Cannabis Consumers' View of Regulated Access to Recreational Cannabis: A Multisite Survey in Switzerland

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Abstract

Introduction: There is considerable effort in legalizing recreational use of cannabis globally. The successful implementation of a program of regulated access to recreational cannabis (PRAC) depends on the consumers' engagement. The aim of this study was to examine the acceptability of twelve different regulatory aspects by cannabis users including those obtaining cannabis from the illicit market and vulnerable populations such as young adults and problematic users. *Methods:* The current study is a multisite online survey conducted in Switzerland. A total of 3,132 adult Swiss residents who consumed cannabis within the previous 30 days represented the studied population. Mean age was 30.5 years, 80.5% were men, and 64.2% of the participants stated that they always or often obtain cannabis from the illicit market. We described consumers' acceptability of twelve regulatory aspects concerning THC content control, disclosure of sensitive personal data, security aspects, and follow-up procedures by applying descriptive statistics and multiple regression models. *Results:* THC content regulation showed most discrepancy with 89.4% of the participants stating to engage in a PRAC if five different THC contents were available as compared to 54% if only 12% THC was available. The least accepted regulatory aspect was disposal of contact details with an acceptability rate of 18.1%. Consumers mainly obtaining cannabis from the illicit market, young adults, and problematic users showed similar acceptability patterns. Participants obtaining cannabis from the illicit market were more likely to engage in a PRAC if five different THC contents were available as compared to participants obtaining cannabis from other sources (OR 1.94, 95% CI: 1.53–2.46). *Conclusion:* A carefully designed PRAC that takes into account the consumers' perspective is likely to transfer them to the regulated market and to engage vulnerable populations. We cannot recommend the distribution of cannabis with only 12% THC content as this is unlikely to engage the target population.

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Introduction

The production, trade, and consumption of cannabis are prohibited in most countries of the world [1]. At the same time, cannabis is the most widely used drug worldwide with a 30% increase of consumption in the last decade [2]. Banning of cannabis has long been controversial because of its widespread use [2], the modest negative health effects as compared to legal substances such as alcohol and tobacco [3], and the high costs of inefficient prohibition policies [4]. Many countries have adopted a policy based on decriminalization and regulation with the aim to reduce the health risks for vulnerable populations including young adults, problematic users, and mentally ill individuals [4].

Uruguay became the first nation to legalize recreational use of cannabis [5]. One quarter of the USA and Canada legalized recreational use of cannabis in the last years [6]. Despite this international trend, the impact of legalization on the illicit market and public health remains poorly understood [4, 7]. It is mainly driven by expert opinion as research flanking the legalization process is lacking. Legalization advocates say that regulated access to recreational cannabis enables better control of the illicit market, will transfer consumers to the regulated market, and thus will be protective even for vulnerable populations as the regulated market allows to control THC content and to simultaneously implement risk reduction interventions [4, 7, 8]. Opponents argue that, similar to alcohol and smoking, drop in prices will facilitate access having as consequence an increase in consumption which will harm vulnerable populations [4, 9].

Emerging research shows consumers' preference for legal cannabis products, yet the illicit market remains active regardless of the regulation model implemented. In Uruguay, which enforced a highly state-controlled policy, consumer engagement remains challenging with 66% still obtaining cannabis from illegal sources [5]. In the USA, which endorsed a cannabis policy oriented toward free market principles, there remained a considerable cannabis supply from outside of the licensed system [10, 11]. Reasons for poor acceptability of programs of regulated access to recreational cannabis (PRAC) are unknown. It is therefore important to involve cannabis users in policy-making. This enables tailoring regulations to their needs, facilitating consumers' engagement, and defining the potential of a PRAC to transfer consumers from the illicit to the regulated marked. Despite the fact that service user involvement has gained considerable momentum in policy development [12, 13], up until now the opinion of cannabis users on how a PRAC should be designed was not evaluated.

The aim of this multisite survey in Switzerland was to examine the acceptability of twelve different regulatory aspects by cannabis users including those obtaining cannabis through the illicit market and vulnerable populations such as young adults and problematic users. This will help designing the most promising PRAC to ensure consumers' engagement with the regulated market and engagement of vulnerable populations. This opens an opportunity for simultaneous implementation of risk reduction interventions to protect young adults and problematic users.

