

AMERICAN UNIVERSITY OF BEIRUT

FORECASTING DEMAND FOR RECREATIONAL
CANNABIS UNDER POTENTIAL CONDITIONS OF
LEGALIZED CONSUMPTION: EVIDENCE FROM BEIRUT,
LEBANON

by
FATME ALBERT ASSAAD

A thesis
submitted in partial fulfillment of the requirements
for the degree of Master of Agricultural Economics
to the Department of Agriculture
of the Faculty of Agricultural and Food Science
at the American University of Beirut

Beirut, Lebanon
January 2021

AMERICAN UNIVERSITY OF BEIRUT

FORECASTING DEMAND FOR RECREATIONAL
CANNABIS UNDER POTENTIAL CONDITIONS OF
LEGALIZED CONSUMPTION: EVIDENCE FROM BEIRUT,
LEBANON

by
FATME ALBERT ASSAAD

Approved by:



[Signature]

Dr. Ali Chalak, Associate Professor
Department of Agriculture

Advisor

[Signature]

Dr. Jad Chaaban, Associate Professor
Department of Agriculture

Member of Committee

[Signature]

Dr. Lilian Ghandour, Associate Professor
Department of Epidemiology and Population Health

Member of Committee

Date of thesis defense: January 27, 2021

ACKNOWLEDGEMENTS

First, I would have never done this without the support of my family. To my husband, who was one of my major supporters, thank you for your constant motivation and for making this possible. To my mother, father, sister and brother, thank you for your continuous encouragement over the years and for always believing in me, you made me passionate about pursuing my higher education.

Second, I would like to thank my University, the American University of Beirut, for being my second home for the last 6 years. You have provided me with memories, friends and experiences that I will forever cherish.

Finally, I would like to extend special thanks to my advisor, Prof. Ali Chalak, for helping and guiding me through my master's degree especially in the rough virtual times of COVID-19.

And to my committee members (Prof. Lilian and Prof. Jad) and to each and every person that helped me, thank you.

ABSTRACT OF THE THESIS OF

Fatme Albert Assaad

for Master of Agricultural Economics
Major: Agriculture Economics

Title: Forecasting demand for recreational Cannabis under potential conditions of legalized consumption: evidence from Beirut, Lebanon

With the ongoing public debate around Cannabis legalization and Lebanon and beyond, it is still not fully known what drives the decision to highly accept such laws or vice versa. Recently a legalization law was passed in Lebanon to legalize the production of Cannabis plant for medical purposes. In this study, we tackle the issue of Cannabis legalization in Lebanon and focus on three main objectives: 1) estimate the potential demand for CBD and THC products under potential legalization in Lebanon, 2) analyze the effect of being a smoker on the decision to buy these products and 3) determine the effect of other factors on the individuals' decision to buy and the quantity bought. The study was carried out on 392 individuals from Lebanon using an online survey. Our findings show that ~30% of the participants were willing to buy CBD products while ~17% were willing to buy THC products. Also, being a smoker (cigarette or water pipe or both) positively affects the decision making of a persons' willingness to buy CBD and THC products as well as it the quantity bought. Results show that being a smoker increases willingness to buy CBD and THC. Other factors that affect this decision include a persons' perception of THC on health, a person's perception on CBD and its effect on the economy, and if a person is currently a cannabis user. These findings provide contextual evidence that must be considered by decision makers before taking major policy decisions towards the legalization of CBD and/or THC for medical and/or recreational use. They also remind semi-governmental and non-government organizations to raise further awareness on the dangers of tobacco smoking and its link with the use of cannabis and other illegal drugs.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	1
ABSTRACT.....	2
TABLES.....	5
Chapter	
1. INTRODUCTION	6
2. LITERATURE REVIEW.....	9
2.1 Cannabis legalization worldwide.....	9
2.2 History of Cannabis cultivation, trade and consumption in Lebanon.....	12
2.3 Importance of Cannabis to the Lebanese farmer	13
2.4 Consumption and legalization in Lebanon and its relationship with smoking	15
3. METHODOLOGY	20
3.1 Model Specification.....	20
3.2 Survey design.....	20
3.3 Measures	23
3.4 Data Collection	25
4. RESULTS	26
4.1 Descriptive Statistics.....	26

4.2 Estimation of Willingness to Buy and Expenditure.....	28
5. CONCLUSION.....	37
REFERENCES.....	40

TABLES

Table

1. Description of Models' Variables	24
2. Descriptive statistic of factors that affect peoples' WTP for CBD and THC (n=392).....	27
3. Double Hurdle model estimation results for WTP for CBD and THC (n=392) and quantity purchased of CBD (n=117) and THC (n=67)	29
4. Unconditional average partial effects estimation results for the CBD and THC Quantity	33

CHAPTER 1

INTRODUCTION

Many countries have experienced a change in their policy reforms to liberalize the traditional regime of criminal prohibition of cannabis. For policy makers, four main strands of policies exist regarding cannabis production, distribution and use: prohibition, decriminalization, medical marijuana, and legalization [1]. Recently, some countries such as Australia regulated the possession and use of limited amount of cannabis [2]. Other countries, such as Uruguay and Canada, regulated the production and distribution of cannabis as well [2].

In light of the current development trends of cannabis liberalization, there have been a rise in public concerns about the increased number of cannabis users and cannabis use among users as a result of the increased access to cannabis [2]. Health care workers are focusing on the physical and mental health issues that are specific to cannabis use, particularly by youth [3]. Along with the health issues induced by cannabis legalization, there have been considerable concerns on the effect of such law implementations on the increased social acceptance of cannabis use, which by itself may break down the fear of trying hard drugs like cocaine and heroin [4].

The issue of legalization of Cannabis cultivation in Lebanon was advocated by politicians beginning 2014 [5]. In July 2018, the consulting company “Mckinesy” suggested that legalizing Cannabis would increase Lebanon’s revenues by up to 1\$ billion [5]. In April 2020, the Lebanese parliament passed a law legalizing the production and sale of cannabis for medicinal purposes [6]. The symbolic nature of this step was recognized as a positive one for the local economy but raised many risk

concerns given the unstable political situation in Lebanon. Reactions to this law varied across the Lebanese population, with some politicians, economists, and institutions in favor of it and others against it [7, 8]. The law has been criticized by some organizations for not consulting with the right group of stakeholders [6]. This is in addition to the limited data on cannabis consumption in Lebanon, which would serve as a baseline to monitor change following the legalization of cultivation for medicinal use [8]. It is worth noting that more than a third of adults in Lebanon are smokers, and recent studies showed a direct effect of smoking on cannabis use [9-11]. For reasons above, the objectives of this study are to evaluate the potential demand for CBD and THC products under potential legalization. More specifically, the study aims to analyze what factors affect peoples' willingness to buy CBD and THC products and, if so, the demand responsiveness to price changes. It also aims to analyze the effect of being a smoker on the decision to buy Cannabis products, as well as the effect of other factors such as peoples' perception towards smoking, Cannabis, and socio-demographic characteristics such as level of income and religious beliefs. In order to address the aforementioned aims, the study used the double hurdle model, using the Contingent Valuation method as its first part of the model, and the Truncated Poisson model for the second part of the hurdle model.

