Sciences Economiques et Sociales de la Santé
& Traitement de l'Information Médicale

sesstim.univ-amu.fr

Davide FORTIN
Doctorant en Économie Université Paris 1 Panthéon-Sorbonne

Economics of Medicinal Cannabis: What can be learned from the US experience?

septembre 2018

Cliquez ici pour voir l'intégralité des ressources associées à ce document

Economics of Medicinal Cannabis:

What can be learned from the US experience?

PRESENTED BY

Davide Fortin

Centre d'Économie de la Sorbonne

UNIVERSITÉ PARIS 1
PANTHÉON SORBONNE

MPG | MARIJUANA POLICY GROUP

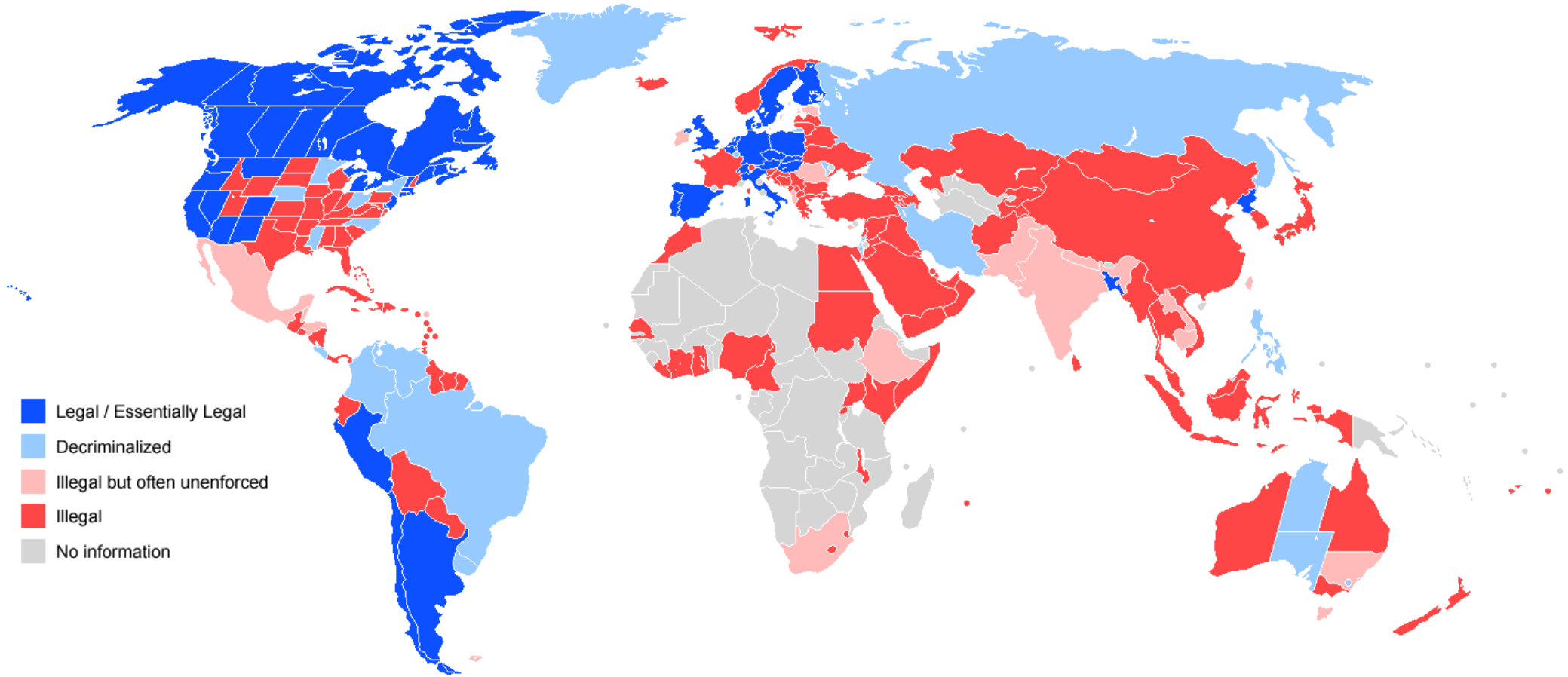
SESSTIM
Sciences Economiques et Sociales de la Santé & Traitement de l'Information Médicale

Séminaire Interne SESSTIM
Marseille, 14 September 2018

Agenda

- Cannabis Regulation in Colorado
- The cannabis markets
- The impact of full legalization on the medical cannabis market
- The integration of medical cannabis in the European Health System
- A theoretical model of legalization for Europe

LEGALITY OF MEDICAL CANNABIS



MPG | MARIJUANA POLICY GROUP

Business / #CannabisMédicinal

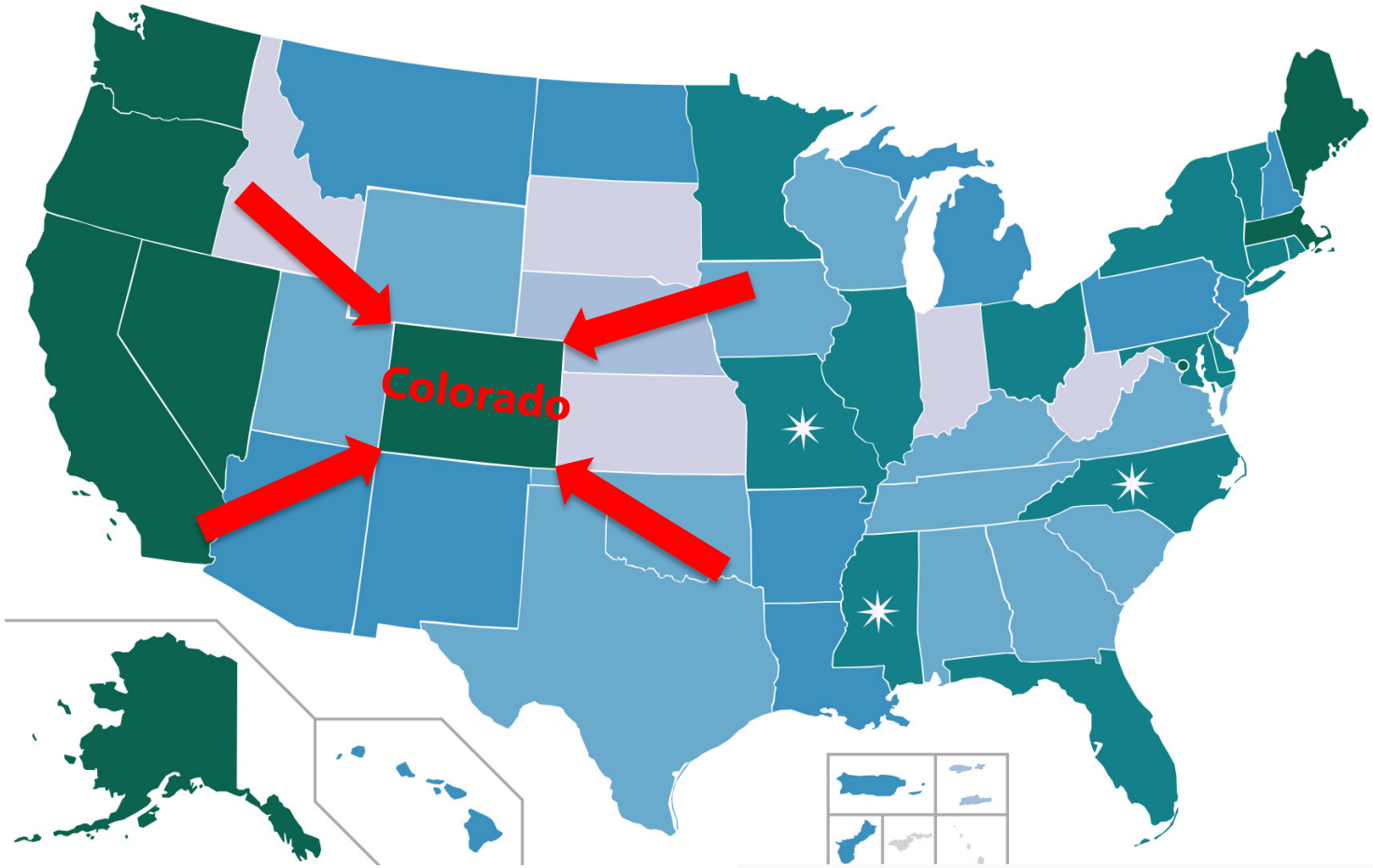
Cannabis Médicinal : Le Débat Sur La Légalisation A Eté Relancé En France

Muriel Touaty
Parler du monde de l'innovation et entrepreneurial autour du progrès pour tous partagé par tous

8 juin 2018

Cannabis Regulation in Colorado

MPG | MARIJUANA POLICY GROUP



Jurisdiction with legalized cannabis.

