal recreational marijuana laws have a history of marijuana use.
- Adults over 65 with recent marijuana use are more likely to smoke cigarettes and drink alcohol.
- Adults over 65 use marijuana for pain relief and recreation/relaxation.

- As with younger adults, recent marijuana use in people over 65 is associated with symptoms of depression and anxiety.

1 | INTRODUCTION

Marijuana use among older adults has increased in higher income countries such as the USA,[1] Canada,[2,3] and Australia,[4] where the use of marijuana is either legal among adults (e.g., recreational marijuana laws) or physicians may prescribe it to treat specific medical conditions (medical marijuana laws). Data from medical marijuana prescriptions in the Netherlands show that 31% of medical marijuana patients in that country from 2003 to 2010 were between 61 and 80 years old.[5] In the USA, the prevalence of past year marijuana use among individuals 65 years and older quadrupled between 2006 and 2018[1] and 74% of US citizens have access to either legal recreational marijuana or a medical marijuana prescription.[6] Fewer older adults regard marijuana use a "great risk" to their health and wellbeing compared to previous decades.[7] Although this may be partly due to US medical marijuana laws, the increase in marijuana use was greater among older adults with fewer chronic medical conditions.[8] Thus, the increase in marijuana use among older US adults may not be simply due to medical marijuana used to treat chronic health conditions that are more common in this age group. In fact, older adults who use marijuana are not new initiates—most began using marijuana as adolescents.[9] Nonetheless, the literature on marijuana use at the population level is limited for adults older than 65 years of age.

Correlates of marijuana use in older US adults include male sex, younger age, single marital status, non-Hispanic Black race and ethnicity, less than a college education, and combustible cigarette and other substance use.[1,7,10–12] As is the case with over-the-counter supplements, there is a dearth of scientific evidence for the effectiveness of marijuana for medical conditions and few randomized clinical trials (RCTs) powered to examine adverse events in those 65 and older.[13,14] In the absence of RCTs, the literature on marijuana use in older adults mainly consists of observational studies. More adverse effects of marijuana use are reported in RCTs than in observational studies.[15] For example, older patients dosed with delta-9-tetrahydrocannabinol (THC) in a clinical trial were more likely to report dizziness or lightheadedness and thinking or perception disorder compared to patients on placebo or THC combined with cannabidiol (CBD).[14] Similar symptoms (dizziness, lightheadedness, dry mouth) have been reported in older Canadian[16] and Israeli[17] adults using medicinal marijuana. In chart review studies, marijuana use among older patients has been associated with psychiatric, respiratory, cardiovascular, and neurologic conditions.[18,19] Cross-sectional data from observational studies suggest that older people who use marijuana may have more behavioral symptoms and reduced cognitive performance.[20,21] Health care providers cannot turn to data from RCTs to inform patients about the risks and benefits of marijuana use, but observational data suggest that older people who use marijuana may have a higher risk profile than those who abstain.

In a constantly changing landscape with increasing legalization of marijuana and increased use in older people, more research is needed on marijuana use in people over 65 years of age, to better identify their health profiles. We tested associations between past-year marijuana use, health conditions, and cognitive functioning in a well-characterized population-based cohort of older adults in small-town communities in Pennsylvania, USA, where medical marijuana was legalized in 2016 and became widely available in 2018. As disparities in life expectancy continue to widen between urban and rural older adults,[22,23] it is crucial to focus on health behaviors and outcomes in older adults from small towns and rural communities. Based on the prior literature on marijuana use in older adults, we hypothesized that participants with marijuana use would endorse more health conditions and worse cognitive functioning than participants without marijuana use, controlling for demographic factors and other substance use.

2 | MATERIALS AND METHODS

We analyzed data on marijuana use and functioning from the Monongahela-Youghiogheny Healthy Aging Team (MYHAT) study, a prospective cohort study of older adults residing in a group of small-town Rust-Belt communities in southwestern Pennsylvania (US). Participants are assessed annually for the development of mild cognitive impairment (MCI) and dementia, as described in detail elsewhere.[24,25] Briefly, MYHAT is an age-stratified random sample of the population drawn from publicly available voter registration lists over two time periods, 2006–2008 and 2016–2019. Inclusion criteria were age 65 and older, residence in the targeted towns, not being in long-term care at study entry, hearing and vision sufficient to allow neuropsychological testing, and decisional capacity to provide informed consent. Identical procedures were used during the second recruitment period in 2016–2019, except that participants were restricted to age 65–74, thus replenishing the cohort with individuals who, during 2006–2008, were 10 years too young to be enrolled. All participants provided written informed consent, and all study procedures were approved by the University of Pittsburgh IRB.

