Brief report

The association of medical cannabis use with quality of life in Illinois' opioid alternative pilot program

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ABSTRACT

Background: In Illinois, the Opioid Alternative Pilot Program (OAPP) was launched to expand access to medical cannabis to use as a direct substitute for opioids. Although therapeutic benefits have been reported in reducing opioid use, there is an absence of literature that examines how medical cannabis use impacts an individual's quality of life (QoL). This study examines the association of medical cannabis use with QoL among the first enrollees in OAPP.
Methods: A survey was sent to enrollees between February and July 2019. Cannabis users (n=626) were compared to non-users (n=234) to determine whether there was an association between cannabis use within the past year and QoL. Ordered logistic regression and backwards stepwise regression modelling was used.
Results: Across the study sample of 860 participants, the average age was 47 years; 60 % of the cohort was male; 72 % were not of Hispanic, Latino, or Spanish origin; 67 % were married. Across the entire study sample, the average perceived QoL was 2.86 (between 'Good' and 'Fair'), with no statistically significant difference in QoL between the two groups (non-users: 2.85; cannabis users: 2.86; p=0.92). Logistic regression reported cannabis use within the past year did not have a statistically significant association with QoL (OR=1.33, 95% confidence interval, 0.85 to 2.08, p=0.21).
Discussion: Overall, there was no significant association between cannabis use within the past year and QoL. This may be attributed to pain being a qualifying condition to enter the program.

Introduction

In the United States (US), an increasing number of states have legalized medical and recreational cannabis use [1]. Medical cannabis has been legal in Illinois since 2013, with the only surveillance of medical cannabis usage coming from Medical Cannabis Patient Program (MCPP) enrollees [2]. The MCPP provided access to medical cannabis for those who had one of 30 debilitating conditions (e.g., autism, arthritis, Parkinson's disease). However, this list did not include opioid dependence or chronic pain as a qualifying condition. In 2018, Illinois passed the Alternative to Opioids Act, which led to the Opioid Alternative Pilot Program (OAPP) by the Illinois Department of Public Health (IDPH) [3]. The OAPP was an opportunity to expand the MCPP, 1 year before recreational cannabis use became legal in Illinois. Unlike other harm reduction programs, Illinois is the first state in the US to offer a separate harm reduction medical cannabis program, specifically developed to allow participants with chronic pain or an opioid medication to receive a certification to substitute medical cannabis for opioids [4–6].

As more individuals are now choosing medical cannabis for various health conditions, there is an urgent need to study the impact of cannabis interventions on an individual's health outcomes, particularly their quality of life (QoL) [7,8] and whether cannabis can potentially improving the QoL of patients who use opioids [9,10]. Despite the therapeutic benefits reported in previous studies, the robustness of these studies is very low due to a lack of randomized controlled trials, observational studies without comparison groups, a wide range of cohort sizes (100–3000 patients), lack of clinical details, and lack of standardized measure of their QoL at the beginning of the medical cannabis intervention. Currently, there is only one study that has

Table 1
Characteristics of the OAPP Study Sample by cannabis use status within the past year (n=860)

Characteristics	Non-users N=234	Cannabis Users N=626	P-value
No. (%)			
Age (mean, SD)	40.5, 14.2	49.7, 13.4	<0.0001
Sex			
Male	175 (74.8)	339 (54.0)	<0.0001
Female	59 (25.2)	287 (45.7)	
Race/Ethnicity			
Not Hispanic, Latino, or Spanish origin	90 (38.5)	534 (85.3)	<0.0001
Hispanic, Latino or Spanish origin	144 (61.5)	92 (14.7)	
Education			
Up to and including high school/GED	18 (7.7)	92 (14.7)	<0.0001
Some college or an associate degree	191 (81.6)	277 (44.2)	
Bachelor's degree	15 (6.4)	149 (23.8)	
Beyond bachelor's degree	10 (4.3)	108 (17.3)	
Marital status			
Never married	9 (3.9)	112 (17.9)	<0.0001
Divorced, Separated or Widowed	33 (14.1)	125 (20.0)	
Married	192 (82.1)	389 (62.1)	
Military service			
Never served	202 (86.3)	586 (93.6)	0.001
Reserves, National Guard, active duty or previously served	32 (13.7)	40 (6.4)	
Employment Status			
Employed	38 (16.2)	290 (46.3)	<0.0001
Unemployed	140 (59.8)	82 (13.1)	
Homemaker or student	6 (2.6)	26 (4.2)	
Retired	20 (8.6)	95 (15.2)	
Unable to work	30 (12.8)	133 (21.3)	
Having a Disability			
Yes	41 (17.5)	419 (66.7)	<0.0001
No	193 (82.5)	207 (33.1)	
Financial Problems			
Yes	34 (14.5)	201 (32.1)	<0.0001
No	200 (85.5)	425 (67.9)	