Materials and Methods

Study Design

The present multisite online survey used a web page designed for the purpose of the study (www.canreg.ch) with open access to public from November 21 to December 21, 2016. The online questionnaire was available in German and French. Four of the five university hospitals of psychiatry in Switzerland (Zürich, Bern, Basel, Geneva) recruited participants in collaboration with the respective governments through announcements in regional newspaper and social networks. Participants were informed at the beginning of the questionnaire that their participation was voluntary and that their data will be used for scientific reasons in an anonymized and confidential way. To avoid double entry, participants were asked at the end of the questionnaire if they already filled it in. They had the possibility to review and adapt their answer throughout. The implementation of the online survey was realized by the company Empiricon, specialized in online surveys. Participants were eligible if they used cannabis during the previous 30 days and were Swiss residents. We excluded participants younger than 18 years, those who already participated, and those who did not completely fill in the questionnaire. In accordance with the Swiss Human Research Act, ethical approval was not required for this study because health-related data were anonymously collected.

Definition of Regulatory Aspects

A panel consisting of experts in addiction medicine, public health, and mental health as well as members of the city councils of the four participating cities defined different regulatory aspects during four workshops held from August 2016 to October 2016. The proposed PRAC is a joint model of state involvement and cannabis user participation that ensures a state control of substance quality and quantity and guarantees a low entry threshold for adequate consumers' engagement. Distinct regulatory aspects included THC content control (five different THC concentrations, only 12% THC); disclosure of sensitive personal data (verification of residence, contact information disposed at the police, verification of criminal record); security aspects (disposal of driving license, exclusion from the program if distribution to third party, weekly disposal); and follow-up procedures (blood samples, urine samples, follow-up interview every 6 months for 2 years, yearly

professional health assessment for 2 years). We asked participants how likely they would engage in a PRAC if any of these twelve regulations were to be implemented using a 5-point Likert scale (very probably, probably, no opinion, rather not, and probably not). We defined acceptability to be high if participants very probably or probably engaged and as low if they had no opinion and would rather not or probably not engage.

Consumer Characteristics

Participants were asked to score how often they obtained cannabis through self-production (themselves or friends) or the illicit market using a 5-point Likert scale (never, rarely, sometimes, often, and always). We defined the illicit market to be the main source of supply if participants often or always obtained cannabis through the illicit market regardless of additional self-production. We recorded gender, age, employment status, self-reported user type, age at first use, daily or almost daily cannabis use during the last month, loss of control of cannabis usage during the last 6 months and impairment with leisure activities, school or work during the last 6 months. We quantified loss of control and impairment in life using a 5-point Likert scale (never, less than monthly, monthly, weekly, and daily or almost daily) and dichotomized these variables (never vs. rest). We recorded alcohol consumption based on standard drinks and defined problematic alcohol use as suggested by National Institute on Alcohol Abuse and Alcoholism of the NIH [14].

Vulnerable Populations

We defined young adults and problematic users as vulnerable populations. We considered individuals aged between 18 and 25 years as young adults [15] and employed two different definitions of problematic users. First, we defined a problematic user according to the self-declaration of an individual participating in the survey. This definition was used for our main analysis as described in the statistical section below. As self-declaration is prone to misclassification, we also defined problematic use according to clinical criteria. We considered participant reporting a daily or almost daily consumption of cannabis with loss of control over his or her consumption and impairment either at work, at school or in leisure time as problematic user. We used this definition in our sensitivity analysis.

Statistical Analysis

We first described acceptability of the twelve different regulatory aspects using descriptive statistics. We then explored the potential of the different regulatory aspects to transfer cannabis users from the illicit to the regulated market and to engage vulnerable populations using multivariable logistic regression analyses. We modeled the associations between illicit market as main source of cannabis supply (yes vs. no), age of study participants (≤25 years vs. >25 years), and self-reported consumer type (problematic use vs. non-problematic recreational use) as exposures of interest and acceptability of regulatory aspects (high vs. low acceptability) as outcomes. Before running the multivariable models, we evaluated if there was relevant collinearity between covariables. The multivariable model included age at first use, daily or almost daily use of cannabis, loss of control, impairment of leisure time, impairment at school or work, and problematic use of alcohol as confounders. An odds ratio (OR) > 1.0 suggested that participants often or always obtaining cannabis from illicit market were more likely to accept a certain regulatory aspect as compared to participants sometimes, rarely, or never buying cannabis on the illicit market. Likewise, an OR >1.0 suggested that young adults or problematic users were more likely to accept the regulatory aspect as compared to participants aged >25 years and non-problematic recreational users. Finally, we performed a sensitivity analysis employing a definition of problematic use based on clinical criteria rather than self-declaration. We defined problematic use of cannabis as daily or almost daily consumption with loss of control over cannabis consumption and impairment either at work, at school or in leisure time. We adjusted the analysis for source of cannabis supply, gender, age, age at first use, and problematic use of alcohol. All reported p values are two-sided, and all confidence intervals (CIs) refer to 95% boundaries. All analyses were performed with R 4.0.3 (R Core Team (2020). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. www.R-project.org.).