2.1 | Participants

During the original recruitment period in 2006–2008, 2036 individuals aged 65+ were enrolled into the MYHAT study, 1982 of whom underwent the full assessment after excluding 54 who already had substantial cognitive impairment as evidenced by age-education corrected scores of <21 on the Mini-Mental State Examination (MMSE).[26,27] During the second recruitment period, 709 individuals enrolled, and

703 underwent the full study assessment. Medical marijuana became available in Pennsylvania in 2018, and in 2019, questions about participants' past and current use of marijuana were added to the study assessment. A total of 910 participants were administered the marijuana-related questions for the first time, which included individuals from both original and new cohorts at different annual cycles. The assessment cycles at which each individual provided these data are treated as his/her study baseline for the current report, and other variables used here are also from that assessment cycle.

2.2 | Measures

2.2.1 | Predictor

Participants reported if they had ever used marijuana and if they answered affirmatively, if they had used marijuana in the past year. For the bivariate analysis, a trichotomous variable was used (0 = never used, 1 = former use only, 2 = past year use). For the multivariable association and sensitivity analyses, a dichotomous variable was created (0 = no current use, 1 = past year use). Participants with past year marijuana use were asked their reasons for use from a list of 12 options, including "other" and were able to endorse multiple options.

2.2.2 | Outcomes

Depression and Anxiety symptoms: Depressive symptoms were measured using the modified Center for Epidemiological Studies Depression scale (CES-D)[28] including all 20 original items but scoring each item as 0/1 (rather than 0–3) so that the maximum score was 20 (mCES-D).[29] Anxiety symptoms were measured with the Generalized Anxiety Disorder screener (GAD-7).[30]

Symptoms of mood disorder: A dichotomous variable was created for symptoms of depression and anxiety using the 90th percentile of this study sample (1 = individuals who scored ≥4 on the mCES-D and/or ≥ 7 on the GAD-7).

Services for a mental disorder: Participants indicated whether a healthcare professional had told them that they had depression or anxiety and whether they had seen a mental health specialist in the past year.

Psychotropic medications: Participants reported all prescription medications they were currently using; we identified any psychotropic medication as an exposure for the current study.

Activities of Daily Living: Participants were rated on the Older Americans Resources and Services (OARS) Activities of Daily Living (ADL) and Instrumental ADL (IADL) scales.[31]

Cognitive screening: Participants were assessed on the MMSE as mentioned above. Impairment in this report was defined as being >1.5 SDs below their recruitment cohort's mean.

Neuropsychological assessment: Participants were assessed with a cognitive test battery reported previously with test scores grouped into the cognitive domains of memory, language, executive function, attention/processing speed, and visuospatial ability. Standardized composite scores on each domain were identified as exposures.[25] Impairment was identified as scores being >1.5 SDs below their recruitment cohort's mean.

Clinical Dementia Rating: Based on all available information excluding neuropsychological test performance, trained interviewers rated participants on the Clinical Dementia Rating Staging Instrument (CDR®),[32] which indicates impairment in cognitively driven everyday activity.

Subjective cognitive concerns: Participants responded to 21 questions regarding concerns about their own cognitive functioning.[33]

Sleep quality: Participants were asked how often they had trouble falling asleep, had trouble going back to sleep if they awoke, waking up too early and not being able to go back to sleep, and falling asleep during the day while actively doing something. Response options for each sleep question ranged from 0 (never/rarely), 1 (sometimes), to 2 (usually). Responses of "sometimes" and "usually" were combined for the current study.

Pain: Participants reported whether they were experiencing any pain and rated the severity of their average pain and their worst pain in the past week on a scale of 1–10. Not all participants completed this measure.

Self-rated health: Participants rated their own health from 1 = poor to 5 = excellent. Categories were collapsed into poor/fair, good, and excellent/very good.