Abbreviations: SD = standard deviation, GED = General educational development.

assessed QoL within a harm reduction program, which did result in an improved QoL score over time [11].

Thus, the purpose of this study is to examine whether medical cannabis use within the past year is associated with QoL in this first sample of OAPP participants in 2019. In alignment with the one study [12] that measured QoL from the start and end of their medical cannabis program, we hypothesized that individuals entering the OAPP would report 'poor' or low QoL.

Methods

Study design and participants

This study sample and design have been described in a previous paper [13]. In collaboration with the IDPH, University of Illinois Urbana-Champaign (UIUC) and University of Iowa, researchers sent a baseline survey during February-July 2019 to 2866 individuals who enrolled in the OAPP during the same time period.

Measures

Cannabis use

Cannabis use was the main independent variable in this study and measured via the survey question "In the past year, for what purpose did you use cannabis?" with the options of "I did not use cannabis" or "I did use cannabis." Respondents who only selected "personal use" were excluded from the sample as it was assumed these respondents were using cannabis for non-medical purposes only (Supplemental Figure 1).

Quality of life (QoL)

The Quality of Life Scale was originally a 15-item instrument used to determine the impact of health care on populations with a specific type of condition or disease [14]. Although there are multiple versions

of the Quality of Life Scale, a single-item measure of QoL and/or self-reported health status has been frequently used in the literature [15,16]. In our OAPP study, self-reported QoL was the dependent variable and measured QoL on a numeric scale via a single item: "In general, would you say your overall quality of life is?" with five item responses: i) Poor, ii) Fair, iii) Good, iv) Very good, and v) Excellent.

Covariates

Participants also self-reported other demographic characteristics (Table 1) and other health outcome measures including pain, general productivity, psychological well-being, exercise levels, sleep quality, emotional problems, digestion problems, memory problems, incidences of falling and emergency room visits (Appendix A).

Statistical analyses

Cannabis users (n=626) were compared to non-users (n=234) to determine whether there were any significant differences in demographic characteristics. Duplicates were defined as one person responding more than once (more than one response with the same record ID). If there were duplicates, the survey response that was more complete (fully answered) was accepted. If the duplicated responses were both filled out and answers different, we accepted the first time stamped response as the purpose of the survey was to capture participants for the very first time as they entered the program (not later on). Chi-square tests were conducted for comparisons of proportions for categorical characteristics, and *t*-tests were used to compare mean values of continuous characteristics. Ordered logistic regression was used. For the backwards stepwise regression modelling, all demographic variables (e.g., age, gender, ethnicity, education) were force kept in the model regardless of significance level as these variables are typically adjusted for in regression models [17,18]. All

regression analyses were performed using STATA version 17. We tested for all possible first order interactions between cannabis use and all other independent variables (see Appendix B for all variables tested). We further tested multiple interactions between several covariates to ensure that the exploratory model could capture interactions that main effects alone could not. From our regression analysis, we found that there were three statistically significant interaction terms that were included in the primary analysis regression model. Finally, we used two strategies for addressing missing values in our survey data. Both approaches have been described in a previous paper we published on the OAPP [13] and guided by van Buuren & Groothuis-Oudshoorn (2011) [19].

Further stratification was conducted on cannabis use (within the past year), by frequency, to assess whether higher frequency of cannabis had a different association with QoL. We compared 'non-users' to "regular cannabis users" (using cannabis 3 or more times per week within the past year).