Results

4,172 (56.6%) of the 7,376 individuals accessing the web page were eligible. 3,042 individuals were ineligible because they have not consumed during the last 30 days and 162 individuals because they were not Swiss residents. We excluded 227 participants because they were younger than 18 years and 128 participants because they already participated. 3,132 of all 3,817 included participants completely filled in the questionnaire, thus defining the study population analyzed. Incomplete data on self-reported consumer type and acceptability of different regulatory aspects were the main reasons for exclusion from the analysis. Online supplementary Table 1 (for all online suppl. material, see www.karger.com/doi/10.1159/000530194) reports consumer characteristics, and online supplementary Figure S1 shows acceptability of the twelve regulatory aspects of the included population, indicating missing data ($N = 3,817$). The most popular source of cannabis supply was the illicit market; however, blended use of different sources was frequent. 2,011 (64.2%) of the participants stated that they always or often obtain cannabis from the illicit market, but only 455 (15.4%) participants exclusively relied on it. Table 1 displays consumer characteristics of the whole study population, stratified according to illicit market as main source of cannabis supply. 80.5% of the participants were men, and 1,342 (42.8%) of all participants were young adults aged between 18 and 25 years. Only every tenth participant reported having a problematic use of cannabis. However, half of the study population consumed cannabis daily or almost daily. Approximately one-third (35.7%) of all 1,387 participants who declared a loss of control of cannabis use stated a daily or almost daily loss of control. In almost half of the participants, cannabis use impaired leisure time activities and 12.0% of

Table 1. Sociodemographic and consumer-related characteristics stratified according to illicit market as main source of cannabis supply (N = 3,132)

	Analyzed population	Main source illicit market*		p value
	(N = 3,132)	yes (N = 2,011)	no (N = 1,121)	
Age	30.5 (11.1)	30.0 (11.0)	31.3 (11.4)	0.003
Gender, n (%)				0.013
Women	612 (19.5)	366 (18.2)	246 (21.9)	
Men	2,520 (80.5)	1,645 (81.8)	875 (78.1)	
Employment status, n (%)				0.049
Full-time	1,603 (51.2)	1,052 (52.3)	551 (49.2)	
Part-time	624 (19.9)	373 (18.5)	251 (22.4)	
Training	640 (20.4)	421 (20.9)	219 (19.5)	
Unemployed	265 (8.5)	165 (8.2)	100 (8.9)	
Self-reported consumer type, n (%)				<0.001
Recreational use	2,065 (65.9)	1,283 (63.8)	782 (69.8)	
Self-medication	777 (24.8)	499 (24.8)	278 (24.8)	
Problematic use	290 (9.3)	229 (11.4)	61 (5.4)	
Age at first cannabis use	16.3 (3.7)	16.1 (3.2)	16.6 (4.3)	<0.001
Daily or almost daily cannabis consumption, n (%)				<0.001
Yes	1,591 (50.8)	1,106 (55.0)	485 (43.3)	
No	1,541 (49.2)	905 (45.0)	636 (56.7)	
Perceived loss of control of cannabis consumption, n (%)				<0.001
Yes	1,387 (44.3)	982 (48.8)	405 (36.1)	
No	1,745 (55.7)	1,029 (51.2)	716 (63.9)	
Cannabis consumption impairing leisure time, n (%)				<0.001
Yes	1,449 (46.3)	1,021 (50.8)	428 (38.2)	
No	1,683 (53.7)	990 (49.2)	693 (61.8)	
Cannabis consumption impairing work or school, n (%)				0.002
Yes	375 (12.0)	268 (13.3)	107 (9.5)	
No	2,757 (88.0)	1,743 (86.7)	1014 (90.5)	
Problematic alcohol use[a], n (%)				0.028
Yes	1,761 (56.2)	1,101 (54.7)	660 (58.9)	
No	1,371 (43.8)	910 (45.3)	461 (41.1)	

Values are numbers (%), means (SD), or p values based on Student's t test or χ^2 test. *Illicit market as main source of supply if participants often or always obtain cannabis from the illicit market. [a] ≥5 standard drinks for males or ≥4 standard drinks for females on the same occasion on at least 1 day in the past month.

the participants were impaired at work or school. Hence, 645 (20.6%) of all participants showed problematic use if this was defined as daily or almost daily use with loss of control and impairment either at work, at school or in leisure time. Participants mainly obtaining cannabis through the illicit market were younger, more likely to be men, and stated more often to have a problematic use of cannabis associated with a loss of control and impairment in daily life.