Jurisdiction with both medical and decriminalization laws.[2]

Jurisdiction with legal psychoactive medical cannabis.

Jurisdiction with legal non-psychoactive medical cannabis.

Jurisdiction with decriminalized cannabis possession laws.

Jurisdiction with cannabis prohibition.

MPG | MARIJUANA POLICY GROUP

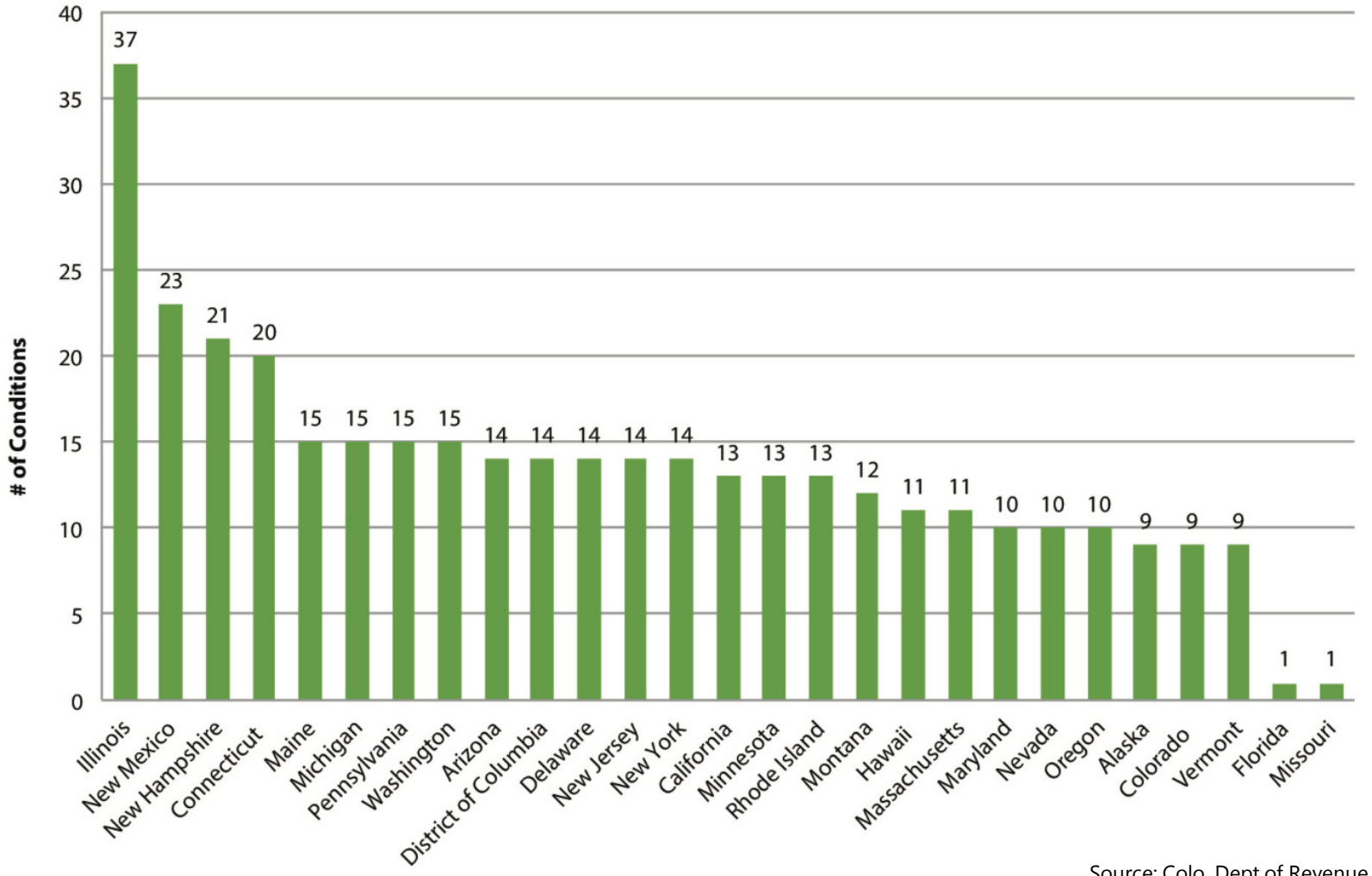
COLORADO IS THE FIRST…

..**Fully legal** market for **recreational** cannabis

..model of c**ommercialized** distribution of **medical** cannabis

MPG | MARIJUANA POLICY GROUP

Conditions accepted to obtain a Physician's Recommendation



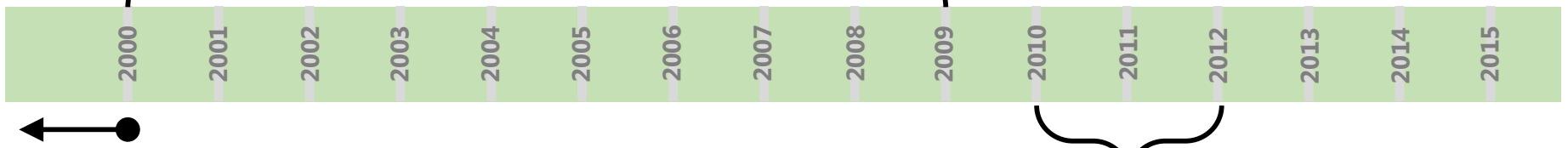
Source: Colo. Dept of Revenue

Cannabis Law in Colorado

LEGAL for medical purposes

- Caregiver model

2000 – 2009



Pre-2000

ILLEGAL

2010 – 2012

Regulated medical market emerges

- Licensed dispensaries

Cannabis Law in Colorado

Year-end 2017

- Market grows to over $1.5 billion of annual revenues

Amendment 64

- Popular vote in favor of legalization

November 2012

January 2014

Regulated market opens

CANNABIS DISPENSARIES IN COLORADO

Recreational Stores

Medical Centers

REQUIREMENTS:

- ❑ To be **over 21 years** old

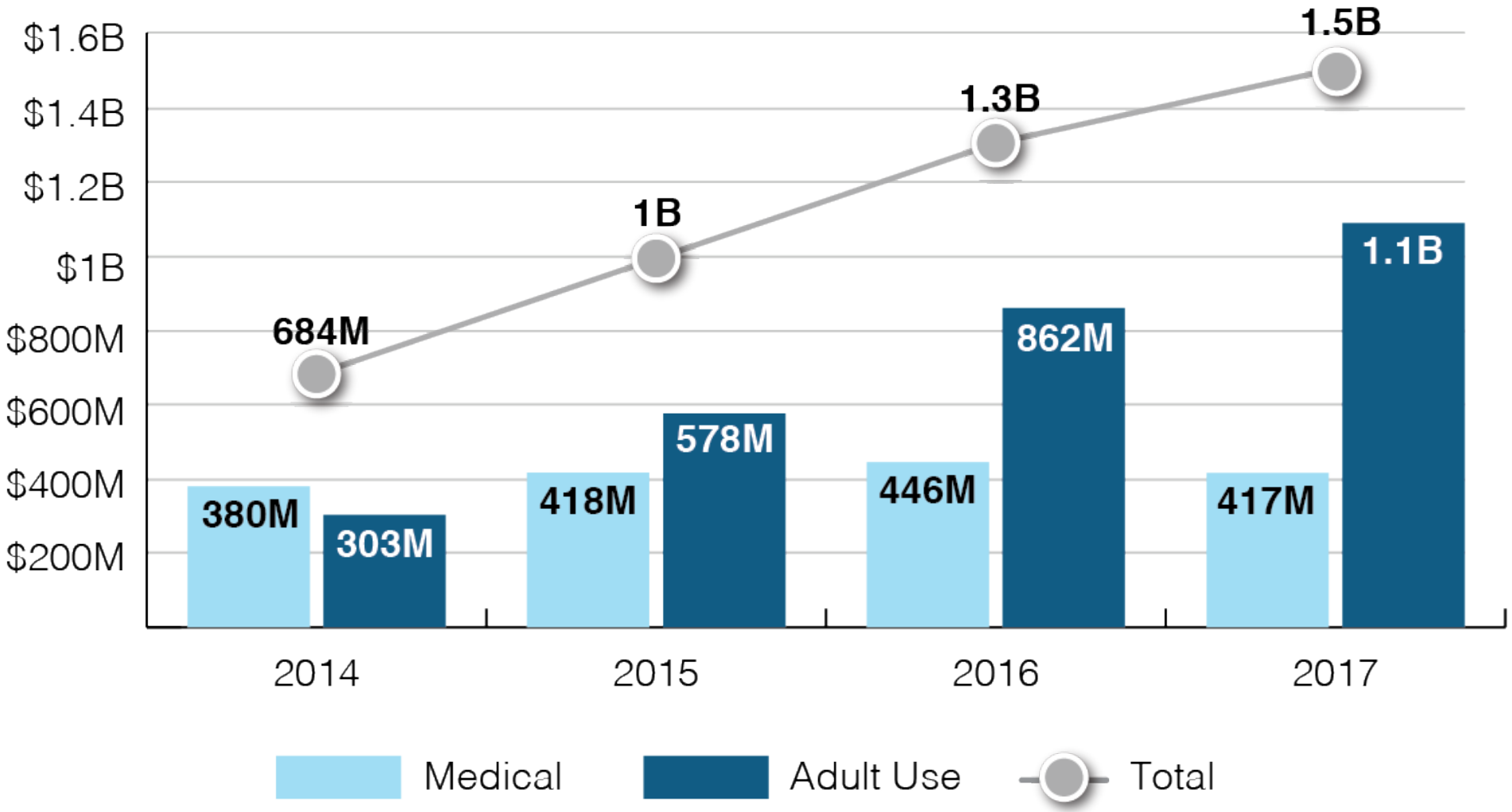
- ❑ To be a Colorado citizen
- ❑ To receive a **Physician recommendation**