Self-reported hypertension: Participants were asked "Has a doctor or a nurse ever told you that you have high blood pressure (hypertension)?" At the baseline assessment, participants were asked if they were *ever* told; at follow-up visits, participants are asked if they were told *in the past year*.

2.2.3 | Covariates

Participants reported their age, sex, education, and marital status. Race was self-reported and categorized according to the US Census categories. Most of the participants identified as White (94%); some were Black (6%), more than one race (0.3%), Asian (0.1%), and American Indian/Alaskan Native (0.03%). Less than 1% identified as Hispanic. A dichotomous race variable was created for this analysis (NonWhite/White). Participants were also asked about their frequency of alcohol use and quantity of cigarette use in the past year. Dichotomous variables were created for these substances (weekly alcohol use and daily cigarette use).

2.3 | Statistical analysis

Bivariate analysis using chi-square tests were first conducted to examine the association between each covariate (demographic characteristics and other substance use) and marijuana use history

(never, former, past year). Next, we examined bivariate associations between marijuana use history and the outcome variables using Chi-square tests or Fisher's exact tests. Multivariable logistic regression analysis was used to determine if there were associations between recent marijuana use (any/none) and outcomes that were significant in the bivariate analysis. The adjusting covariates in all multivariable models included age, educational attainment, race, sex, daily tobacco use, and weekly alcohol use. Finally, sensitivity analyses were conducted to compare individuals with recent marijuana use to all others (never and past use) on demographic characteristics, substance use, and the health outcomes using Chi-square tests or Fisher's exact test. Bivariate associations were conducted using SAS software, version 9.4 (SAS Institute). Multivariable logistic regression models were fit using SPSS for Windows, version 28.0 (IBM).

3 | RESULTS

Half of the participants in this analysis were 65–75 years old and the other half were 76 years old or older (Table 1). One in five participants had previously used marijuana, and 5% reported use in the past year. As seen in Figure 1, most participants with recent marijuana use cited pain (41%) as the most common reason for use, followed closely by recreation/relaxation (37%), and social activity (22%).

In bivariate analysis, participants who reported recent (past year) marijuana use were more likely to be male, less than 75 years old, and more educated. They were also more likely to smoke combustible cigarettes and drink alcohol weekly, but there were no differences in race, marital status, or self-rated health, compared to participants without recent marijuana use (Table 1). Participants with past-year marijuana use were also more likely to report symptoms of anxiety, services for a mental disorder, recent pain, trouble falling back asleep and excessive daytime sleepiness (Table 1). Participants with past-year marijuana use were less likely to self-report hypertension and functional impairment in ADLs and IADLs (Table 1).

In the multivariable logistic regression models, adjusting for demographics and current alcohol and tobacco use, past year marijuana use was significantly associated with concurrent anxiety or depression symptoms (Table 2: adjusted Odds Ratio [aOR] = 2.36 [95% CI: 1.19–4.69]), attention impairment (aOR = 2.92 [95% CI: 1.02–8.35]), and problems falling back asleep if awakened at night (aOR = 2.46 [95% CI: 1.34–4.52]). After adjustment, past year marijuana use was not associated with IADL and ADL scales, hypertension, or daytime sleepiness.

In the sensitivity analysis, participants who had used marijuana in the past year were more likely to be younger and more educated and reported more cigarette and alcohol use than those without recent marijuana use. However, there was no sex difference between those with recent use and those who had never used or had no past year marijuana use (Supplementary Table S1). As with the main analysis, participants with past year marijuana use had more symptoms of anxiety on the GAD-7 screener, were more likely to have had a health care provider diagnose them with depression or anxiety or received services for a mental disorder, pain, and trouble going back to sleep when awakened, and were less likely to have hypertension compared to all others. However, there were no differences in daytime sleepiness or activities of daily living (Supplementary Table S1).