This research identifies the key drivers of cannabis demand, helping policy makers estimate the potential demand of both CBD and THC and their price sensitivities. These findings provide contextual evidence that must be considered by decision makers before taking major policy decisions towards the legalization of CBD and/or THC for medical and/or recreational use. They also remind semi-governmental and non-government organizations to raise further awareness on the dangers of tobacco

smoking and its link with other substances. This relationship is a key driver for policy makers to further regulate the sale, distribution, purchase, and usage of smoking products especially amongst youth to potentially decrease the number of Cannabis smokers (legally or illegally) and to limit the CBD medication to those who truly need it.

CHAPTER 2

LITERATURE REVIEW

2.1 Cannabis legalization worldwide

Today, many countries are facing a choice regarding the legalization of Cannabis. Several countries have recently legalized Cannabis for medical purposes while others have done it for both medical and recreational purposes. Several countries have already implemented legalization. For example, in October 2018, Canada legalized Cannabis for recreational use after studying all the different aspects and concerns related to legalization. Large percentage of Canada's youth have at least tried Cannabis before its legalization [12]. According to Canadian statistics: 21% of people aged 15-19 years use Cannabis [12]. Studies have focused on the effect of legalization on youth consumption and the factors affecting it. These factors include: the tax level set by the government, the presence of incentives for a black market, and the regulatory system design [13]. A recent Canadian study found that 10% of high school students who had not yet used marijuana intended to use it if it became legal, and 18% of those who had already use it declared intention to use it more frequently [14]. These percentages, although considered low, might pose a serious effect on the society especially youth and their consumption attitudes. To monitor the consumption and selling of drugs, the federal government in Canada decided to have a strict public health model that focuses on the production and sale of Cannabis [12]. But will this strict model be enough in controlling consumption? To answer this question, studies compare Cannabis consumption with alcohol consumption. Despite regulation against its sale or

distribution to minors, alcohol continues to be widely used by Ontario students at all age levels [14].

In the US, the use of Cannabis is still illegal according to federal law. However, many states have legalized Cannabis usage for medical and/or recreational use. As of Aug. 2018, 31 states allow the medical use of marijuana and 15 states allow use of ‘low THC, high CBD’ products for medical purposes [5]. While, studies in the US showed no significant association between the consumption of Cannabis in the US and its legalization for medical use, 3 studies found that legalizing Cannabis for medical use led to an increased consumption and 1 paradoxical study found that it led to a decreased use [5].

According to different studies, legalizing Cannabis whether for medical or recreational use could encourage more youth into trying this kind of habit. As the price of the drug is more likely to decrease, nonusers can be induced into taking up the habit [4]. After legalization, the price of Cannabis may vary depending on the government’s intervention. If the price of legal Cannabis increases slightly, most users would want to buy legal Cannabis. But if regulations prevent sales to underage users, they would have no incentive to stop purchasing from other illicit sources [14]. On the opposite side, if the price of legal Cannabis is made lower than the illicit price, this will increase the consumption for younger people with limited financial resources. As we already know, a decrease in price of any commodity leads to an increase in its demand and likewise, a decrease in drug prices would affect the number of users, as it will be more affordable and economically accessible [4].

Globally, some people oppose the idea of Cannabis legalization due to its repercussions while others are in favor of its legalization. For example, 6% of the US

population consume Cannabis regularly, and more than 700,000 people are arrested annually for Marijuana possession [15]. Despite the US government's attempts to restrict the use of this drug, it is considered the most widely used illegal drug [15]. Today, the public opinion is changing more towards accepting the use of Cannabis and other similar drugs. Majority of youth are supporting legalization moving the public opinion to tolerate the idea more. According to a study conducted by the University of Michigan's Institute for Social Research on 45,000 students' which projects trends in use and perception of legal and illegal drugs over several years, the number of high school students who perceived the occasional use of marijuana as harmful dropped from 27.4% in 2009 to 17.1% in 2016 [16]. There has never been a case where someone died from a marijuana overdose, unlike tobacco and alcohol where a huge number of people are killed annually [15]. One of the main reasons for governments to favor Cannabis legalization is the possibility to gain tax revenues, like that of the sale of alcohol [14]. People in favor of legalization use the Dutch example as a case in point. Today, Netherlands has the world's lowest rates of drug-related arrests. Their strategy has helped segregate marijuana utilization from that of hard drugs like heroin [15]. Others might argue that legalizing Cannabis can reduce the costs of police and court work caused by current prohibition policy. In fact, according to findings from British Columbia, Canada most of the procession charges were add-ons to the main offence making the work of the police practically the same [14]. Such laws have a long-term influence on the economy and the society.

2.2 History of Cannabis cultivation, trade and consumption in Lebanon

Historically Cannabis cultivation in Lebanon does not belong to a specific date. The beginning of Cannabis cultivation in Lebanon have several theories: some believe that its cultivation started in the Beqaa valley around 1860, while others state that it was introduced by the Turks during the Ottoman era (1516-1918) making it the centerpiece of the region's economy [17]. Others claim that it was introduced by seeds coming from India via Zahliot traders [18]. During the Ottoman period, the Beqaa region was marginalized and was occupied by poor people who produced "hashish" [18]. This production continued during the French mandate in Lebanon. It then spread to northwest Beqaa which was a place for revolutionary movements against French protectorate that prohibited such cultivation [18].

Farmers started switching their practices to Cannabis cultivation when other crops failed to provide them with their basic needs. In contrast, Cannabis, or so called "hashish", production provided significantly higher financial gains for farmers due to the ease of the crop's cultivation and minimum requirements [18]. The Cannabis industry flourished during the Lebanese civil war (1975-1990), when hashish production became a \$500 million a year industry [17]. Almost all factions fighting in the civil war contributed to drug trafficking. Corruption and the absence of government at that time worsened the drug problem.

Cannabis is considered one of the crops requiring minimum maintenance and inputs. "Cannabis can be tossed in the field with some water and that's it ", explained a Lebanese Cannabis farmer while interviewed by a newspaper [19]. The simplicity of this crops made other farmers switch their practices from legal farming to an illegal one, increasing the annual production of hashish from 30,000 tons at the outbreak of the civil

war to 100,000 tons in the early 1980s [20]. The illicit activity increased the revenues in the Lebanese financial sector and hashish was considered the largest cash crop [20]. According to Marshall, Cannabis cultivation occupied 80% of all farmland in the upper Beqaa valley under the protection of armed tribes [20].

2.3 Importance of Cannabis to the Lebanese farmer

The main reasons behind the quick expansion of this market in Lebanon are political instabilities, lack of basic infrastructure, lack of funds, unemployment, and the neglected agricultural sector [18]. Even when the government tried to flex its powers to stop the illegal act of farmers, they couldn't. The illicit market remains active up until now and every time the security situation deteriorates, farmers get away with harvesting and selling larger amounts of "hashish" [21]. With the recent increasing political instability, especially the war in Syria, it is believed that Cannabis cultivation has significantly increased, taking advantage of the political instability and the increased number of the cheap labor [18].