MPG | MARIJUANA POLICY GROUP

Cannabis Markets in Colorado

MPG | MARIJUANA POLICY GROUP

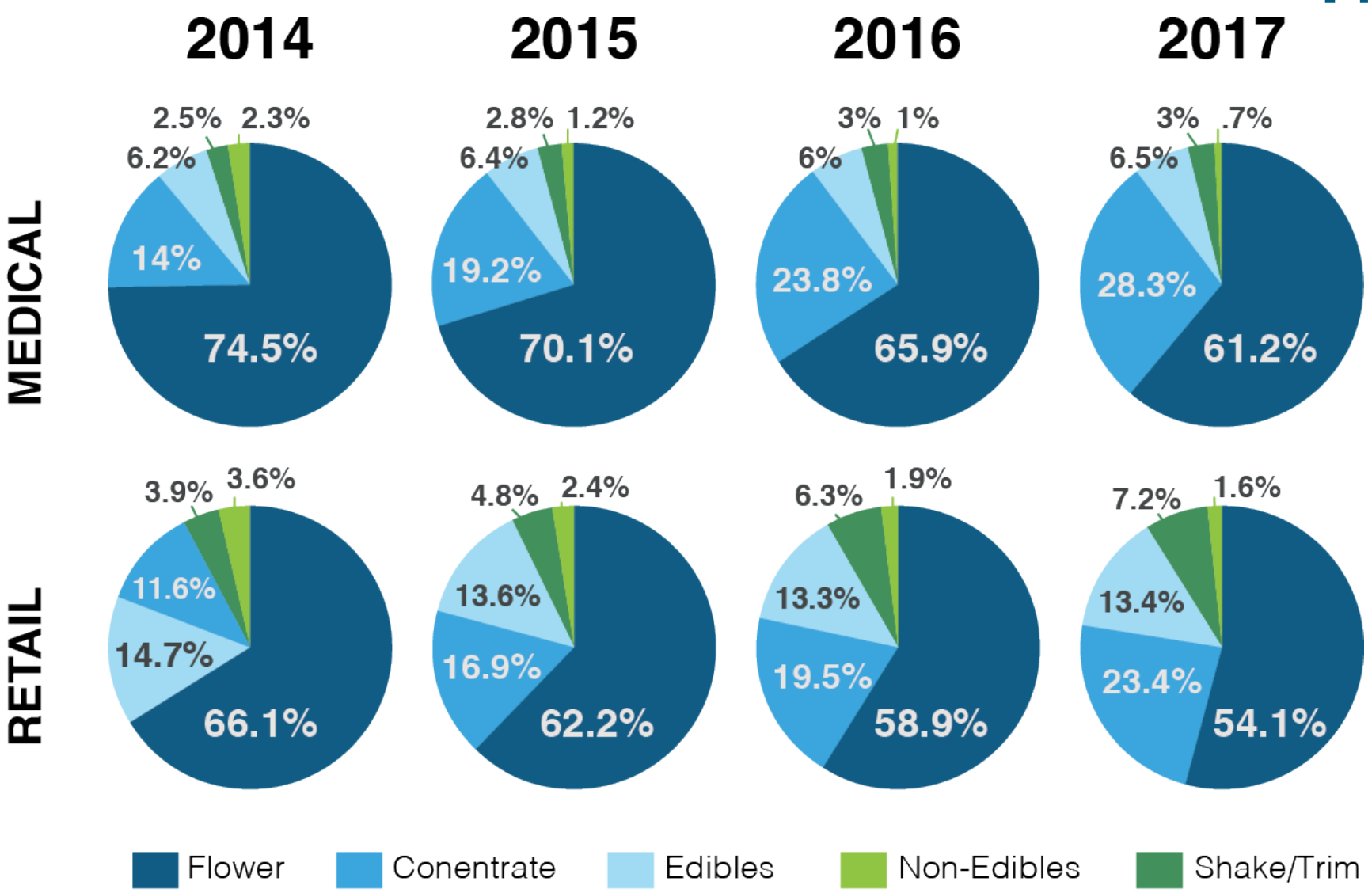
GROWTH EXPERIENCE: COLORADO



MPG MARIJUANA POLICY GROUP

Source: Colo. Dept of Revenue

Product Market Share

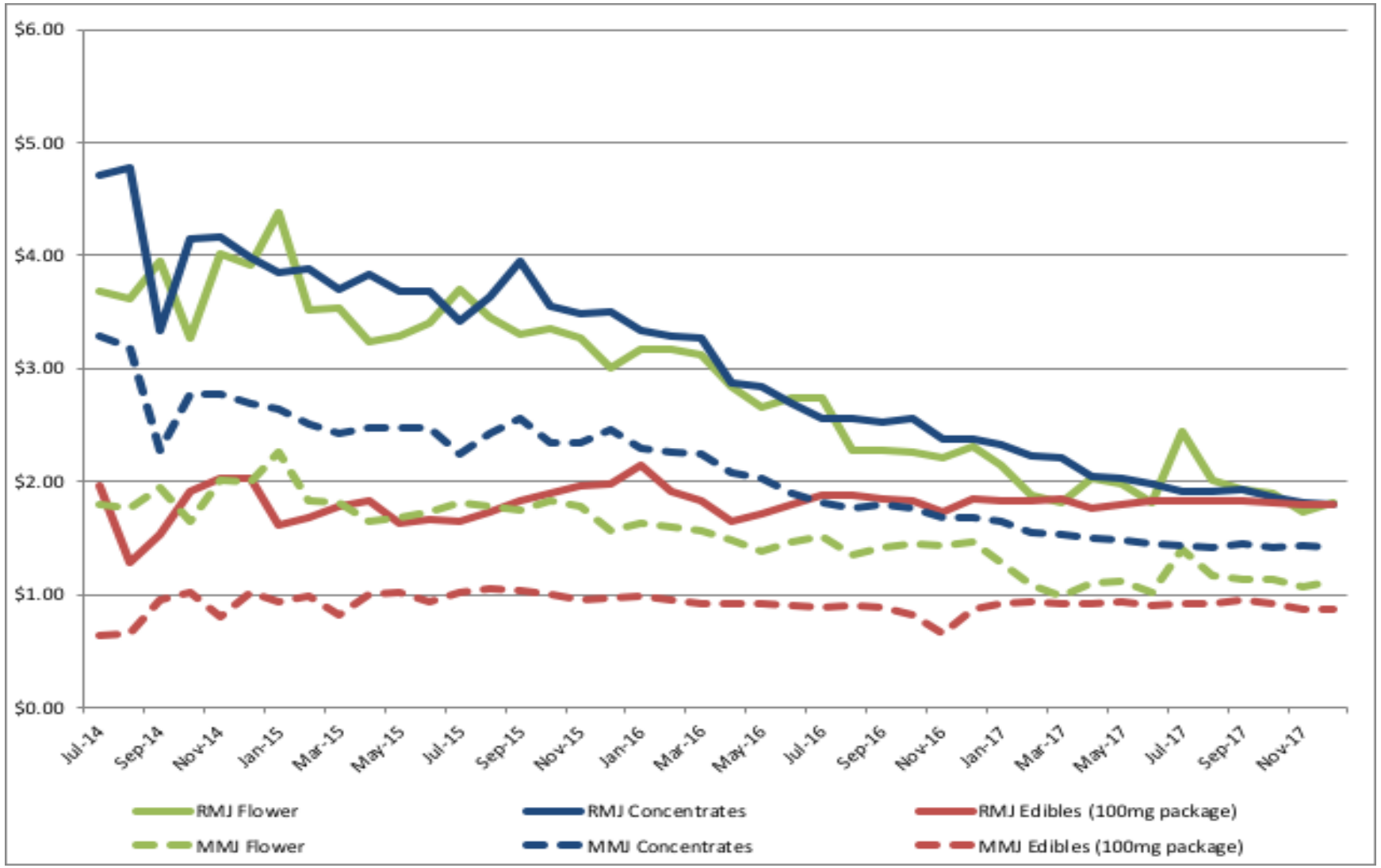


- Steady decline of flower sales from 2014-2017
- Steady increase of concentrate sales

MPG MARIJUANA POLICY GROUP

Source: Colo. Marijuana Enforcement Division; MPG

PRICE PER GRAM

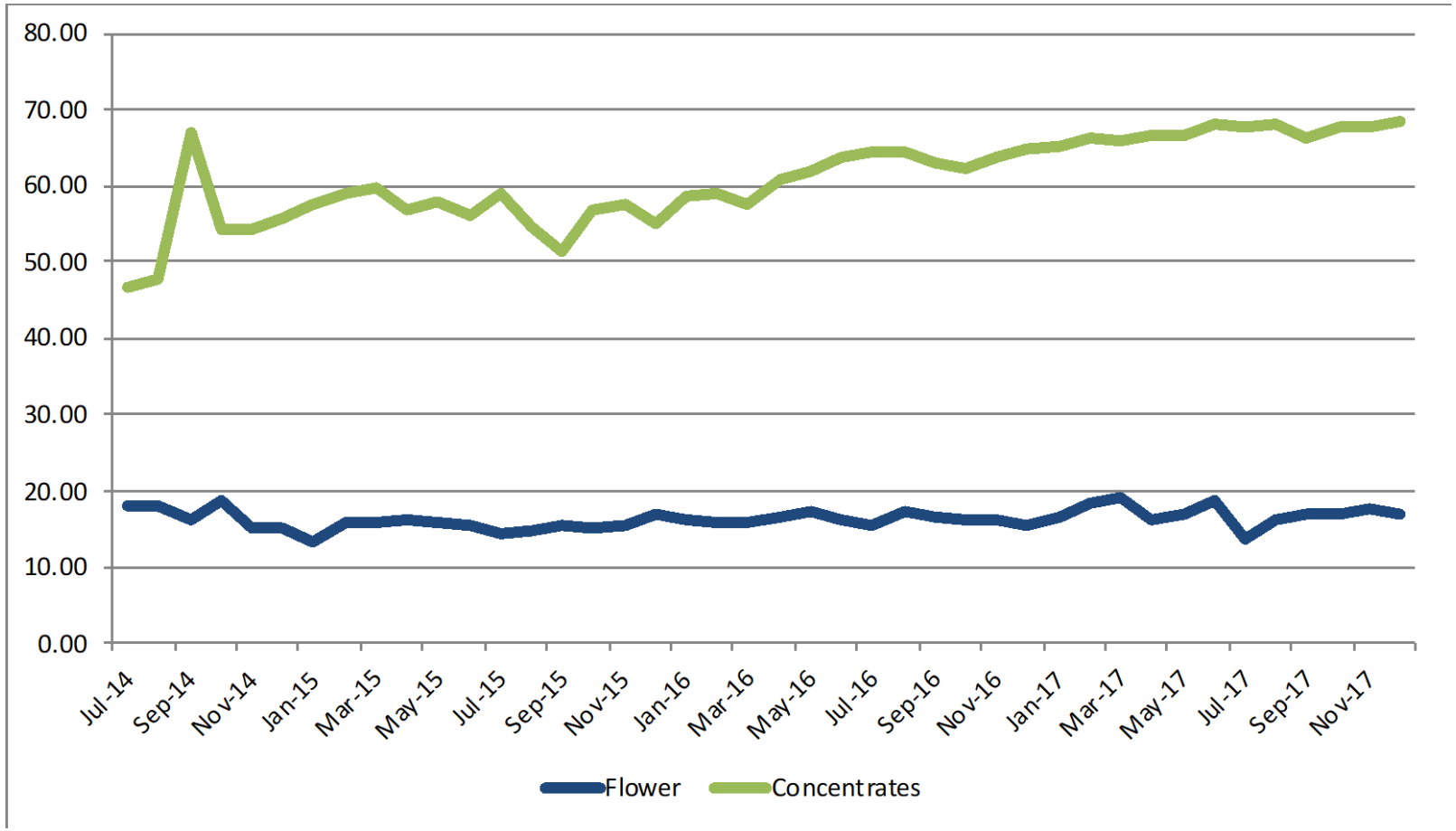


- Flower and concentrate product price per serving has significantly decreased
- Edibles price per serving has remained relatively constant

MPG MARIJUANA POLICY GROUP

Source: Colo. Marijuana Enforcement Division; MPG

PRODUCT POTENCY (%THC)



- Steady increase in concentrate potency
- Concentrate products 2017 average: 68%
- Flower 2017 average: 19.6%