4 | DISCUSSION

In this population-based study of adults over age 65 from a small-town under-resourced community in the USA, one in five participants reported a history of marijuana use, and one in 20 had used marijuana in the past year. Rates of marijuana use among older adults may be even higher among medical marijuana users[5,34] and those living in regions that have legalized recreational marijuana use.[16,35–37] Pain was the most cited reason for marijuana use in our sample, consistent with other studies of community-dwelling older adults.[16,17,36] Findings are mixed with regards to effective pain relief among medical marijuana patients, with improvements reported in Canadian[16] and Israeli[17] samples, but no differences in symptom scores for pain, nausea, appetite, insomnia, or anxiety scores measured before and after patients initiated medical marijuana use in a chart review study of US cancer patients over 65 years.[38] Of note, two-thirds of participants with recent marijuana use in this study reported recreational reasons for use including recreation/relaxation, social activity, boredom, habit, and creativity/music/art appreciation. This may be a cohort effect, as 81% of them were "Baby Boomers," a cohort of individuals in the USA characterized by increasing acceptance and use of marijuana. Thus, this study contributes to a small but growing literature on marijuana use in adults over the age of 65, highlighting the prevalence and correlates of use in older people from small towns who use marijuana for pain as well as non-medical reasons.

Healthcare providers in regions without legal recreational marijuana, such as Pennsylvania, should be aware that some of their older patients may be using marijuana for recreational purposes. Participants in this study who had recently used marijuana were more likely to suffer from attention impairment and sleep problems despite being younger, on average, than individuals without recent marijuana use. In addition, bivariate analysis conducted on a subsample of participants with pain data revealed that individuals with past year marijuana use reported greater average pain and more severe pain in the past week than those without recent marijuana use. It may therefore be useful for clinicians to ask older patients with pain and sleep continuity problems whether they are using marijuana. Older people who use marijuana also tend to use combustible cigarettes and alcohol[12] and thus represent a higher-risk population. Participants with recent marijuana use did not rate their health more poorly than those without recent marijuana use. This is consistent with prior research suggesting that, unlike people under the age of 65,[39] marijuana use is less common among older individuals who suffer from multiple chronic health conditions than those without such conditions.[8]

Although past year marijuana use was linked to subjective memory complaints in a recent population-level analysis of US adults

TABLE 1 Sample characteristics and health problems as a function of marijuana use history.

		Total $N = 910$	Never used marijuana $N = 679$	Former use marijuana $N = 183$	Recent use (past year) $N = 48$	
		N (col %)				p value[a]
Covariates						
Sex	Female	572 (62.9)	460 (67.8)	87 (47.5)	25 (52.1)	<0.0001
	Male	338 (37.1)	219 (32.3)	96 (52.5)	23 (47.9)	
Race	Black, Asian, AIAN	63 (6.9)	41 (6.0)	18 (9.8)	4 (8.3)	0.184
	White	847 (93.1)	638 (94.0)	165 (90.2)	44 (91.7)	
Education	< High school	29 (3.2)	28 (4.1)	0	1 (3.5)	<0.0001
	High school	309 (34.0)	262 (38.6)	39 (21.3)	8 (16.7)	
	> High school	572 (62.9)	389 (57.3)	144 (78.7)	39 (81.3)	
Age	65–74 years	452 (49.7)	259 (38.1)	152 (83.1)	41 (85.4)	<0.0001
	75–84 years	279 (30.7)	244 (35.9)	28 (15.3)	7 (14.6)	
	85+ years	179 (19.7)	176 (25.9)	3 (1.6)	0 (0)	
Married/living as married	Yes	418 (47.6)	310 (47.2)	88 (49.7)	20 (44.4)	0.762
	Unmarried	461 (52.5)	347 (52.8)	89 (50.3)	25 (55.6)	
Weekly alcohol use	No	738 (81.3)	568 (83.8)	140 (76.5)	30 (63.8)	0.001
	Yes	170 (18.7)	110 (16.2)	43 (23.5)	17 (36.2)	
Current cigarette use	No	850 (93.4)	649 (95.6)	161 (88.0)	40 (83.3)	<0.0001
	Yes	60 (6.6)	30 (4.4)	22 (12.0)	8 (16.7)	
Outcomes						
Self-rated health	Excellent/very good	390 (42.9)	285 (42.0)	83 (45.4)	22 (45.8)	0.868
	Good	389 (42.8)	292 (43.0)	77 (42.1)	20 (41.7)	
	Poor/fair	131 (14.4)	102 (15.0)	23 (12.6)	6 (12.5)	
Depression (mCES-D)[b]	≤3	785 (87.2)	587 (87.5)	159 (87.9)	39 (81.3)	0.441
	≥4	115 (12.8)	84 (12.5)	22 (12.2)	9 (18.8)	
Anxiety (GAD7)[c]	≤6	806 (89.5)	604 (89.9)	165 (91.2)	37 (77.1)	0.014
	≥7	95 (10.5)	68 (10.1)	16 (8.8)	11 (22.9)	
Services for a mental disorder	No	674 (76.5)	515 (78.3)	133 (74.7)	26 (57.8)	0.006
	Yes	207 (23.5)	143 (21.7)	45 (25.3)	19 (42.2)	
Psychotropic Rx drug use	No	650 (74.2)	490 (74.8)	131 (74.0)	29 (65.9)	0.425
	Yes	226 (25.8)	165 (25.2)	46 (26.0)	15 (34.1)	
CDR	0	721 (82.1)	528 (80.4)	157 (88.7)	36 (81.8)	0.094
	0.5	138 (15.7)	112 (17.1)	19 (10.7)	7 (15.9)	
	≥1	19 (2.2)	17 (2.6)	1 (0.6)	1 (2.3)	
MMSE impairment	No	742 (90.1)	555 (89.9)	150 (93.2)	37 (92.5)	0.264
	Yes	82 (10.0)	68 (10.9)	11 (6.8)	3 (7.5)	
Attention impairment	No	828 (93.2)	613 (92.9)	172 (95.6)	43 (89.6)	0.261
	Yes	60 (6.8)	47 (7.1)	8 (4.4)	5 (10.4)	
Executive function impairment	No	832 (92.1)	623 (92.7)	167 (91.3)	42 (87.5)	0.382
	Yes	71 (7.9)	49 (7.3)	16 (8.7)	6 (12.5)	