Lebanon's Cannabis market had overcome many international and local pressures. Lebanon's historical background of Cannabis cultivation had made any kind of prohibition an ineffective one [18]. Cultivation might have decreased during governmental pressures to eradicate illicit drug crops, but farmers have always found alternatives in other places moving the problem elsewhere [18]. Even when the Lebanese government tried to substitute Cannabis with other crops, such as potato or sunflowers, their attempt failed [21]. No other crop was nearly compared to the ease profitability that Cannabis offered. Families kept entering to this business due to its low requirements and its high returns. One of the producers estimated that 20,000 families

are involved in the business [18]. As a result, many attempts failed to stop this cultivation and there are several reasons that stimulated the failure of such governmental attempts.

The main reason why these programs fail is that they give farmers an uneven alternative. The farmer has to choose between leaving a crop that can earn him ~\$5000 per month and substituting it with another crop that can earn him ~\$1000 per month [22]. One of the farmers explained the value of this crop by saying "...All of these people who are planting, they aren't dealers, they are planting just in order to survive.", as mentioned in an interview with The Daily Star Newspaper in 2011 [23]. Profit is the main reason which triggers farmers into always going back to Cannabis as a major crop. Furthermore, most of local farmers in the Beqaa belong to heavily armed tribes. Farmers even claim that they are protected by certain political parties in the Beqaa region [17]. Those political parties turned a blind eye to the illegal activity, while limitations and sanctions against the farmers came mainly from international demands [24]. As the government tried force eradication programs to destroy any Cannabis fields, farmers made it clear that they would resist using force [19]. Nowadays, it is estimated that the area planted with Cannabis in the Beqaa region is between 30,000 and 40,000 acres, with a total revenue of about 800 million dollars annually, which represents the source of income for 30,000 families in the Beqaa [25]. Alternatively, while some political parties were focused on eradication programs or alternative crops, others were always in support of legalization [26].

2.4 Consumption and legalization in Lebanon and its relationship with smoking

Waterpipe tobacco smoking is a growing public health concern in Lebanon especially among young ages. The rates of smoking in Lebanon for both cigarettes and water-pipes are very high. More than a third of adults in Lebanon are smokers, and ~ 60% of children aged 13-15 smoke water-pipes [11]. In Lebanon, Waterpipe is the most common form of tobacco smoking among sixth and seventh grade [27]. This large consumption is related to how youth are being exposed to secondhand smoking at home. Waterpipe tobacco smoking is becoming a socially acceptable act due to several reasons: The absence of tobacco surveillance, and the waterpipe advertisement exposure [27]. The huge exposure for different kinds of smoking raises concerns on the potential link between smokers in Lebanon and their potential use of cannabis after legalization. For that reason the gateway, or stepping stone, hypothesis is important as it has had considerable influence on drug policy and legislation in many countries [28]. This hypothesis talks about the possible development of someone's behavior from first use of legal drugs (alcohol, tobacco) toward the use of Cannabis (marijuana) and onward toward other drugs like cocaine and heroin [29]. The gateway theory focuses on how use of soft drugs breaks down the fear of trying harder drugs [30].

Nowadays electronic cigarettes are replacing traditional cigarettes among youth. For that reason, a study was conducted to formulate an association between e-cigarettes and marijuana use. Although e-cigarettes are used by some to quit smoking, youth are attracted to the idea of it [9]. According to the results of this study, there is a greater tendency for youth who are experimenting with e-cigarettes to use the same device for vaping illegal drugs, and there is link between youth who starts vaping at an early age (ex. 12 to 14) and initiation of marijuana use [9]. In another study, the authors in [10]

studied the association between e-cigarettes, hookah, or any other combustible cigarettes use with initiating marijuana use. Surveys were collected from ninth grade students at baseline, and then were followed with a 24-month follow-up in 11th grade. The results showed that for each additional tobacco product used at baseline, participants had 3.5 times higher odds of initiating marijuana use in the last 24 month, and 3.4 times higher odds of currently using marijuana [10]. These findings suggest that the replacement of traditional forms of tobacco with newer ones are more likely to increase the use of marijuana or other illegal drugs. The study also highlights the association between hookah smoking and marijuana use as the strongest, because it yields more nicotine than any other combustible cigarette. The main issue in e-cigarettes and hookah products is that access, sales, and promotion are not regulated. According to [10], 27% of adolescents who reported smoking hookah did so at a friend's house, 8% at cafes, 8% smoked at home, and 43% chose not to indicate where they smoke hookah. The easy access to hookah presents a potential threat to using hookah as a means to smoke other illegal drugs. Other than smoking and its association with possible increase of trying other drugs, the political situation in Lebanon and the stress it imposes on young generations plays a great deal in their smoking behavior. The gateway theory raises concerns of the possible link between smokers in Lebanon and their potential use of cannabis after legalization.

In July 2018 the consulting firm "Mckinsey" suggested that legalizing Cannabis cultivation would increase Lebanon's revenues up to 1\$ billion [5]. This suggestion followed a debate between people in favor of such law and people against it. Politicians, stakeholders and farmers were in favor of such law highlighting the potential benefits gained from implementing it. At the same time, concerns were highlighted regarding

this law and its possible negative outcomes. The first position supports the idea of legalizing the cultivation of Cannabis, and this represents a group of public opinion that have generally liberal political views. According to Legislator Antoine Habchi in [31]: “The legal industry will create jobs and bring order in the Beqaa, a region notorious for lawlessness, allowing farmers to live with dignity.” Private pharmaceutical companies would provide seeds and seedlings to farmers and during harvest plants would be counted to make sure nothing had been diverted [31]. Coincided with the newly suggested law, the Lebanese American University (LAU) introduced its initiative to establish the Medicinal Cannabis Research Center, which aims to "generate evidence-based knowledge on the potential medical value of Lebanon-grown Cannabis" [7]. The center focuses on the potential pharmacological characteristics that the Lebanese Cannabis has. Their hope is that Cannabis can be fully studied which gives Lebanon a unique opportunity for pharmaceutical science researchers. Furthermore, some politicians and economists are in favor of legalizing to allow the state from benefiting from the revenues of its export. Back in 2014, Agriculture Minister Akram Chehayeb along with MP Walid Jumblatt called for Cannabis legalization in Lebanon that is monitored and organized by the state [26]. Marwan Iskandar; an economist estimated a \$2 billion increase to the Lebanese economy and \$400 million to the state budget just by legalizing the Cannabis crop and its export abroad to countries in Europe and the United States [32].