The bar chart in Figure 1 shows acceptability of the twelve regulatory aspects by the whole study population. Seven regulations yielded high acceptability with 50% or more of the participants stating they would very probably or probably take part in a PRAC if these aspects would be implemented. The three most widely accepted aspects were availability of five different THC contents, program exclusion upon distribution to third party, and yearly professional health assessment with 89.4%, 75.9%, and 73.4% of the participants stating they would very probably or probably engage. Acceptability of regulations concerning THC content showed most discrepancy. As compared to the high acceptability if five different THC contents were available, acceptability of only 12% THC was lower with only half of the participants still engaging. The two poorly accepted regulations were disposal of contact information or driving license with only 18.1%
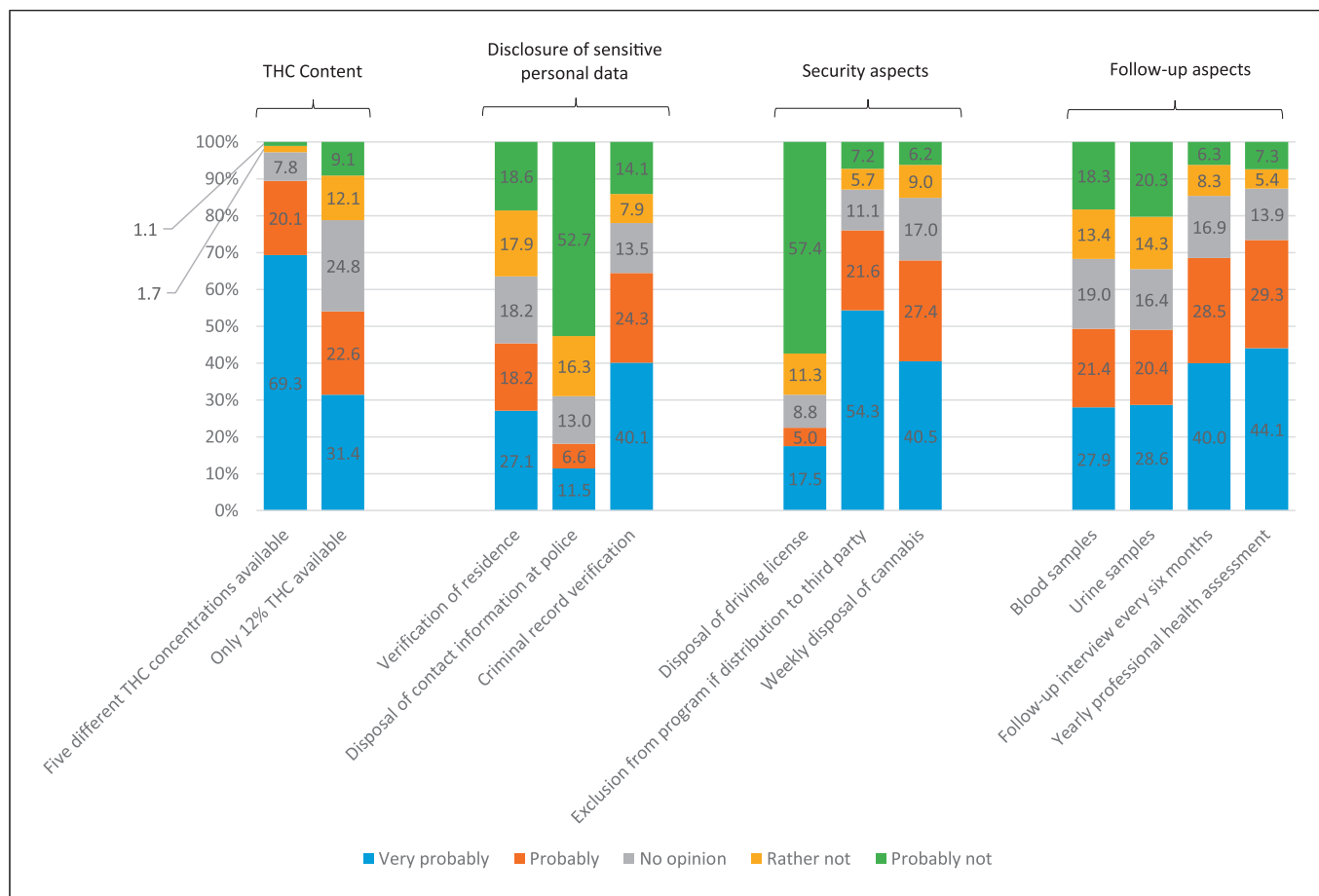
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Fig. 1. Acceptability of twelve regulatory aspects of a program of regulated access to recreational cannabis (*N* = 3,132).