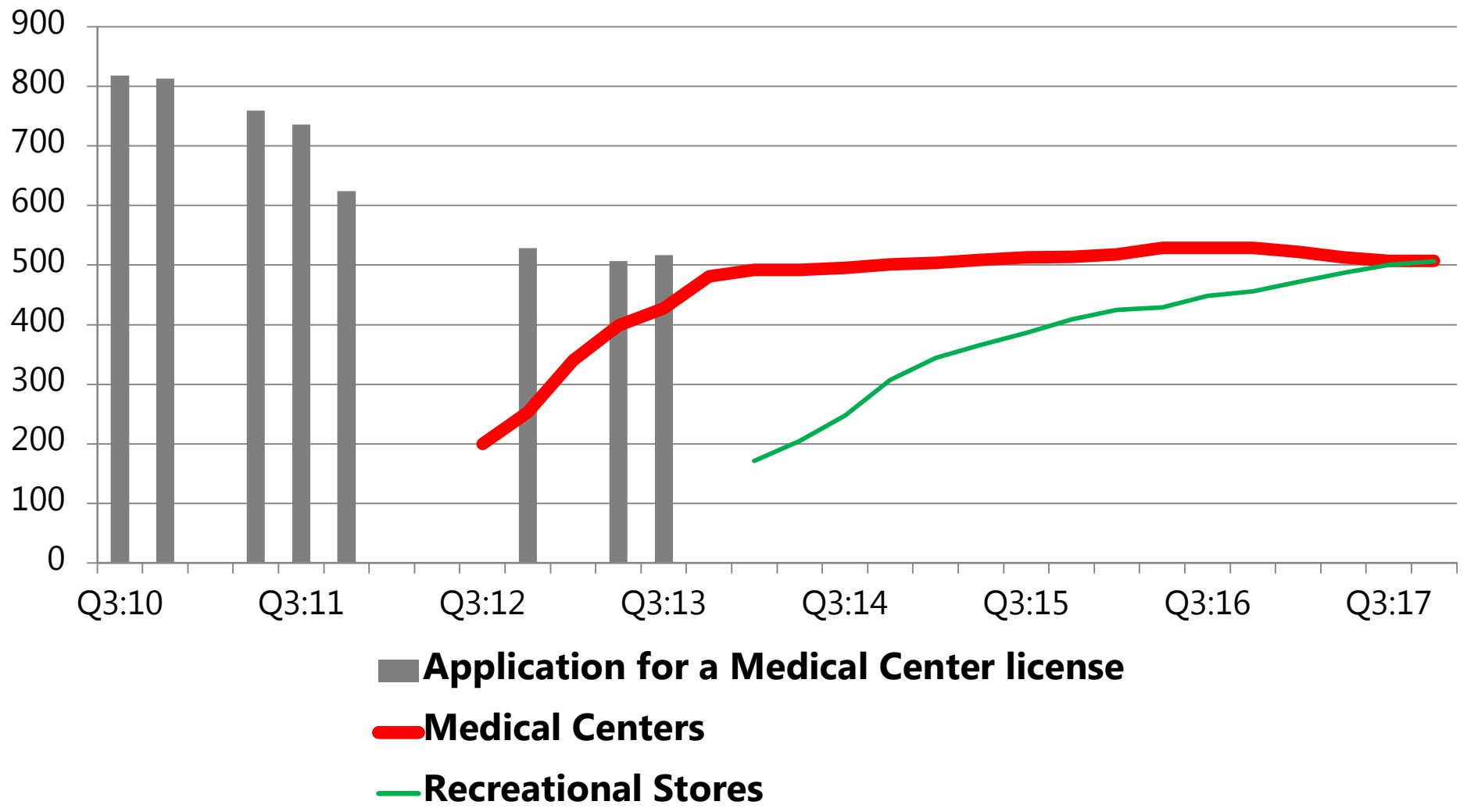
MPG MARIJUANA POLICY GROUP

Source: Colo. Marijuana Enforcement Division; MPG

The Impact of Full Legalization on Medical Cannabis Market in Colorado

MPG | MARIJUANA POLICY GROUP

Cannabis Dispensaries



MPG MARIJUANA POLICY GROUP

Source: Colo. Dept of Revenue

Research Question

- ARE PATIENTS USING THE RECREATIONAL MARKET?
- ARE NON-MEDICAL USERS USING THE MEDICAL MARKET?

Is the new recreational market

- **Expanding** cannabis sales?
- **Cannibalizing** medical sales?

MPG | MARIJUANA POLICY GROUP

Recreational Market Demand

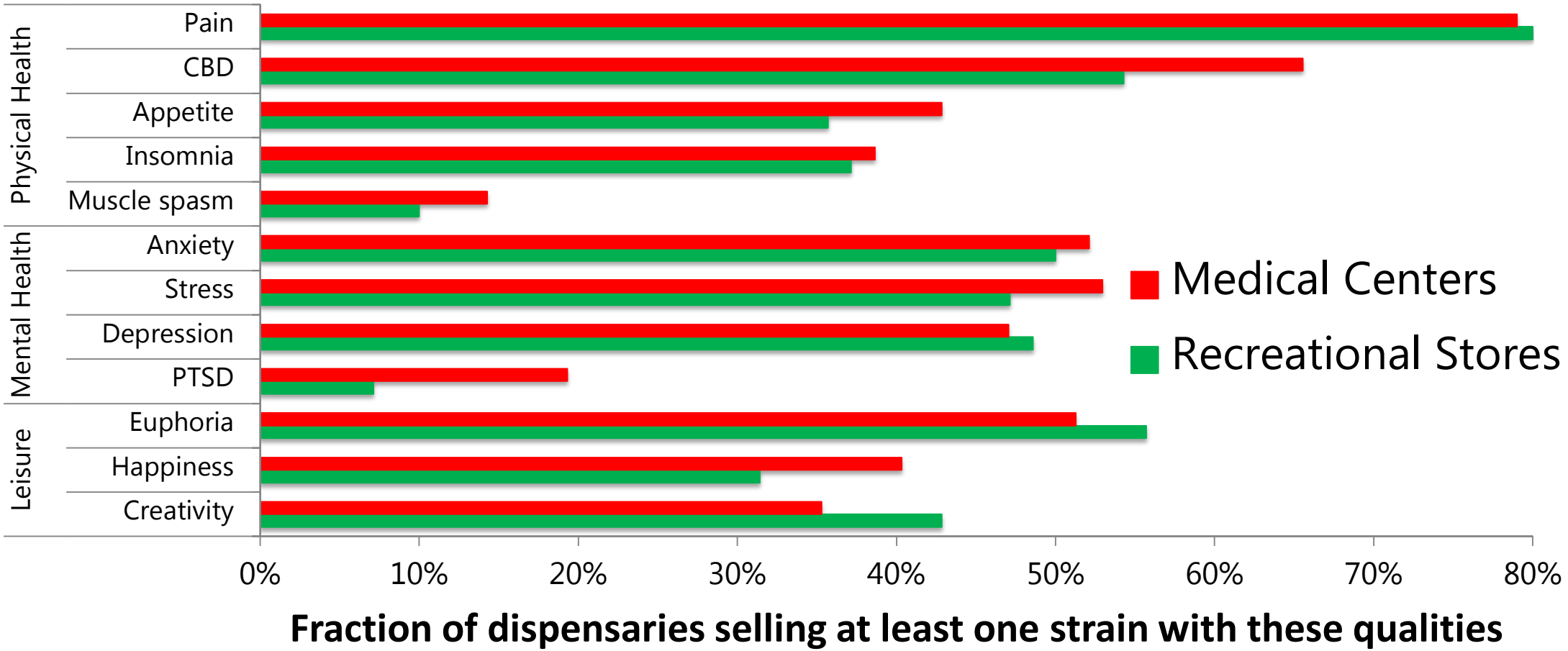
- Previous buyers in medical market
  - *"Patients"*
  - *Unwilling to be registered*
  - *Sophisticated*

Cannibalization

- New consumers
- Consumers previously buying illegal cannabis
- Out-of-state buyers
  - *Tourists*
  - *Interstate Smugglers*

Market Expansion

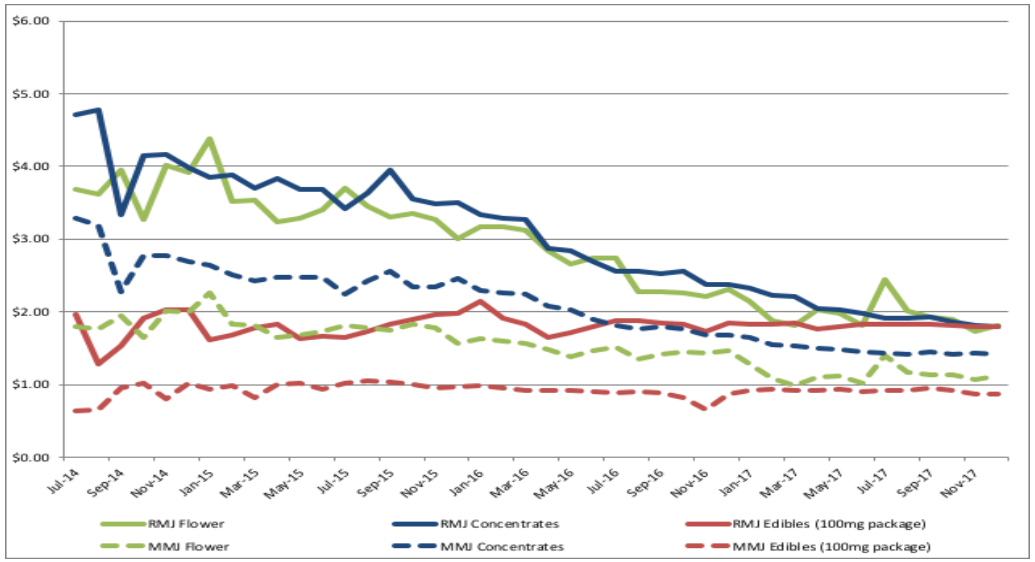
Are Rec and Med Dispensaries selling the same product?