Results

Overall, there were 2866 surveys send out to individuals who enrolled in the OAPP in 2019. From there, there were 880 participants (response rate: 30 %), which were individuals who provided fully complete responses. From there, 87 duplicates were removed (43 being incomplete survey responses and 44 duplicates of individuals who responded to the survey more than once). In total, there were 860 participants in the analytical sample: 234 (27 %) participants who indicated 'no cannabis use' (non-users), and 626 (73 %) who indicated 'cannabis use within the past year' (cannabis users). This OAPP survey was unable to capture any data on the non-respondents (individuals who were sent the survey but did not respond to the survey). Among cannabis users, 490 participants (78 %) indicated using cannabis "regularly" (3 or more times per week) (Supplemental Figure 1; Table 1). The study sample has been fully described in our previous paper [13]. Across the entire study sample, the average perceived QoL was 2.86 (between 'Good' and 'Fair'), with no statistically significant difference in QoL between the two groups (non-users: 2.85; cannabis users: 2.86; p=0.92) (Table 2).

The final logistic regression model reported cannabis use within the past year did not have a statistically significant association with QoL (OR=1.33, 95 % CI: 0.85, 2.08), indicating that OAPP participants who used cannabis did not increase or decrease the odds of having higher QoL than non-users (Table 3). As mentioned, there were also three

Table 2

Self-reported quality of life and health outcomes categorized by cannabis use within the past year status (n=860).

Health Outcome Measures Mean	Overall (n=860)	Cannabis Use within the past year		
		Non-users (n=234)	Users (n=626)	P-value[a]
Quality of life	2.86	2.85	2.86	0.92
Psychological well-being	3.18	3.12	3.21	0.18
Sleep quality	2.82	2.84	2.81	0.64
Digestion problems	3.46	3.76	3.36	<0.0001
Emotional problems	3.50	3.85	3.38	<0.0001
Exercise	2.44	2.67	2.36	0.0002
General productivity	3.46	3.63	3.39	0.001
Pain level	60.25	61.93	59.62	0.12
Number (%) of individuals who had memory problems	210 (24.4)	29 (12.4)	181 (28.9)	<0.0001
Number (%) of individuals who went to the ER	42 (4.9)	8 (3.4)	34 (5.4)	0.23
Number (%) of individuals who reported falls	78 (9.1)	12 (5.1)	66 (10.5)	0.01

[a] All p-values were determined via a *t*-test if the variable was continuous, chi-square if variable was categorical

Table 3

Association of medical cannabis use within the past year (and other predictors) with quality of life among OAPP participants (n=860)

Model/Variables	Odds ratio	95% Confidence Intervals	P-value
Cannabis use within the past year	1.33	0.85, 2.08	0.21
Opioid use within the past year	2.60	1.14, 5.92	0.02
High frequency of opioid use within the past year	0.43	0.31, 0.60	<0.0001
Age, per 1-year increase	1.02	1.01, 1.05	0.001
Female gender	0.75	0.02, 1.88	0.09
Hispanic, Latino, or Spanish origin	0.67	0.38, 1.16	0.15
Education level			
No schooling up to high school (ref)	1.00	…	…
Some college	1.28	0.81, 2.04	0.29
Bachelor's degree	1.71	1.00, 2.91	0.05
Beyond bachelor's degree	2.07	1.15, 3.75	0.02
Marital status			
Never married (ref)	1.00	…	…
Divorced/Separated/Widowed	0.80	0.50, 1.27	0.34
Married	0.52	0.30, 0.89	0.02
Military status: currently or have previously serviced	1.67	0.91, 3.05	0.10
Employment status			
Employed (ref)	1.00	…	…
Unemployed	0.75	0.42, 1.36	0.34
Homemaker/student	1.42	0.63, 3.19	0.40
Retired	0.95	0.55, 1.62	0.84
Unable to work	1.60	0.93, 2.75	0.09
Financial problems	0.83	0.56, 1.23	0.35
Pain	0.96	0.95, 0.97	<0.0001
General productivity	3.77	2.94, 4.84	<0.0001
Psychological well-being	5.04	2.74, 9.30	<0.0001
Exercise	1.55	1.28, 1.87	<0.0001
Emotional problems	1.52	1.16, 1.99	0.003
Digestion problems	6.53	3.38, 12.64	<0.0001
Memory problems	21.3	4.71, 96.35	<0.0001
Having a disability	0.25	0.11, 0.55	0.001
Memory x Digestion problems interaction	0.38	0.25, 0.58	<0.0001
Psychological well-being x Digestion problems interaction	0.83	0.70, 0.98	0.03
Having a disability x Exercise interaction	1.47	1.08, 2.00	0.01

interaction terms that were statistically significant in the primary analysis. The sensitivity analyses also showed that regular cannabis use within the past year did not have a statistically significant association with QoL (OR=1.36, 95 % CI: 0.84, 2.20) (Supplementary Table 1 and Supplementary Table 2).