On the contrary, certain people and organizations are against legalizing Cannabis in all its forms, and those are the people from different groups who are mainly afraid of the increased consumption of Cannabis and other drugs among people and especially among youth. Their fear lies also in the idea that Cannabis use would be

acceptable socially. J.A.D (youth against drugs) organization refused legalization for many reasons. The first reason was that they believed that money coming back from Cannabis will go back to prostitution, terrorism, and arms instead of the development of the economy. Second, the only drug approved by the US Food and Drug Administration is the drug for cancer treatment and they do not use Cannabis. Third, there are harsh international conditions on the quantity and quality to plant Cannabis and Lebanon won't be able abide by these conditions [33]. Brigitte Khoury, a clinical psychologist and a professor at the American University of Beirut, explains that an increase in Cannabis production in Lebanon would correspond to an increase in domestic drug use [19]. Some might claim that the domestic output of Cannabis can be sold out of the country, however, some farmers expressed difficulties in smuggling to international markets. This means that when Cannabis fails to be sold out of this country it will end up being sold in local markets for domestic use [19]. Several organizations such as CDLL and JCD (youth drug control) who are directly concerned with treatment and prevention of addiction showed complete refusal for such law and highlighted several points concerning their refusal: a potential increase in the number of drug abusers, a change in cannabis perception making it more socially acceptable, and an inflation in cannabis black market much more than it is before legalization [8].

As countries start to legalize the consumption and selling of Cannabis, Lebanese markets start to lag behind. With the emerging acceptance for Cannabis worldwide, it is now even harder to convince farmers to give up on growing Cannabis. It is unknown whether the proposals in the Lebanese authorities on legalizing Cannabis for pharmaceutical or medical purposes will solve the problem. According to pharmaceutical standards, medical Cannabis requires strict rules and high investments

to start producing it [34]. Developed countries like the United States, Canada and Netherlands are much more advanced in medical Cannabis industry which makes countries like Lebanon or Morocco far behind. This makes the current proposal far from ideal in controlling Cannabis cultivation. It remains unknown whether Lebanon's proposed new law to legalizes Cannabis for medical use is the solution for families that rely on this plant for their living, and for the suffering economy that is striving to flourish.

CHAPTER 3

METHODOLOGY

3.1 Model Specification

This study uses the double hurdle model to study decision process of the participant. The “double-hurdle” model is done as a two-stage process: first, the participant decides whether or not to buy the product if it were available; and second, they decide on the quantity of the product to be purchased at a given price. The first stage is specified by a probit model where the dependent variable takes the values equal to 1 if the participant is willing to buy CBD and THC products and 0 if not. The second stage is specified as a truncated Poisson regression model where the dependent variable is the quantity of CBD and THC people are willing to buy for a given amount of money.

In addition, the marginal effect or the unconditional average partial effects (UAPE), is estimated by the combined effects of both decisions, the decision to buy and the conditional average partial effect if the initial adoption decision is positive [35]. The coefficients measure the effect of the independent variables on the quantity of CBD and THC people are willing to buy, unconditional on expressing their willingness to buy.

3.2 Survey design

The Contingent Valuation Method (CVM) is a survey- based technique to assess the value of a public good, an environmental good in particular. CVM presents an advantage being able to create a hypothetical market [36]. This method involves a set of questions asked to the consumer about their willingness to pay (WTP) for a certain environmental service, or commodities that are not exchanged in regular markets [36].

Demand for Cannabis is linked to many variables that affect the consumer's decision. The survey included closed and open-ended questions about the variables that impact the willingness to pay for Cannabis, such as: the price of Cannabis, government regulations, participants' interests, participants' smoking patterns, smoking history, and other social behaviors including Cannabis use. The survey is divided into six sections:

- The first section contains a set of questions about the participant's behavior toward smoking substances like cigarettes or water pipe. Questions included whether the respondent is a current smoker, a former smoker, or never smoked, the level of consumption and age at which smoking first began. Additionally, it includes a series of questions about the attitude concerning smoking (including enjoyment and self-rated addiction) [37].
- The second section targets the participants' attitude towards smoking Cannabis. It includes a set of questions targeting the attitude toward legalizing Cannabis, usage, acceptance, etc...
- The third section contains questions about personal use of Cannabis.
- The fourth section (attitude towards legalizing Cannabis) talks briefly about two scenarios: the first one on legalizing Cannabis for medical uses, and the second one on legalizing Cannabis for recreational uses. Both scenarios are ended with a willingness to pay question.
- The fifth section includes a table to display the level of religiosity of the participant.
- The last section includes a series of questions on the demographic characteristic of the respondent including sex, age, education and income

A closed-ended approach was used, which means that the participant WTP value was obtained if one would be willing to pay for a given amount of money. The model used was a dichotomous choice model (yes/no), and the amount of money varied across surveys. The WTP questions were:

- Imagine that, next time you walk into any pharmacy you are able to purchase CBD products (oils, capsules, cream...) over the counter without a prescription (just like Panadol). If you are offered a box containing 30 CBD capsules for **X,000** L.L. Would you be willing to buy any of these drugs?
- A maximum of 5 grams is allowed for possession, each gram allows you to make 2-3 joints. Specialized shops are allowed to sell Cannabis in small quantities at a price of **Y,000** L.L./g. If you have access to these shops near you, would you be willing to buy Cannabis?

Variable **X and Y** were designed to present different prices for each survey. Values for **X** were randomized and equally distributed between 40, 50, 60, 70, 80, 90, 100. The values were based on the average price of one box of CBD capsules sold in different countries and the Purchasing Power Parity. Values for **Y** were randomized and equally distributed between 20, 25, 30, 35, 40, 45, 50. Values were based on the average price of 5g of Cannabis sold in countries where Cannabis is legalized for recreational use and the Purchasing Power Parity.

We also provided a follow-up question asking the participant how much he/she is willing to buy from that product in a given time. In this case the question asks about the amount in a specific time given the randomly selected price.

3.3 Measures

Variable smoker was derived from the question if the person was a current smoker or not. The answers were categorical divided into a non-smoker, cigarette smoker, water pipe smoker, or cigarette and water pipe smoker.

Variables that talked about a persons' perception towards cannabis in general and cannabis legalization for medical or recreational uses were set in a table form with five answers to choose from; strongly agree, agree, neutral, disagree, and strongly disagree. Variable current cannabis use and having friends who smoke were binary questions. In addition, the question regarding reasons behind people trying cannabis was categorical (multiple answers allowed) with four answers; curiosity, peer pressure, psychological reasons, and pain killer.

The religiosity questionnaire was based on Santa Clara questionnaire that included five statements with a 4-point scale to each statement ranging from (1) Strongly disagree to (4) strongly agree. According to [38], the score values ranged from 5 (low strength of faith) to 20 (Strong strength of faith).

Demographic variables were categorical; gender (male or female), age (18-24, 25-30, 30-40, and 40+), highest educational level (school, bachelors' degree, masters' degree or higher).

The set of variables included in both the probit model and the Truncated Poisson model are provided in **Table 1**.