and 22.5% of the participants stating that they would very probably or probably engage. Online supplementary Figures S2–S4 show bar charts of the acceptability in consumers mainly obtaining cannabis from the illicit market, young adults, and problematic users. These subgroups showed acceptability patterns similar to the overall study population.

The caterpillar plot in Figure 2 shows the association between main source of cannabis supply and acceptability of the twelve regulatory aspects controlled for consumer characteristics. Participants mainly obtaining cannabis from the illicit market were significantly more likely to accept seven of the twelve regulations with adjusted ORs between 1.19 and 1.94 as compared to participants sometimes, rarely, or never obtaining cannabis on the illicit market. Availability of five different THC contents showed the strongest association with an adjusted OR of 1.94 (95% CI: 1.53–2.46). As compared to this, availability of only 12% THC was the sole regulation with a point estimate lower than one (OR 0.96, 95% CI: 0.83–1.12). Table 2 summarizes adjusted associations between belonging to a vulnerable population and the twelve regulatory aspects. None of the regulations showed a significant negative association suggesting that young adults or problematic users could be less likely to participate. Young adults were even more likely to engage if five different THC concentrations were available, if their criminal records were to be verified, if they had to dispose their driving license, if cannabis disposal was weekly, and if there were yearly professional health assessments. Adjusted ORs for these regulations were between 1.34 and 1.48 and lower bounds of 95% CI clearly above one. Availability of only 12% THC showed again a negative, nonsignificant association in young adults and problematic users. Our sensitivity analysis using an alternative, clinical definition of problematic use yielded similar results as our main analysis (online suppl. Table 2). Only online supplementary Table 3 shows adjusted
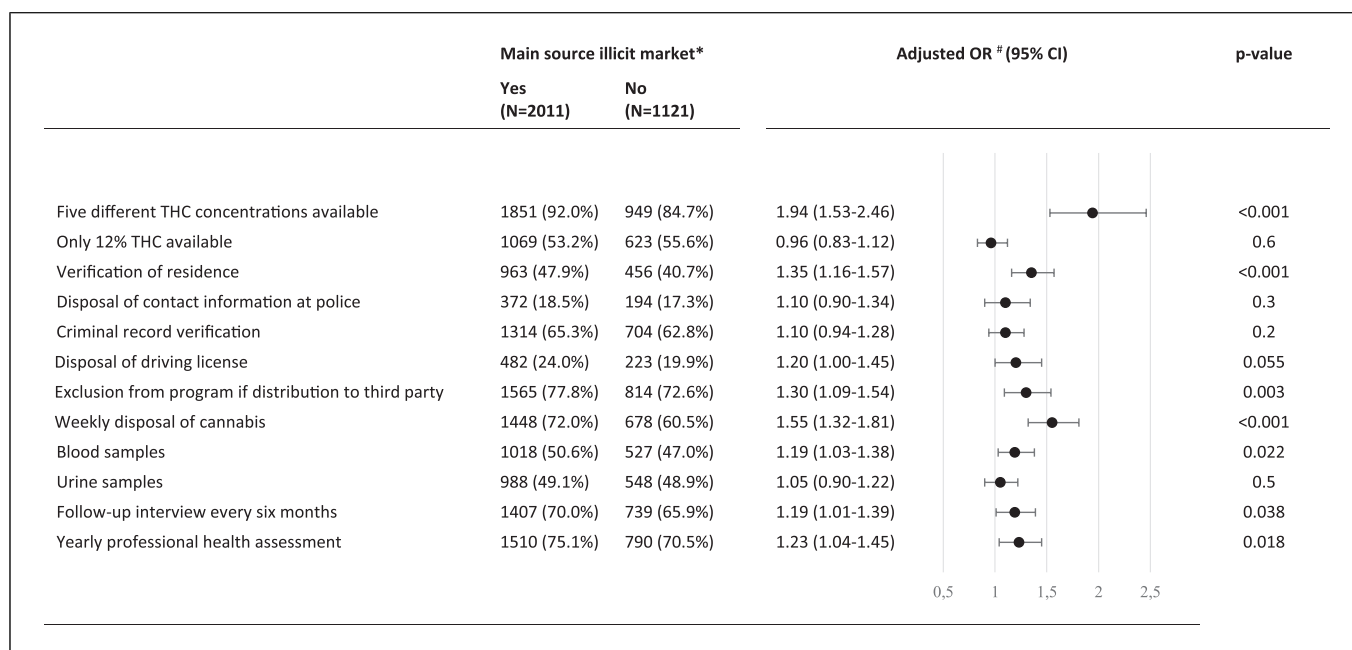
	Main source illicit market*		Adjusted OR # (95% CI)	p-value
	Yes (N=2011)	No (N=1121)		
Five different THC concentrations available	1851 (92.0%)	949 (84.7%)	1.94 (1.53-2.46)	<0.001
Only 12% THC available	1069 (53.2%)	623 (55.6%)	0.96 (0.83-1.12)	0.6
Verification of residence	963 (47.9%)	456 (40.7%)	1.35 (1.16-1.57)	<0.001
Disposal of contact information at police	372 (18.5%)	194 (17.3%)	1.10 (0.90-1.34)	0.3
Criminal record verification	1314 (65.3%)	704 (62.8%)	1.10 (0.94-1.28)	0.2
Disposal of driving license	482 (24.0%)	223 (19.9%)	1.20 (1.00-1.45)	0.055
Exclusion from program if distribution to third party	1565 (77.8%)	814 (72.6%)	1.30 (1.09-1.54)	0.003
Weekly disposal of cannabis	1448 (72.0%)	678 (60.5%)	1.55 (1.32-1.81)	<0.001
Blood samples	1018 (50.6%)	527 (47.0%)	1.19 (1.03-1.38)	0.022
Urine samples	988 (49.1%)	548 (48.9%)	1.05 (0.90-1.22)	0.5
Follow-up interview every six months	1407 (70.0%)	739 (65.9%)	1.19 (1.01-1.39)	0.038
Yearly professional health assessment	1510 (75.1%)	790 (70.5%)	1.23 (1.04-1.45)	0.018