MPG MARIJUANA POLICY GROUP

Source: Weedmaps™; April 2015

PRICE DIFFERENTIAL



TAX STRUCTURE: RATES

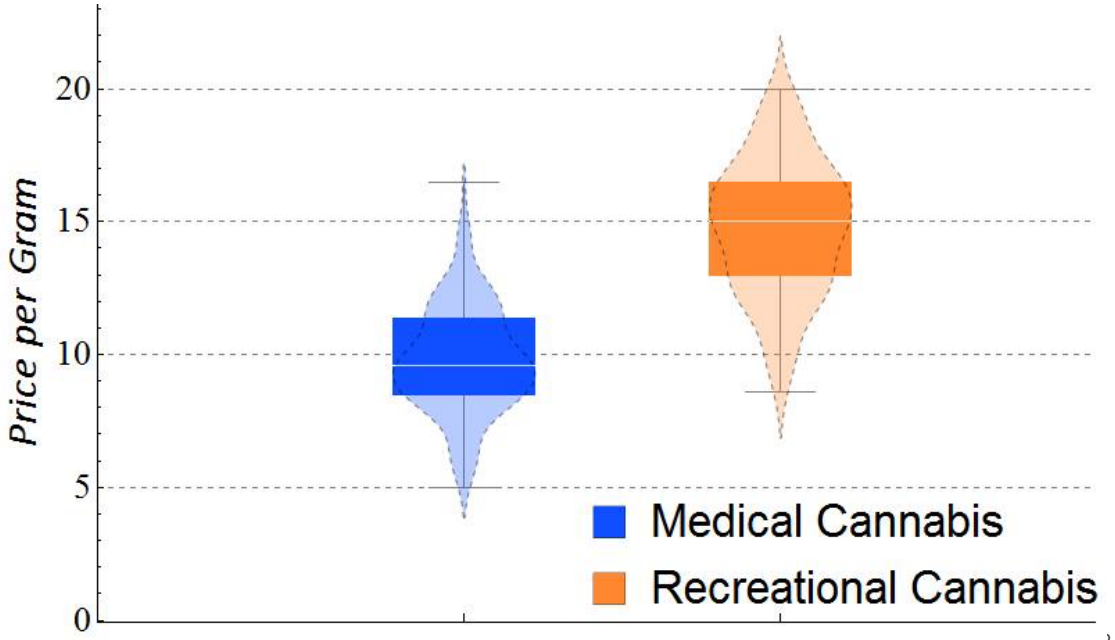
Colorado Tax Regime (2016) Sales Tax (Consumer Pays)		
	Medical	Retail*
State Base Rate	2.90%	2.90%
State Special Rate	0%	10.00%
City Base Rate	0%	3.65%
City Special Rate	0%	3.50%
Other Sales Rates	0%	1.10%
Total Sales Tax Rate:	2.90%	21.15%
Excise Tax (Producer Pays)		
$/Pound: Flower	$0	$ 292.20
$/Pound: Trim	$0	$ 69.60
$/Inmature Plant:	$0	$7.00
*Denver city used as example		
**Based upon DOR price of $1948 / $464 for flower/trim.		

Effective Rate Paid (Excise + Sales):

Medical: 2.9%

Retail: ~ 39.3%

(1 + 15%) * (21.15%)

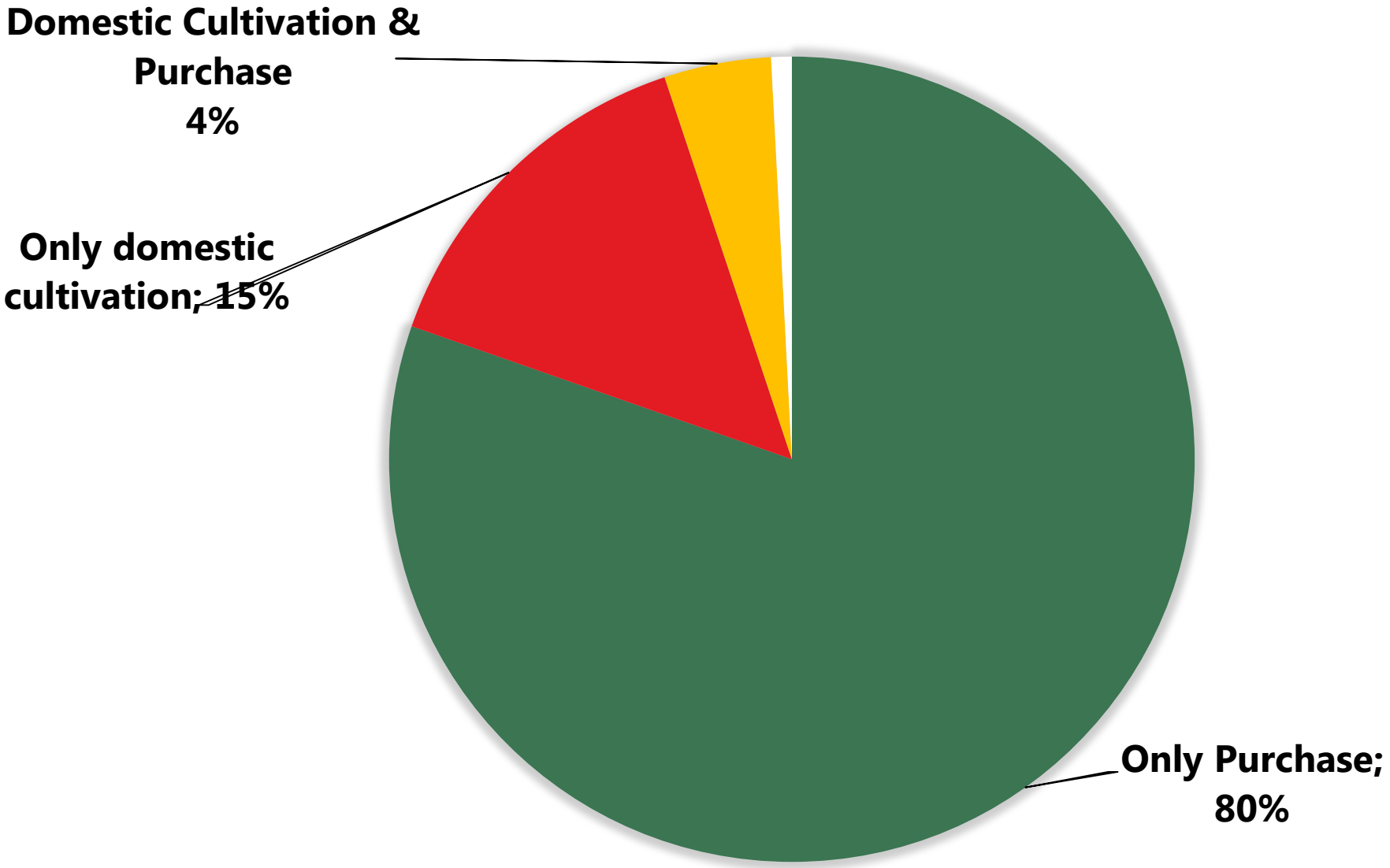


DATASET

- **Medical Market (Q3:2012 – Q4:2017)**
- **Recreational Market (Q1:2014 – Q4:2017)**
- **Data observed at a county level**
  - Quarterly Sales Revenues
  - # Med Centers
  - # Rec Stores
  - Result from legalization Ballot in 2012
- **Data on patients with medical cannabis prescription**