Table 1 Description of Models' Variables

Variable	Categories/levels
Willingness to buy a box of capsules containing CBD	1= YES, 0= No
Willingness to buy X grams of Cannabis to smoke	1= YES, 0= No
Current cigarette or shisha smoking	1= YES, 0= No
Agrees that smoking helps in stress relief	1= YES, 0= No
Agrees that buying cigarettes should not be regulated	1= YES, 0= No
Presence of friends that smoke Cannabis	1= YES, 0= No
Agrees that smoking Cannabis does not affect the brain negatively	1= YES, 0= No
With legalizing Cannabis	1= Yes. 0= No
Doesn't consider smoking Cannabis as unethical	1= Yes. 0= No
With legalizing Cannabis for personal use	1= Yes. 0= No
Doesn't consider smoking Cannabis as an unhealthy habit	1= Yes. 0= No
Agrees that legalizing Cannabis for medical use will improve the economy	1= Yes. 0= No
Current Cannabis use	1=Yes, 0= No
How many packs the participant would buy in a year knowing that each pack contains 30 servings of the CBD product of choice.	Open-ended
How many grams would the participant buy per month knowing that 1 gram of Cannabis can make 2-3 joints?	1= 1 g/month 2.5= 2-3 g/month 4.5= 4-5 g/month 10= >5 g/month
Price of 30 CBD capsules	40 to 100 L.L
Price of 1gram of Cannabis	20 to 50 L.L
Participant's religiosity	(5-20) score 5: Lowest score 20: Highest score
Participant's average monthly income level	0= ≤ 3000000 L.L 1= > 3000000 L.L.
Participant's highest educational level	1= school level 2= bachelor level 3= master's level or higher

3.4 Data Collection

Data was collected through an online questionnaire using “Lime Survey” platform. The survey was approved by the Institutional Review Board “IRB”. An online consent form was attached along the survey so that the participant could agree to the terms or not before starting the survey.

The target population were people living in Greater Beirut and aged between 18 to 60 years old. Snowball and convenience sampling were used to recruit people. A direct link was sent to people in Greater Beirut via WhatsApp and Instagram, who in turns shared with other individuals within the age limit set.

Data collection took place between June 2nd, 2020 and June 28th, 2020 and YY. While 532 clicked on the survey link, 392 surveys were filled completely. The average time needed to complete a survey was around 8 minutes.

CHAPTER 4

RESULTS

4.1 Descriptive Statistics

Out of the total 392 respondents, 63% were women. 80% were aged between 18 and 30 years old and 20% were 31 or older. The highest level of education among participants were distributed as follows: master's degree and higher (44%), bachelor's degree (44%) and high school level (12%). The average monthly income of the 70% of the participants was between 1,000,000 and 3,000,000 L.L or less, while the rest of the participants had an average monthly income of 3,000,000 L.L to 6,000,000 L.L or more. Table 2 displays the variables included in the model with their percentages.

Religiosity was measured using the Santa Clara strength of religious faith questionnaire [38]. The percentage of people with religiosity score of 12 or less was 14%, while 86% scored more than 12.

Regarding smoking, 39% of the respondents were current smokers divided into cigarette smokers (14%), water pipe (shisha) smokers (20%) and people who smoke both (5%).

Table 2 Descriptive statistic of factors that affect peoples' WTP for CBD and THC
(n=392)

Variable	Percentage
Willingness to buy a box of capsules containing CBD	29.9 (% yes)
Willingness to buy X grams of Cannabis to smoke	17.1 (% yes)
Smoker categories:	
Non-smoker	61.5%
Cigarette smoker	14%
Water pipe smoker	19.4%
Cigarette and water pipe smoker	5.1%
Agrees that smoking cigarettes helps in stress relief	35.2 (% yes)
Agrees that buying cigarettes should not be regulated	7.4 (% yes)
Presence of friends that smoke Cannabis	30.9 (% yes)
With legalizing Cannabis	27.3 (% yes)
Agrees that smoking Cannabis does not affect the brain negatively	14 (% yes)
Doesn't consider smoking Cannabis as unethical	24.2 (% yes)
With legalizing Cannabis for personal use	21.2 (% yes)
Doesn't consider smoking Cannabis as an unhealthy habit	11.2 (% yes)
Agrees that legalizing Cannabis for medical use will improve the economy	70.9 (% yes)
Current Cannabis use	6.9 (% yes)
Past Cannabis use	20.7 (% yes)
Reasons for Cannabis use (for people who tried cannabis, multiple selections allowed)	
Curiosity	82%
Peer pressure	17%
Pain killer	11%
Psychological reasons	9%
How many packs the participant would buy in a year knowing that each pack contains 30 servings of the CBD product of choice.	1.46 (on average)
How many grams would the participant buy per month knowing that 1 gram of Cannabis can make 2-3 joints?	3.89 (on average)
Participant's gender	Male: 37% Female: 63%

Variable	Percentage
Participant's age	18-24: 41%
	25-30: 38%
	30-40: 11%
	40+: 10%
Participant's average monthly income level	<1M L.L: 37%
	1-3 M L.L: 33%
	3-6 M L.L: 16%
	>6 M L.L: 14%

4.2 Estimation of Willingness to Buy and Expenditure

The estimation results on the willingness to buy of CBD and THC and their quantity are presented in Table 3. Socio-demographic indicators (age and gender) were not included since they had no significant effect on neither the decision to buy nor the quantity bought.

From the eleven variables analyzed in the probit model, six of them were statistically significant for willingness to buy CBD: price of 30 CBD capsules, being a smoker, doesn't consider being smoking cannabis as unethical, doesn't consider smoking cannabis an unhealthy habit, agrees that legalizing CBD for medical purposes improves the economy, current smoking cannabis. While, six were statistically significant for the willingness to buy THC: being a smoker, with legalizing cannabis, with legalizing cannabis for personal use, doesn't consider being smoking cannabis as unethical, doesn't consider smoking cannabis an unhealthy habit, currently smoking cannabis.

Table 3 Double Hurdle model estimation results for WTP for CBD and THC (n=392) and quantity purchased of CBD (n=117) and THC (n=67)

Variable Label	CBDChoice		THCChoice	
	Coefficient	p-value	Coefficient	p-value
	<i>Probit model (1st hurdle)</i>			
Price of 30 CBD capsules	-0.533	0.032		
Price of 1g of THC			-0.059	0.873
Being a smoker	0.337	0.033	0.817	0.000
With legalizing Cannabis	0.264	0.225	0.527	0.062
With legalizing Cannabis for personal use	-0.058	0.809	0.837	0.002
Doesn't consider smoking Cannabis as unethical	0.679	0.001	0.762	0.003
Doesn't consider smoking Cannabis as an unhealthy habit	0.566	0.035	0.698	0.019
Agrees that legalizing Cannabis for medical use will improve the economy	0.429	0.017	-0.074	0.777
Current cannabis use	0.759	0.037	0.995	0.018
Income				
Low	0 (base)			
High	-0.088	0.593	-0.077	0.742
Education				
Master's degree or higher	-0.017	0.909	0.327	0.150
Religiosity score	0.003	0.890	-0.012	0.650
Constant	0.852	0.435	-2.017	0.153
Observations	392	---	392	---
Pseudo R2	0.2013	---	0.5120	---
Log-likelihood	-190.858	---	-87.488	---
	<i>Truncated Poisson Model (2nd hurdle)</i>			
Price of 30 CBD capsules	0.079	0.594	-	-
Price of 1g of THC	-	-	0.047	0.813
Being a smoker	0.161	0.125	0.132	0.442