(Continues)

TABLE 1 (Continued)

		Total N = 910	Never used marijuana N = 679	Former use marijuana N = 183	Recent use (past year) N = 48	
		N (col %)				p value[a]
Language impairment	No	822 (92.5)	609 (92.3)	169 (93.4)	44 (91.7)	0.864
	Yes	67 (7.5)	51 (7.7)	12 (6.6)	4 (8.3)	
Memory impairment	No	815 (93.0)	606 (93.7)	167 (92.3)	42 (87.5)	0.243
	Yes	61 (7.0)	41 (6.3)	14 (7.7)	6 (12.5)	
Visuospatial impairment	No	613 (93.5)	431 (92.7)	146 (95.4)	36 (94.7)	0.468
	Yes	43 (6.6)	34 (7.3)	7 (4.6)	2 (5.3)	
IADL score[d]	0	670 (76.7)	476 (72.9)	157 (88.7)	37 (84.1)	<0.0001
	≥1	204 (23.3)	177 (27.1)	20 (11.3)	7 (15.9)	
ADL score[e]	0	641 (73.0)	451 (68.7)	153 (86.4)	37 (84.1)	<0.0001
	≥1	237 (27.0)	206 (31.4)	24 (13.6)	7 (15.9)	
Subjective memory complaints[f]	0–2	591 (65.0)	434 (63.9)	125 (68.3)	32 (66.7)	0.5442
	3–5	223 (24.5)	171 (25.2)	43 (23.5)	9 (18.8)	
	≥6	96 (10.6)	74 (10.9)	15 (8.2)	7 (14.6)	
Self-report hypertension	No	323 (35.5)	223 (32.8)	76 (41.5)	24 (50.0)	0.009
	Yes	587 (64.5)	456 (67.2)	107 (58.5)	24 (50.0)	
Worst pain severity N = 85	No pain past week	46 (54.1)	26 (47.3)	19 (86.4)	1 (12.5)	0.001
	1–7	23 (27.1)	19 (34.6)	1 (4.6)	3 (37.5)	
	≥8	16 (18.8)	10 (18.2)	2 (9.1)	4 (50.0)	
Average pain severity N = 84	No pain past week	46 (54.8)	26 (48.2)	19 (86.4)	1 (12.5)	0.002
	1–4	15 (17.9)	11 (20.4)	1 (4.6)	3 (37.5)	
	≥5	23 (27.4)	17 (31.5)	2 (9.1)	4 (50.0)	
Trouble falling asleep	Never/rarely	627 (68.9)	467 (68.8)	131 (71.6)	29 (60.4)	0.328
	Sometimes/ usually	283 (31.1)	212 (31.2)	52 (28.4)	19 (39.6)	
Trouble going back to sleep if awakened	Never/rarely	580 (63.7)	433 (63.8)	124 (67.8)	23 (47.9)	0.039
	Sometimes/ usually	330 (36.3)	246 (36.2)	59 (32.2)	25 (52.1)	
Wake earlier than want	Never/rarely	622 (68.4)	469 (69.1)	126 (68.9)	27 (56.3)	0.180
	Sometimes/ usually	288 (31.7)	210 (30.9)	57 (31.2)	21 (43.8)	
Excessive daytime sleepiness	Never/rarely	466 (51.2)	333 (49.0)	110 (60.1)	23 (47.9)	0.026
	Sometimes/ usually	444 (48.8)	346 (51.0)	73 (39.9)	25 (52.1)	