Discussion

Overall, there was no significant association between cannabis use within the past year and QoL, in which OAPP participants who used cannabis within the past year reported similar QoL as non-users as they entered the program. This is not particularly surprising as one of the eligibility requirements to enter the OAPP was to have a pain or health condition that would make the individual eligible to receive opioids, and pain has been shown to be directly associated with QoL [20].

The rating of the OAPP's QoL is similar to other cross-sectional survey studies on medical cannabis. One cross-sectional study [21] reported that their 100 participants scored, on average, a 'moderate level of general health status'. Another study in Pennsylvania [12] with 299 adults starting medical cannabis reported that they rated 'low' QoL in multiple domains. Lastly, although a statistically significant difference was noted between average scores for some health outcome predictors between cannabis users and non-users, these small differences may not show a clinically relevant difference.

The major strength of this study is that it is one of the few studies in the US, to our knowledge, to assess QoL from a program that directly allows substitution of opioids for cannabis. As such, the characteristics of the medical cannabis user population may be

generalizable to other individuals enrolled in similar harm reduction programs in the US. Finally, another major strength of this study is its ability to provide insight about Illinois' first study sample of OAPP enrollees, individuals in Illinois who are eligible for an opioid, and a subset of individuals with disability status [3].

However, the study is not without limitations. The study is cross-sectional, and all measures were self-reported, which limits our ability to fully assess the causal mechanism between cannabis use and QoL. Secondly, although robust methods were used for multiple imputation, there was a risk for nonresponse bias as the survey had a response rate of only 30 %, which may have resulted in underestimation in the prevalence of health measures and characteristics. Thirdly, our study is limited by the lack of clinical details such as other medication use or substance use; and there is no guarantee that OAPP participants consumed medical cannabis as prescribed by the physician and whether patients chose to use alternative treatments for their pain. Fourthly, although we took rigorous steps to mitigate bias, instances where we removed duplicate responses from participants may have still introduced confounding if incomplete response versions had completely different responses than duplicate versions. Lastly, we were unable to pinpoint one specific strain, dose, or frequency of medical cannabis in this study.

Conclusion

In Illinois' first study sample of OAPP participants, there was no clinically relevant differences in QoL between cannabis users versus non-users. In continuing to build evidence, future surveys with this study sample should implement a multi-item QoL questionnaire with strong psychometric properties to fully assess all domains of QoL.

Funding Sources

Conflict of Interest

There are no competing interests to declare.

Ethics approval and consent to participate

This original ethics approval was completed by the IDPH and UIUC. As this was a secondary data analysis of using de-identified data, the Northwestern IRB deemed the project to have non-human subjects and not require an additional IRB approval (STU00217293).

Declaration of generative AI in scientific writing

We did not use any generative AI and/or AI-assisted technologies in the writing of this manuscript.

Author Contributions

CD designed the study and is the primary author of this paper. LD is the statistician that conducted the advanced imputation methods. All other authors (NJ, AAK, JB, and DTE) revised it critically for important intellectual content and approved the final version to be published. All authors are accountable for the work and integrity of the work.

Consent for publication

All authors consent to the publication of this manuscript.

Data Availability Statement

The data can be made available, upon reasonable request to Dr. Julie Bobitt.

Human and Animal Rights and Informed Consent

This article does not contain any studies with human or animal subjects performed by any of the authors.

Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.jeph.2024.202803.

References

[1] A.R. Turner and S. Agrawal, "Marijuana," in *StatPearls*. Treasure Island (FL), 2022.

[2] I. D. o. P. H. (IDPH). "Debilitating conditions." Illinois.gov. https://dph.illinois.gov/topics-services/prevention-wellness/medical-cannabis/debilitating-conditions.html (Accessed October 12, 2022).