Variable Label	CBDChoice		THCChoice	
	Coefficient	p-value	Coefficient	p-value
<i>Truncated Poisson Model (2nd hurdle)</i>				
Agrees that smoking cigarettes helps in stress relief	0.278	0.002	0.24	0.106
Agrees that buying cigarettes should not be regulated	0.344	0.006	0.138	0.461
Agrees that smoking Cannabis does not affect the brain negatively	-0.117	0.246	0.305	0.031
Doesn't consider smoking Cannabis as an unhealthy habit	0.366	0.000	0.316	0.032
Agrees that legalizing Cannabis for medical use will improve the economy	0.319	0.031	0.905	0.002
Current cannabis use	0.481	0.000	0.253	0.100
Having friends who smoke cannabis	0.360	0.002	0.174	0.343
Education				
Master's degree or higher	-0.325	0.001	-0.149	0.278
Constant	0.365	0.567	-0.391	0.624
Number of observations	117	---	67	---
Log-likelihood	-302.274	---	-135.862	---

The price of 30 CBD capsules was significant to the willingness to buy CBD with a p-value= 0.032 and coefficient = -0.533. This shows that as CBD price increases by one unit, willingness to buy CBD decreases by 0.5 units. However, the price of 1g of cannabis had no significance on willingness to buy THC. As cannabis price increase, willingness to buy CBD decreases slightly.

Being a smoker was significant in both willingness to buy CBD and THC with p-values = 0.033 and <0.0001 respectively. This significance shows a strong relationship between being a smoker and the decision to buy CBD and THC products. The findings tell us that being a smoker significantly increases the chance to buy CBD by 0.3 units, and more so THC by 0.8 units. This significance between being a smoker (cigarettes or water pipes) played an important role in affecting the decision taken for whether to buy CBD and THC. This evidence supports other studies that views smoking as a trigger onset for Cannabis. A United States study shows that the increased cigar or cigarillo smoking might be a trigger to Cannabis smoking [39]. Differentiating between smoking behaviors, a recent study found out that heavy smokers engaged in higher alcohol use as well as lifetime Cannabis use [40]. Other studies link E-cigarette and water pipe smoking to marijuana use [9]. Thus, the findings in this model proved what past research showed, and in the case of Lebanon where smoking plays a big role in our society nowadays, it has a positive effect on potential demand for both CBD and THC products.

Participants with legalization of cannabis and with legalizing it for personal use were not significant to willingness to buy CBD with p-values 0.225 and 0.809 respectively but were significant to willingness to buy THC with p-values 0.062 and 0.002 respectively. This can be justified because these two variables relate more to the THC personal use. People that are with legalization of Cannabis fully and who specifically are with the idea of personal use legalization are the ones most likely to be willing to buy THC products.

Participants who don't view smoking cannabis as unethical was significant in both willingness to buy CBD and THC with p-values 0.001 and 0.003 respectively. The

results show that people who don't view smoking Cannabis as unethical are more willing to buy both CBD and THC products than those who view it as unethical.

Participants who don't view smoking cannabis as an unhealthy habit was also significant for both with p-values 0.035 and 0.019 and are more likely to buy both CBD and THC.

People who agree that legalizing Cannabis for medical use improves the economy had a positive significant effect on willingness to buy CBD (p-value=0.017), and a negative non-significant effect on willingness to buy THC (p-value = 0.777).

Participants who are currently using cannabis significantly shows a high increase in both willingness to buy CBD by 0.75 units and willingness to buy THC by 0.99 units.

Unexpectedly, income had no significance on both willingness to buy CBD (p-value = 0.593) and willingness to buy THC (p-value = 0.742). Buying is dependent usually on the level of income, the more income the more a person is willing to buy, however this is not the case here because this decision for most people is related to moral issues and ethics and health. In fact, income had a negative effect on both willingness to buy and thus the higher the income the less he/she are willing to buy CBD and THC products.

Education had no significance on both. Since our sample consisted of mostly educated participants (88% finished their bachelor's degree or higher), the analysis focused on the higher education level to see the influence of it. Results showed that educated or not will not influence the participants decision making process to buy CBD or THC.

Table 4 Unconditional average partial effects estimation results for the CBD and THC Quantity

Variable Label	CBDQnt		THCQnt	
	dy/dx	p-value	dy/dx	p-value
Price of 30 CBD capsules	-0.407	0.209		
Price of 1g of THC			0.013	0.939
Being a smoker	0.569	0.010	0.345	0.012
Agrees that smoking cigarettes helps in stress relief	0.411	0.002	0.143	0.111
Agrees that buying cigarettes should not be regulated	0.509	0.007	0.093	0.462
With legalizing Cannabis	0.260	0.225	0.165	0.066
With legalizing Cannabis for personal use	-0.057	0.809	0.262	0.002
Doesn't consider smoking Cannabis as unethical	0.668	0.001	0.238	0.004
Cannabis does not affect the brain negatively	-0.172	0.247	0.204	0.033
Doesn't consider smoking Cannabis as an unhealthy habit	1.097	0.000	0.430	0.001
Agrees that legalizing Cannabis for medical use will improve the economy	0.894	0.002	0.584	0.007
Current cannabis use	1.459	0.000	0.481	0.003
Having friends who smoke cannabis	0.532	0.003	0.117	0.344
Income	0 (base)			
Low	-0.087	0.593	-0.024	0.742
High				
Education				
Master's degree or higher	-0.497	0.021	0.002	0.987
Number of observations	392	---	392	---

Surprisingly, religiosity score had no significance on both willingness to buy CBD and THC products. The findings here show that the level of religiosity of a person and his choices regarding CBD and THC do not really matter. One explanation for CBD could be that it is considered as a medicine and in this case, religion doesn't mind

treating anything with any kind of medicine. Unlikely, results shown here do not match other studies' findings that affiliate religion with THC smoking. For instance, a study done in Russia on students showed that students affiliated with a religion (Islam or Christian) were against and policy permitting the use of Cannabis and they believed that its use is addictive and poses risks [41]. However, the Santa Clara method which was used in this study does not measure religion as a practice, it measures religiosity also known as level of spirituality. Religiosity is basically a measurement assessing the strength of religious faith with multiple religious traditions as well as for people without any interest in or affiliation with religious organizations or traditions and perspectives [38]. This can explain why religiosity didn't have an effect on the on the participants' choice to buy THC. A higher level of spirituality does not mean that this person is affiliated with certain rules and traditions, and thus smoking CBD or THC does not make him/her a non-spiritual person.

Moving to the next part of the hurdle model, from the eleven variables analyzed in the Truncated Poisson model, seven were statistically significant to the quantity of CBD: having friends who smoke cannabis, agrees that smoking cigarettes helps in stress relief, agrees that buying cigarettes should not be regulated, doesn't consider smoking cannabis an unhealthy habit, agrees that legalizing CBD for medical purposes improves the economy, current cannabis use, highest level of education, and three were statistically significant to the quantity of THC: Agrees that smoking Cannabis does not affect the brain negatively, doesn't consider smoking cannabis an unhealthy habit, agrees that legalizing CBD for medical purposes improves the economy.