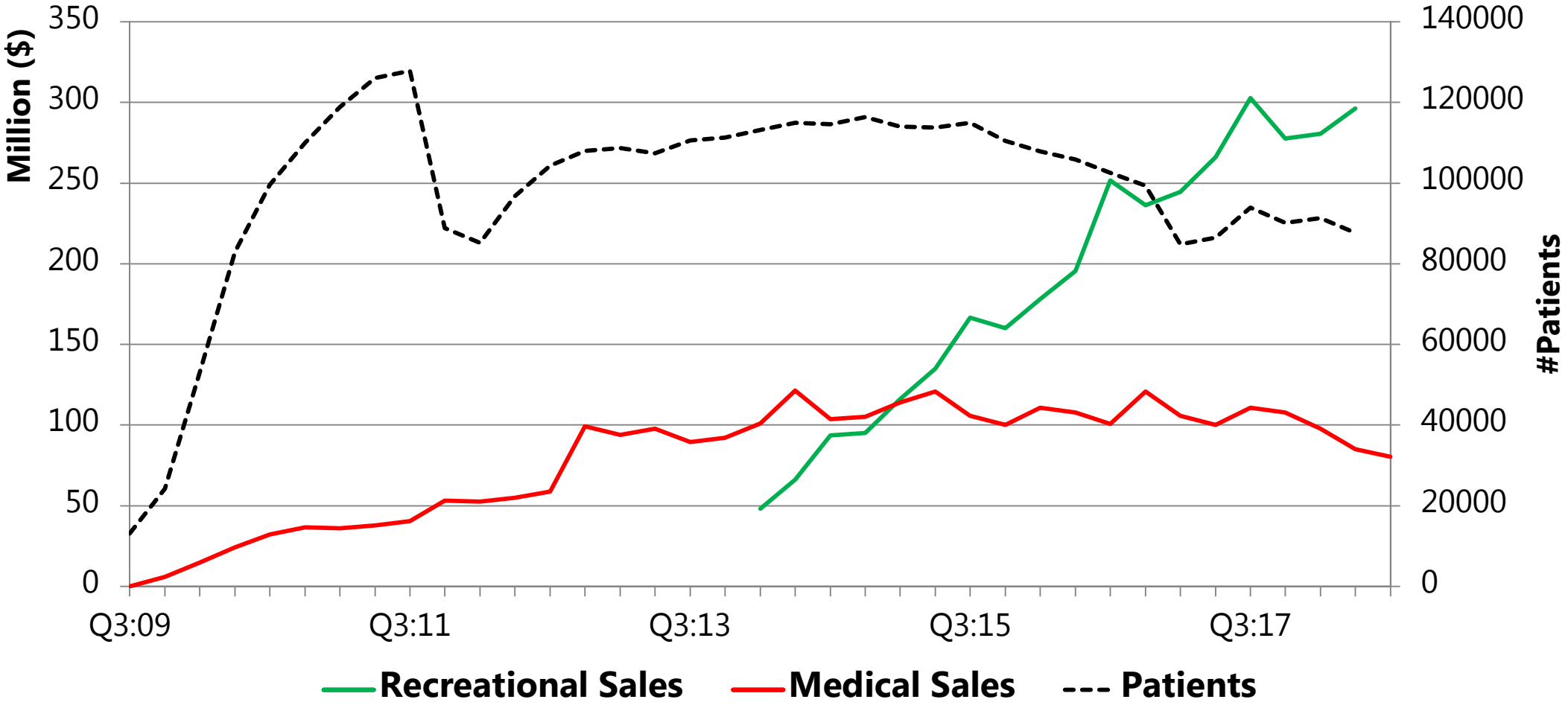
MPG | MARIJUANA POLICY GROUP

Supply Channels used by Patients in Colorado



Source: Colo. Dept of Public Health and Environment, July 2018

Quarterly Sales and Patients



MPG MARIJUANA POLICY GROUP

Source: Colo. Dept of Revenues; Colo. Dept of Public Health and Environment

BASIC "ECONOMETRIC" MODEL

$$Rev\_Med_{i,t} = \beta_1 Med\_Centers_{i,t} + \beta_2 Rec\_Stores_{i,t} + \beta_3 POP_i$$

$$Rev\_Med_{i,t}/POP_{i,t} = \beta_1 Med\_Centers_{i,t} + \beta_2 Rec\_Stores_{i,t} + \beta_3 POP_i + \beta_4 Time_i + \beta_5 Ballot_i + \beta_6 Leisure + + \beta_7 Border$$

MPG | MARIJUANA POLICY GROUP

RESULTS

- **Weak Cannibalization of Medical Cannabis Sales**
  - Approximately 5% reduction
- **An additional recreational store generates**
  - $ 22.800 reduction of medical sales per quarter
  - About $ 90.000 annual reduction of medical cannabis sales

	Medical Sales		
	RE	FE	Diff
VARIABLE	*REV_MED*	*REV_MED*	*ΔREV_MED*
Constant	-7.06e+06***	1.64e+06***	1.53e+05*
	[1.70e+06]	[1.51e+05]	[8.5e+04]
#MMC[1]	2.13e+05***	1.58e+05***	1.67e+05***
	[5963]	[7321]	[7971]
#RMS[1]	-2.28e+04***	-1.84e+04***	-5.60e+04***
	[5420]	[4859]	[6204]
ln*(POP)*	6.78e+05***		
	[1.58e+05]		
$\mathcal{E}_{\#MMC}$	0.960	0.712	
$\mathcal{E}_{\#RMS}$	-0.055	-0.044	
N	432	432	336
Groups	24	24	22
R^2 *within*	0.598	0.598	0.524
R^2 *between*	0.964	0.970	0.842
R^2 *overall*	0.945	0.948	0.576

MPG MARIJUANA POLICY GROUP

RESULTS PER CAPITA

- **Weak Cannibalization of Medical Cannabis Sales per capita**
  - Approximately 11-13%
  - Medical cannabis revenues are decreasing overtime
- **An additional recreational store generates**
  - $ 10-15 reduction of medical sales per capita
- The **sentiment towards cannabis** is positively correlated with the sales per capita of medical cannabis

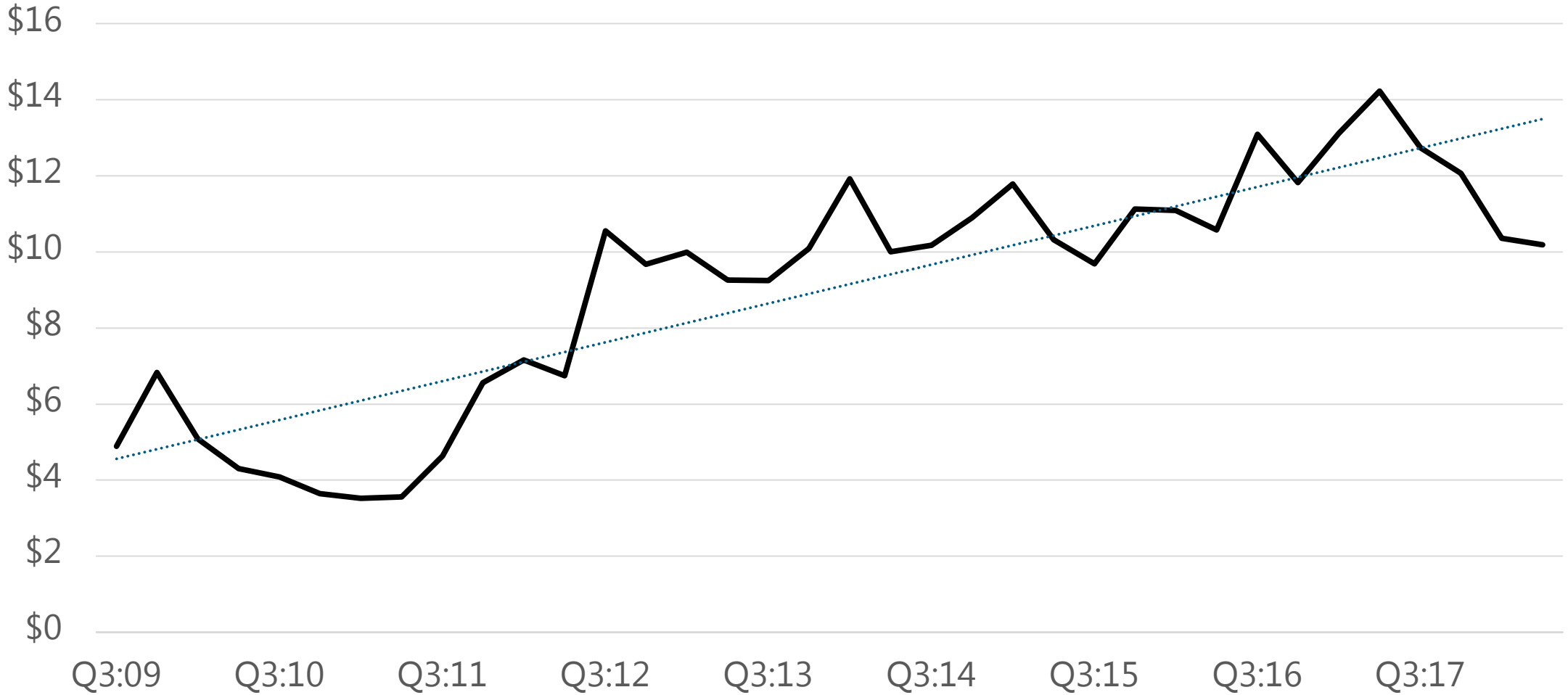
	REV_MED/POP			
VARIABLE	RE *REV_MED/POP*	FE *REV_MED/POP*	Diff *ΔREV_MED/POP*	Diff *ΔREV_MED/POP*
Constant	-114.9***	16.67***	-0.912**	-1.627***
	[41.77]	[1.269]	[0.447]	[0.556]
#MMC[1]	55.70***	54.31***	30.68***	
	[4.966]	[5.142]	[5.747]	
#RMS[1]	-15.66***	-16.35***	-10.10***	
	[2.258]	[2.335]	[2.695]	
#MMC/POP[1]				0.366***
				[0.039]
#RMS/POP[1]				-0.147***
				[0.031]
ln*(POP)*	7.707***			
	[2.259]			
TIME	-0.121**	-0.082		
	[0.061]	[0.060]		
BALLOT	0.698*			
	[0.413]			
LEISURE	10.51			
	[9.16]			
BORDER	7.005			
	[6.525]			
$\mathcal{E}_{\#MMC}$	0.487	0.450		
$\mathcal{E}_{\#RMS}$	-0.116	-0.124		
N	432	432	336	336
Groups	24	24	22	22
R^2 *within*	0.366	0.359	0.069	0.213
R^2 *between*	0.371	0.139	0.562	0.339
R^2 *overall*	0.416	0.215	0.120	0.238