[3] I. D. o. P. Health. "Opioid Alternative Pilot Program." https://dph.illinois.gov/topics-services/prevention-wellness/medical-cannabis/opioid-alternative-pilot-program.html (Accessed October 17, 2022).

[4] Hawk M, et al. Harm reduction principles for healthcare settings. Harm Reduct J 2017;14(1):70. doi: 10.1186/s12954-017-0196-4.

[5] Hawk KF, Vaca FE, D'Onofrio G. Reducing Fatal Opioid Overdose: Prevention, Treatment and Harm Reduction Strategies. Yale J Biol Med Sep 2015;88(3):235–45 [Online]. Available https://www.ncbi.nlm.nih.gov/pubmed/26339206.

[6] Newcombe R, O'Hare P, et al. The reduction of drug-related harm: a conceptual framework for theory, practice and research. London: Routledge; 1992.

[7] Wadsworth E, Hines LA, Hammond D. Legal status of recreational cannabis and self-reported substitution of cannabis for opioids or prescription pain medication in Canada and the United States. Subst Abus 2022;43(1):943–8. doi: 10.1080/08897077.2022.2060431.

[8] S. Bains and T. Mukhdomi, "Medicinal Cannabis For Treatment Of Chronic Pain," in *StatPearls*. Treasure Island (FL), 2022.

[9] Mok J, et al. Use of cannabis as a harm reduction strategy among people who use drugs: a cohort study. Cannabis Cannabinoid Res 2023;8(4):670–8. doi: 10.1089/can.2021.0229.

[10] Lucas P, Boyd S, Milloy MJ, Walsh Z. Cannabis significantly reduces the use of prescription opioids and improves quality of life in authorized patients: results of a large prospective study. Pain Med 2021;22(3):727–39. doi: 10.1093/pm/pnaa396.

[11] Aviram J, et al. Prolonged medical cannabis treatment is associated with quality of life improvement and reduction of analgesic medication consumption in chronic pain patients. Front Pharmacol 2021;12:613805. doi: 10.3389/fphar.2021.613805.

[12] Buonomano LS, et al. Clinical characteristics and quality of life in adults initiating medical marijuana treatment. Med Cannabis Cannabinoids 2022;5(1):95–101. doi: 10.1159/000524831.

[13] Dubois C, Bobitt J, Ding L, Eurich DT, Knapp AA, Jordan N. The association of medical cannabis use with pain levels and opioid use in illinois' opioid alternative pilot program. Subst Use Misuse 2024:1–12. doi: 10.1080/10826084.2024.2383585.

[14] Burckhardt CS, Anderson KL. The quality of life scale (QOLS): reliability, validity, and utilization. Health Qual Life Outcomes 2003;1:60. doi: 10.1186/1477-7525-1-60.

[15] Wasson JH. A brief review of single-item and multi-item quality-of-life measures for medicare patients. J Ambul Care Manage 2019;42(1):21–6. doi: 10.1097/JAC.0000000000000265.

[16] Meng Q, Xie Z, Zhang T. A single-item self-rated health measure correlates with objective health status in the elderly: a survey in suburban beijing. Front Public Health 2014;2:27. doi: 10.3389/fpubh.2014.00027.

[17] Norgaard M, Ehrenstein V, Vandenbroucke JP. Confounding in observational studies based on large health care databases: problems and potential solutions - a primer for the clinician. Clin Epidemiol 2017;9:185–93. doi: 10.2147/CLEP.S129879.

[18] Andrade C. Confounding. Indian J Psychiatry 2007;49(2):129–31. doi: 10.4103/0019-5545.33263.

[19] van Buuren SG-O. mice: multivariate imputation by chained equations in R. J Stat Softw 2011;45:1–67 Available https://scikit-learn.org/stable/modules/impute.html#iterative-imputer.

[20] Hadi MA, McHugh GA, Closs SJ. Impact of chronic pain on patients' quality of life: a comparative mixed-methods study. J Patient Exp 2019;6(2):133–41. doi: 10.1177/2374373518786013.

[21] Tsampoula I, et al. Quality of life in patients receiving medical cannabis. Adv Exp Med Biol 2023;1425:401–15. doi: 10.1007/978-3-031-31986-0_39.