Both the price of 30 CBD capsules with $p\text{-value} = 0.594$ and the price of 1g of cannabis with $p\text{-value} = 0.813$ had no significant effect on the quantity chosen. This

result implies that the difference in prices for this commodity had no effect on the quantity chosen by the participant, which is counterintuitive. Typically, an increase in the price of a certain product has a negative effect on the quantity sold, but in our study, THC products didn't follow this general rule. Similarly, the results of the UAPE shown in table 4 shows that both prices had no significance on the quantities bought. The hypothesis of this result could be due to the limited range of prices that was set for the participants. The difference in prices was so little and did not have an impact on the quantities that people chose to buy. Currently Lebanon is facing one of its worst economic crises with unprecedented rates of unemployment, inflation, poverty, and devaluation of the national currency [42]. Due to the latter, the population in Lebanon has become numb to the small changes in prices for any commodities.

Being a smoker with p- value = 0.125 for the quantity of CBD and p-value = 0.442 for the quantity of THC proved no significance on the quantity chosen for both CBD and THC. However, UAPE results showed otherwise. Being a smoker had significance on the quantities of CBD and THC chosen. Regardless of peoples' willingness to buy CBD and THC products, being a smoker or not affects the quantity they are willing to buy.

Participants who agree that smoking helps in stress relief and that buying cigarettes should not be regulated had significance on the quantity of CBD, but no significance on the quantity of THC. These two variables increase the quantity of CBD bought and more for THC. The result here is explained for CBD quantity but was not expected for THC because several studies shows a link between stress and Cannabis as a coping solution [43].

On the other hand, participants who agree that smoking Cannabis does not affect the brain negatively had no significance on the quantity of CBD (p -value = 0.246) and significance on quantity of THC (p -value = 0.031). UAPE results also shows that people who agree that smoking Cannabis does not have a negative effect on the brain are more likely to increase the THC quantity purchased and vice versa.

Participants who don't consider smoking cannabis an unhealthy habit and agrees that legalizing CBD for medical purposes improves the economy are positively significant to both CBD and THC quantity. The UAPE showed similar results that people with a positive perception towards smoking cannabis are willing to buy more of both CBD and THC.

Participants on current cannabis use and having friends who smoke cannabis are significant to the quantity of CBD with p -values <0.0001 and 0.002 respectively. However, they are not significant to the quantity of THC. The results obtained are opposite to what the hypothesis assumed. This can be interpreted as a result of the small sample ($n=67$) that were willing to buy THC. The UAPE results showed that current cannabis has an effect on both quantities purchased, while having friends who smoke cannabis only affects the quantity of CBD bought.

Similar to UAPE results, the Truncated Poisson results showed that education had significance on the quantity of CBD bought and no significance on quantity of THC bought. Both results imply that a person with a master's degree or higher will decrease the quantity purchased of CBD and THC. Thus, education plays a significant role in limiting the overuse of CBD products. The higher the education (masters' degree or higher) the less the quantity purchased of CBD.

CHAPTER 5

CONCLUSION

This research has analyzed the main factors affecting peoples' willingness to buy CBD and THC products in Lebanon. The key findings show that being a smoker whether cigarette or water pipe significantly increases the chance to buy CBD, and more so THC. This factor alone was insufficient to explain willingness to buy and the quantity bought. Peoples' perception to THC and its effect on health, perception towards CBD and its positive effect on the economy, and current cannabis use, were key determinants for both willingness to buy and the quantity bought of CBD and THC. Moreover, Price and income had little impact on the decision to buy CBD or THC (or the quantities purchased). Below, we summarize four target areas to be further assessed by the Lebanese government and non-government organizations.

First, authorities can use the analysis results (the significant variables in particular) to estimate the potential demand of both CBD and THC and their price sensitivities. These estimates will act as important inputs for decision makers before taking major policy decisions towards the legalization of CBD and/or THC for medical and/or recreational use.

Second, the analysis shows that being a smoker, whether cigarette or water pipe or both, affects the willingness to buy of both CBD and THC products, and this represents a call-to-action for the government as well. Policy makers are urged to further regulate the sale, distribution, purchase, and usage of smoking products especially amongst youth to potentially decrease the number of Cannabis smokers (legally or illegally) and to limit the CBD medication to those who truly need it. Semi-

governmental and non-government organizations should also raise further awareness on the dangers of smoking and its potential to trigger onset of Cannabis and other illegal drugs.

Third, the analysis shows that participants who don't view Cannabis smoking as an unhealthy habit are more likely to buy CBD and THC. This highlights the importance of the population's perception towards Cannabis and its potential effects on the individual's health on purchasing decisions. For future implications, if the government wishes to keep Cannabis products illegal for recreational use, they, along with non-government organizations, need to further raise awareness on the potential negative health effects of Cannabis (e.g., higher levels of anxiety and stress [43]) to curb the illegal Cannabis use. They should especially target youth as they are considered the most vulnerable age group to such laws, because smoking cannabis cause functional and structural changes to their developing brain, leading to its damage [3].

Fourth, price and income, two typical drivers behind consumer purchase decisions, had little impact on the decision to buy CBD or THC (or the quantities purchased). Knowing this, governments can better estimate the potential added taxes on THC and CBD and pharmaceuticals and farmers can better price their Cannabis products. However, this result needs to be further analyzed in future research to understand why customers are price insensitive to these types of commodities.

Like any other study, this research has its limitations and weaknesses. For instance, contingent valuation survey suffers from several types of bias [44]. This can be assessed by applying similar survey in different countries to check if results hold. Moreover, the snowball sampling technique method which was applied does not include

random selection and instead creates a biased sample based on people who are connected and may share similar traits.

Limitations that were done in the analysis include dropping age and gender as part of the analysis. If future research wishes to expand such a study, age and gender must be included in the survey even if they are not significant. It is also important to note that the range of prices given to both CBD and THC products is considered limited, it should include a much wider range of values to accommodate for the different purchasing power of each participant. A wider range of prices could have changed the results and prices would have an effect on the willingness to buy decision. Finally, variables that were tested in the analysis were not screened for correlation between each other, this can impose the research to the problem of collinearity. For more accurate results, future research may test for correlated variables before testing the model.