Fig. 2. Acceptability of twelve regulatory aspects according to illicit market as main source of cannabis supply*. Values are numbers (percentages) of participants expressing that they would probably or very probably engage in a corresponding program of regulated access to recreational cannabis. Adjusted odds ratios (ORs) # with corresponding 95% confidence intervals (95% CIs) and *p* values from complete case multivariable logistic regression models (N = 3,132). *Illicit market as main source of supply if participants often or always obtain cannabis from the illicit market. #Adjusted for gender, age, age at first use, self-reported consumer type, daily cannabis use, loss of control of consumption, impairment with leisure activities, impairment at work or school, problematic alcohol use OR >1.0 means participants often or always obtaining cannabis from illicit market are more likely to accept regulatory aspect as compared to participants sometimes, rarely or never buying cannabis on the illicit market.

ORs of all consumer characteristics included in the multivariable model of the main analysis.

Discussion

In this multisite online survey of 3,132 cannabis users, at least half of the participants approved seven of twelve regulatory aspects concerning THC content, disclosure of sensitive personal data, security, and follow-up procedures. Most widely accepted regulations were availability of five different THC contents, program exclusion upon distribution to third party, and yearly health assessment. THC content regulation showed most discrepancy with 54.0% of the participants accepting to engage in a PRAC if only 12% THC was offered as compared to 89.4% of the participants likely to engage if five different THC contents were available. Disposal of contact details or of driving license was the least accepted regulation with only every fifth respondent very probably or probably participating. The illicit market was the most common source of cannabis supply with

two-thirds of all participants stating they always or often obtained cannabis from it. The acceptability pattern of participants mainly obtaining cannabis from the illicit market was comparable to that of the whole study population. Interestingly, participants obtaining cannabis mainly from the illicit market were more likely to accept the majority of the regulations suggesting that users prefer a regulated, legal alternative. Availability of five different THC contents showed the strongest independent association with an adjusted OR of 1.94 (95% CI: 1.53–2.46), whereas availability of only 12% THC was unlikely to shift users from the illicit to the regulated market with an adjusted OR of 0.96 (95% CI: 0.83–1.12). Also, vulnerable populations such as young adults and problematic users showed similar acceptability pattern as the whole study population. None of the regulations showed a significant negative association, suggesting that young adults and problematic users were not less likely to engage in a PRAC than older adults or nonproblematic recreational users.