Abbreviations: ADL, activities of daily living; AIAN, American Indian/Alaskan Native; CDR, Clinical Dementia Rating; GAD7, Generalized Anxiety Disorder 7-item assessment; IADL, independent activities of daily living; mCES-D, modified Center for Epidemiological Studies Depression scale; MMSE, Mini-Mental State Examination.

[a]Chi-square tests and Fisher's exact tests were used to test associations.

[b]mCES-D score range 0–20.

[c]GAD7 score range 0–21.

[d]IADL score range 0 (independent) to 7.

[e]ADL score range 0 (independent) to 6.

[f]subjective memory complaints score range 0–21.

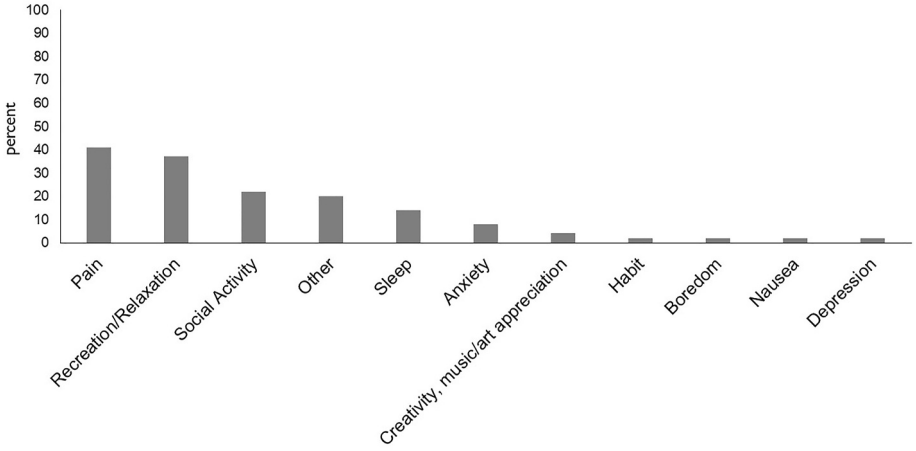

FIGURE 1 Reasons for recent marijuana among community-dwelling adults over 65 with past-year use ($n = 48$).

TABLE 2 Adjusted odds ratios of recent marijuana use[a].

Outcome variable	Odds ratio (OR)	95% confidence interval	Wald test statistic
Depression/Anxiety	2.36	1.19–4.69	6.04**
Attention impairment	2.92	1.02–8.35	4.00*
Problems falling back asleep	2.46	1.34–4.52	8.36**

[a]0 = no current use, 1 = past year use; adjusting for daily cigarette use, weekly alcohol use, education attainment, age, race, and sex.

* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$.

over 50,[40] past year marijuana use was not associated with subjective memory complaints or memory test scores in our study with individuals over 65. A pilot study of brain structure in older adults using MRI scans found no differences between individuals who were current marijuana users compared to those who were non-users[41] but there may be functional differences, as reflected in reduced cognitive performance in older adults with a history of heavier or more frequent marijuana use.[20] A review of PET studies on molecular brain differences found evidence for a link between marijuana use and striatum dopamine synthesis capacity, and this was related to inattention, working memory deficits, negative mood, and cravings among individuals with marijuana use or Cannabis Use Disorder.[42] In one small (n = 16) crossover RCT of US patients with diabetic peripheral neuropathy, those who inhaled a high dose of vaporized marijuana leaf reported an analgesic effect but also experienced reductions in attention/working memory that might have an impact on daily activities such as driving.[43] Health care providers can caution their marijuana-using patients to avoid "driving while high." Future research in larger samples of older adults may have sufficient numbers of participants with current marijuana use to allow results to be stratified by amount and frequency of use and/or by type or dose of marijuana.