REFERENCES

1. Pacula, R.L. and R. Smart, *Medical marijuana and marijuana legalization*. Annual review of clinical psychology, 2017. **13**: p. 397-419.
2. Shi, Y., M. Lenzi, and R. An, *Cannabis liberalization and adolescent cannabis use: a cross-national study in 38 countries*. PloS one, 2015. **10**(11): p. e0143562.
3. Grant, C.N. and R.E. Bélanger, *Cannabis and Canada's children and youth*. Paediatrics & child health, 2017. **22**(2): p. 98-102.
4. Bretteville-Jensen, A.L., *To legalize or not to legalize? Economic approaches to the decriminalization of drugs*. Substance use & misuse, 2006. **41**(4): p. 555-565.
5. Nadeen Hilal, L.B.-K., Noor Ataya, Fadi ElJardali*, <K2P Rapid Response_Marijuana August 7 2018.pdf>. 2018.
6. El-Khoury, J., et al., *Legalizing Medical Cannabis in Lebanon: the Complex Interface Between Medicine, Law, Ethics, and Economics*. Cannabis and Cannabinoid Research, 2020.
7. Ajami, L., *Unlocking the Power of Lebanese Cannabis*. 2018.
8. ما هو موقف شبكة المجتمعات العلاجية من تشريع زراعة القنب لغايات طبية؟, in *AN-NAHAR*. 2018.
9. Dai, H., et al., *Electronic cigarettes and future marijuana use: a longitudinal study*. Pediatrics, 2018. **141**(5): p. e20173787.
10. Audrain-McGovern, J., et al., *Adolescent e-cigarette, hookah, and conventional cigarette use and subsequent marijuana use*. Pediatrics, 2018. **142**(3): p. e20173616.
11. Salti, N., J. Chaaban, and N. Naamani, *The economics of tobacco in Lebanon: an estimation of the social costs of tobacco consumption*. Substance use & misuse, 2014. **49**(6): p. 735-742.
12. Watson, T.M. and P.G. Erickson, *Cannabis legalization in Canada: how might 'strict' regulation impact youth?* 2019, Taylor & Francis.
13. Caulkins, J., *Estimated cost of production for legalized cannabis*. RAND Corporation, WR-764, Santa Monica, CA: RAND; 2010. 2010.
14. Kalant, H., *A critique of cannabis legalization proposals in Canada*. International Journal of Drug Policy, 2016. **34**: p. 5-10.
15. Warf, B., *High points: an historical geography of cannabis*. Geographical Review, 2014. **104**(4): p. 414-438.
16. Johnston, L.D., et al., *Monitoring the Future national survey results on drug use, 1975-2016: Overview, key findings on adolescent drug use*. 2017, Institute for Social Research, The University of Michigan.
17. Mackinnon, M., *High times in Lebanon's Bekaa Valley*, in *The Globe and Mail*. 2007, The Globe and Mail: Toronto, Ont. p. A.20.
18. Afsahi, K. and S. Darwich, *Hashish in Morocco and Lebanon: A comparative study*. International Journal of Drug Policy, 2016. **31**: p. 190-198.
19. Blanford, N., *In Lebanon, a comeback for cannabis*, in *The Christian Science Monitor*. 2007, The Christian Science Publishing Society (d/b/a "The Christian Science Monitor"), trusteeship under the laws of the Commonwealth of Massachusetts: Boston, Mass. p. 6.

20. Marshall, J., *The Lebanese connection: Corruption, civil war, and the international drug traffic*. 2012: Stanford University Press.
21. Ulrichsen, K.C., *Philip Robins. Middle East Drugs Bazaar: Production, Prevention and Consumption*. Oxford: Oxford University Press, 2016. xiv+ 289 pages. Paper US \$29.95 ISBN 978-0-1904-6245-1. Review of Middle East Studies, 2017. **51**(2): p. 307-309.
22. al-Fakih, R., *Impoverished villagers see cannabis cultivation as lone lifeline*, in *The Daily Star*. 2012, Tribune Content Agency LLC: Washington.
23. Slemrod, A., *Hemp offers cannabis farmers legal alternative*, in *The Daily star* 2011, SyndiGate Media Inc: United States. Beirut.
24. Arnson, C.J. and I.W. Zartman, *Rethinking the economics of war: the intersection of need, creed, and greed*. 2005: Woodrow Wilson Center Press.
25. Takiiedine, S., *Feature: Lebanon's cannabis producers complain prosecution, depression*, in *Xinhua News Agency*. 2017, Xinhua News Agency: United states, Woodside.
26. *Lebanon agriculture minister urges cannabis cultivation for export*, in *The Daily Star*. 2014, Tribune Content Agency LLC: United States, Chicago.
27. Jawad, M., et al., *Parental smoking and exposure to environmental tobacco smoke are associated with waterpipe smoking among youth: results from a national survey in Lebanon*. Public Health, 2015. **129**(4): p. 370-376.
28. Bretteville-Jensen, A.L., H.O. Melberg, and A.M. Jones, *Sequential patterns of drug use initiation-Can we believe in the gateway theory?* The BE Journal of Economic Analysis & Policy, 2008. **8**(2).
29. O'brien, M.S., et al., *Does cannabis onset trigger cocaine onset? A case-crossover approach*. International journal of methods in psychiatric research, 2012. **21**(1): p. 66-75.
30. Keyes, K.M., A. Hamilton, and D.B. Kandel, *Birth cohorts analysis of adolescent cigarette smoking and subsequent marijuana and cocaine use*. American journal of public health, 2016. **106**(6): p. 1143-1149.
31. *Lebanon's cannabis heartland, Bekaa, hopes for legalization*, in *AN-NAHAR*. 2018.
32. Hoke, Z., *Syria/Lebanon: Syrian War Aids Lucrative Cannabis Farming in Lebanon*, in *Asia News Monitor*. 2014, Thai News Service Group: Bangkok.
33. Shbaro, A., *جنبلات مع "الحشيشة" ... ما واقعية الأمر؟*, in *AN-NAHAR*. 2014.
34. Blickman, T., *Morocco and Cannabis—Reduction, Containment or Acceptance*. TNI Drug Policy Briefing, 2017. **49**.
35. Chalak, A., et al., *Farmers' willingness to adopt conservation agriculture: New evidence from Lebanon*. Environmental Management, 2017. **60**(4): p. 693-704.
36. Romano, K.R., et al., *Willingness to pay more for value-added pomegranate juice (Punica granatum L.): An open-ended contingent valuation*. Food Research International, 2016. **89**: p. 359-364.
37. Weimer, D.L., A.R. Vining, and R.K. Thomas, *Cost–benefit analysis involving addictive goods: contingent valuation to estimate willingness-to-pay for smoking cessation*. Health economics, 2009. **18**(2): p. 181-202.
38. Plante, T.G. and M.T. Boccaccini, *The Santa Clara strength of religious faith questionnaire*. Pastoral Psychology, 1997. **45**(5): p. 375-387.

39. Fairman, B.J. and J.C. Anthony, *Does starting to smoke cigars trigger onset of cannabis blunt smoking?* Nicotine and Tobacco Research, 2018. **20**(3): p. 355-361.
40. Charrier, L., et al., *Cigarette smoking and multiple health risk behaviors: a latent class regression model to identify a profile of young adolescents.* Risk analysis, 2019. **39**(8): p. 1771-1782.
41. Gritsenko, V., et al., *Religion in Russia: Its impact on university student medical cannabis attitudes and beliefs.* Complementary Therapies in Medicine, 2020. **54**: p. 102546.
42. Jaspal, R., M. Assi, and I. Maatouk, *Potential impact of the COVID-19 pandemic on mental health outcomes in societies with economic and political instability: case of Lebanon.* Mental Health Review Journal, 2020.
43. Glodosky, N.C. and C. Cuttler, *Motives Matter: Cannabis use motives moderate the associations between stress and negative affect.* Addictive behaviors, 2020. **102**: p. 106188.
44. Mostafa, M.M., *Egyptian consumers' willingness to pay for carbon-labeled products: A contingent valuation analysis of socio-economic factors.* Journal of Cleaner Production, 2016. **135**: p. 821-828.