Our findings suggest no major barrier to reach the target population if a PRAC is carefully designed. A

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Table 2. Associations between participation of vulnerable populations and twelve regulatory aspects

	Young adults (ref: adults >25 years)		Problematic users (ref: recreational users)	
	adjusted OR[1] (95% CI)	p value	adjusted OR[2] (95% CI)	p value
THC content				
Five different THC concentrations available	1.48 (1.15–1.91)	0.002	0.87 (0.56–1.39)	0.5
Only 12% THC available	0.88 (0.76–1.02)	0.088	0.81 (0.62–1.06)	0.12
Disclosure of sensitive personal data				
Verification of residence	1.00 (0.86–1.16)	>0.9	1.15 (0.88–1.50)	0.3
Disposal of contact information at police	1.00 (0.82–1.22)	>0.9	1.48 (1.04–2.07)	0.025
Criminal record verification	1.34 (1.15–1.57)	<0.001	0.97 (0.74–1.28)	0.8
Security aspects				
Disposal of driving license	1.39 (1.16–1.66)	<0.001	1.33 (0.97–1.82)	0.071
Exclusion from program if distribution to third party	1.01 (0.85–1.20)	>0.9	1.14 (0.84–1.57)	0.4
Weekly disposal of cannabis	1.45 (1.24–1.71)	<0.001	1.15 (0.86–1.56)	0.4
Follow-up aspects				
Blood samples	1.06 (0.91–1.23)	0.4	1.06 (0.81–1.38)	0.7
Urine samples	1.06 (0.91–1.22)	0.5	0.98 (0.75–1.28)	0.9
Follow-up interview every 6 months	0.95 (0.81–1.11)	0.5	1.13 (0.85–1.51)	0.4
Yearly professional health assessment	1.39 (1.18–1.65)	<0.001	1.08 (0.80–1.47)	0.6

Values are adjusted odds ratios (ORs) with corresponding 95% confidence intervals (95% CIs) and p values from complete case multivariable logistic regression models comparing young adults with adults above 25 years and problematic users with recreational users. OR >1.0 means participants belonging to vulnerable population are more likely to accept regulatory aspect. [1]Adjusted for gender, age at first use, self-reported consumer type, daily cannabis use, loss of control of consumption, impairment with leisure activities, impairment at work or school, problematic alcohol use, and source of cannabis supply. [2]Adjusted for gender, age, age at first use, daily cannabis use, loss of control of consumption, impairment with leisure activities, impairment at work or school, problematic alcohol use, and source of cannabis supply.

corresponding program should be particularly attentive to the THC content offered and should emphasize measures of data confidentiality as availability of different THC contents showed most discrepancy in acceptance and disposal of contact details or driving license was poorly accepted. Even though a recent meta-analysis found a relevant effect of driving under the influence of THC on unfavorable traffic events [16], we think that disposal of driving license will hamper consumers' engagement placing a PRAC at risk for failure. Prohibition to drive under the influence of THC, as implemented in the USA and in Canada [4], seems to be more promising. Despite the international trend toward legalization of recreational cannabis, there is an ongoing debate of its impact on the illicit market [4, 7–9]. It is hypothesized that the evolution of the illicit cannabis market depends on the policy implemented with its total eradication being unlikely. Uruguay's restrictive policy primarily aims to remove organized crime from cannabis trade with the consequence that engagement with the regulated market

remains limited [5]. The Canadian policy adopts primarily a public health-oriented approach that aims to protect public health and minimize use in youth while replacing the illicit by a legalized market. Preliminary evaluations suggest that blended use of different sources is frequent with only one-third of the population exclusively using legal cannabis [17, 18]. Legalization in the USA aims to replace the illicit with a regulated, legal cannabis market following free market principles. This would ensure greater consumer safety and, importantly, would establish a new source of state revenue from taxes on legal sales [4]. The new policy led to a steady increase in cannabis sales along with a decrease in cannabis prices indicating that more cannabis is purchased from the legal as compared to the illicit market [10, 11]. Persistence of the illicit market is proposed to be the result of trafficking to states where cannabis is not yet legalized rather than poor consumer engagement [10, 11]. This trend to legalize recreational cannabis happens on the background of uncertainty concerning its long-term public health consequences,

especially in vulnerable populations such as young adults, problematic users, or users with preexisting mental health problems [4, 7, 9]. These concerns could be addressed if vulnerable populations agreed to engage in a PRAC with regular follow-ups as this would open the possibility for monitoring and simultaneous implementation of risk reduction interventions. Our study suggests high acceptability of most regulations including regular follow-up visits by young adults and problematic users. This would enable to introduce corresponding interventions.