Our study participants with recent marijuana use also reported more psychiatric distress, including symptoms of anxiety, compared to participants without recent marijuana use. Individuals who had used marijuana in the past year were twice as likely as non-users to report services for a mental disorder, including depression and anxiety, in the past year. One-third of participants with recent marijuana use had been prescribed a psychotropic medication, compared to a quarter of those with no history or no recent use of marijuana. These findings are consistent with prior studies linking marijuana use to mental health problems in older adults.[15,21,43] Although some individuals with mood disorders may be attempting to self-medicate their symptoms with marijuana, there is evidence from longitudinal studies of younger people that marijuana use, especially frequent and/or heavy use, increases the likelihood of these symptoms.[44–48] Similarly, reductions in marijuana use may result in decreased depression scores[49,50] although this work needs to be replicated in older adults. Research conducted in younger people indicates that the link between marijuana use and psychiatric symptoms may be related to reduced dopamine synthesis capacity in individuals who use marijuana.[41] People who are aging outside of bigger cities are more likely to rely on general practitioners to assess for mental health and less likely to access specialty care than people living in urban areas, even with the growth of telehealth services.[51] The results of this study suggest that primary care providers should assess for mental health problems in older patients who use marijuana.

Although this was a large US sample of community-dwelling adults aged 65 and older with robust measures of mental health and standardized assessments of cognitive functioning, there are some limitations to consider. These data are cross-sectional and therefore provide no information about directionality or causality. More longitudinal research of adults followed into late adulthood is needed to determine if years and quantity of marijuana use have an

impact on pain or cognitive decline in those without prior history of these conditions. The results of this study also may not generalize to other populations of older adults who live in rural or large urban areas, different racial and ethnic groups, and from other countries. For example, the small-town largely White population sampled for this study were not the target of the "War on Drugs" that penalized marijuana use disproportionately among Black and indigenous people in North America, amplifying health inequities for these communities.[52,53] More focus is needed on the implications of marijuana use among older people from racial and ethnic minority groups and more research is needed on marijuana use in older adults from lower and middle income (LMIC) countries.[54] Marijuana use is more common in urban areas[55,56] so this analysis may underestimate use among older adults. It is possible that older adults from small towns who use marijuana may represent people who are at greater risk of health behaviors than older people from large urban areas. However, the prevalence of recent marijuana use in this sample was consistent with what has been reported in national US samples with similar demographic correlates of use.[8] Another limitation was that pain in the past week was only measured in a small subset of the participants, and thus multivariate results were not conducted on average pain or most severe pain in the past week. Longitudinal studies with repeated measures of pain are needed to determine if marijuana use is associated with alleviation of different types of pain in older adults.

4.1 | Conclusion

As medical and recreational marijuana use becomes available more widely, more older individuals are likely to use marijuana[4,8] and may need advice from healthcare providers regarding marijuana use. Marijuana use has not only been linked to poorer mental health among older populations but may also interact with prescription drugs commonly used in this population such as warfarin.[57] Older people who use marijuana may also be at greater risk of motor vehicle accidents[58] and other marijuana-related problems compared to younger adults.[59] Health care providers should consider routinely asking all their patients, regardless of their age, about marijuana use in the same non-judgmental manner they ask about use of herbal supplements, tobacco, and alcohol. As with alcohol and tobacco use, discussions about the possible harms of marijuana use and suggestions for harm reduction should be part of discussions with providers. Patients who use marijuana for medical reasons should be offered more effective, evidence-based treatment for those conditions. Some older people in medical marijuana states may be pleased to have access to marijuana as another treatment option, but frustrated that science and therefore their physicians, currently cannot provide accurate information about dosing and adverse effects.[60]

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CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to disclose.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

Ethical approval for this study was obtained from the University of Pittsburgh IRB.

PARTICIPANT CONSENT

All participants provided written informed consent prior to data collection.

ORCID

Natacha M. De Genna https://orcid.org/0000-0002-8264-3485

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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