This is the first online survey that examined the acceptability of different regulatory aspects by cannabis users to help us understand how a PRAC should be designed so that it ensures adequate consumers' engagement. Up until now, the discussion around legalization of recreational cannabis has been predominantly driven by economic and political considerations, what contrasts the importance of service user involvement in policy and service development [12, 13]. We therefore consider the focus on the consumers' view as major strength of our study. We could recruit 3,132 cannabis users within 1 month what suggests good outreach to the target population through our online survey. Online surveys typically give access to marginalized populations such as drug users who are usually hard to reach offline [19, 20]. A general limitation of any online surveys is that the sampling frame is difficult to establish, especially if the online survey is based on a convenient sample rather than a sample derived using probability sampling techniques. This was the case for the present study, and thus, one could argue that our sample might not be representative [19, 20]. We believe that this is not the case because we recruited the study population through four of the five university hospitals of psychiatry of Switzerland and in collaboration with the respective governments and because the consumer characteristics of our study population are comparable to those of the cannabis consumer population of Switzerland [21]. Another limitation was the lack of data quality assurance measures such as inconsistency and incompleteness checks. However, despite this lack, 82.1% of the participants completed the online questionnaire. This is similar to the completion rates reported in a review of 25,000 online surveys [22]. We did not collect data on users of multiple substances and persons with severe mental illnesses, and they might be underrepresented in our study population. This should be taken into account when designing a corresponding PRAC suitable to engage vulnerable populations. We relied on self-declaration of problematic cannabis use

for our main analysis because the participation in a PRAC will be based on the consumers' self-referral rather than referral through a health care professional, prioritizing the self-declaration of problematic cannabis use over a definition based on medical criteria. Nevertheless, we performed a sensitivity analysis applying medical criteria for a problematic use such as frequency of consumption, loss of control over consumption, and impairment in daily life due to consumption and found robust results.

Conclusion

Our results suggest that a carefully designed PRAC taking into account the consumers' perspective is likely to transfer cannabis users from the illicit to the regulated market and is likely to engage vulnerable populations such as young adults and problematic users. This opens an opportunity for simultaneous implementation of risk reduction interventions to ultimately protect vulnerable populations. Recently, the Swiss government passed new regulations that allow regulated access to recreational cannabis for research purposes with the aim to inform the design of a new cannabis policy by research [23]. Our results may guide the policy adaptation process in Switzerland and other countries so that an appropriate consumer's engagement with a PRAC may be ensured. We propose as a next step to compare different PRAC in a cluster-randomized controlled trial. Such a trial should investigate the acceptability of different programs, their effect on mental and physical health outcomes, and should be complemented by qualitative research investigating barriers and motivations to obtain cannabis through the regulated rather than the illicit market.

Statement of Ethics

In accordance with the Swiss Human Research Act, this study protocol did not require ethical approval because health-related data were anonymously collected. Consent form was presented online and required participants to agree before proceeding with answering survey questions. There was no additional written informed consent.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

Monika Müller contributed to the formal analysis, methodology, supervision, and visualization, and had the lead in writing the original draft and in reviewing and editing the final manuscript. Edith Meszaros contributed to the formal analysis, the methodology, visualization, and writing of the original draft. Marc Walter and Marcus Herdener contributed to funding acquisition and methodology. Lavinia Baltes-Flückiger contributed to the project administration. Reto Auer reviewed and edited the manuscript. Gabriel Thorens contributed to the funding acquisition, investigation, and supervision. Stéphane Rothen contributed to the investigation, methodology, and writing the original draft and had the lead in formal analysis. Carlos Nordt contributed to the formal analysis and writing the original draft and had the lead in methodology. Daniele Zullino participated in the funding acquisition and methodology, and had the lead in the project administration and supervision. All authors contributed to the conceptualization, data curation, and revision of the manuscript.

Data Availability Statement

All data generated or analyzed during this study are included in this article and its supplementary material files. Further inquiries can be directed to the corresponding author.

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