MPG | MARIJUANA POLICY GROUP

Two potential drivers of cannibalization

- Lower sales per patient
- Fewer patients

Average Daily Consumption per Patient



Nota: The cost does not include the cannabis produced domestically

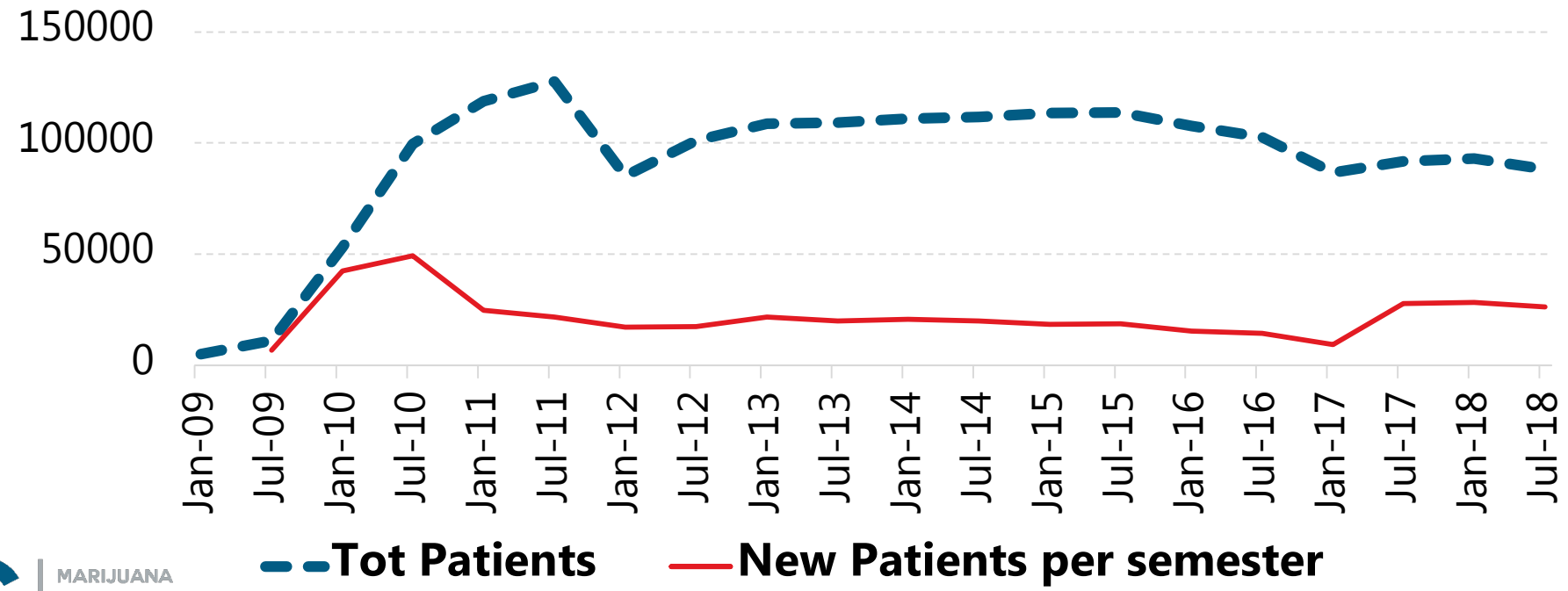
Source: Colo. Dept of Revenue; Colo. Dept of Public Health and Environment

MPG MARIJUANA POLICY GROUP

Patients Profile have Changed

About 420.000 new patients since 2009

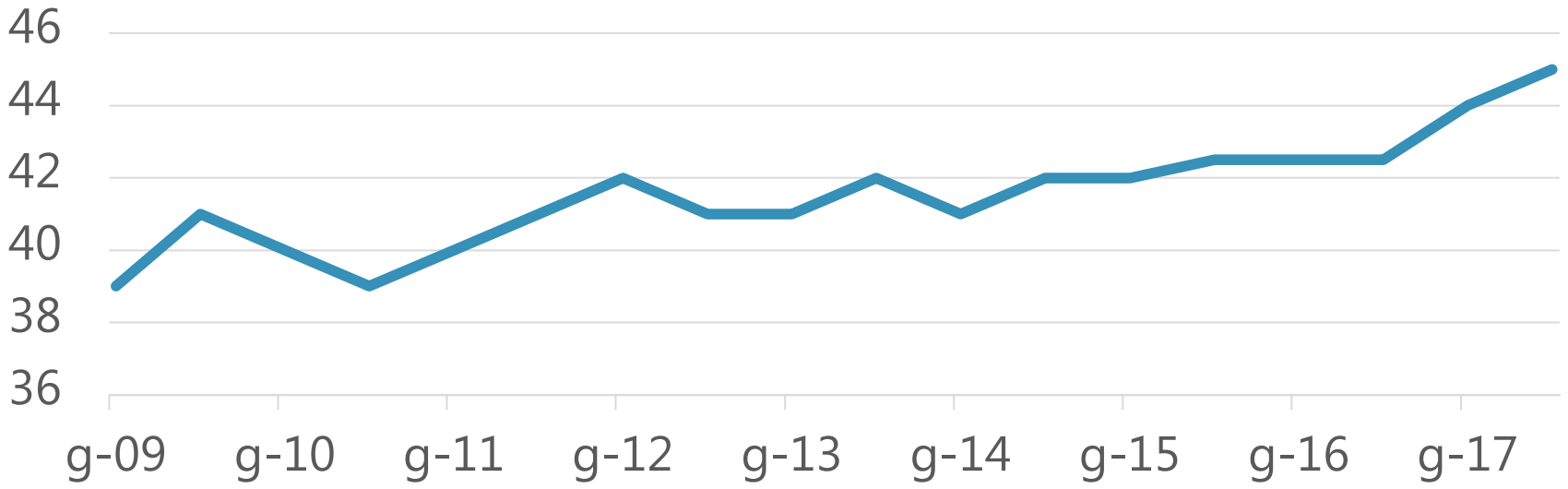
- Since 2011, about 40.000 new applications per year
- 50% annual turnover

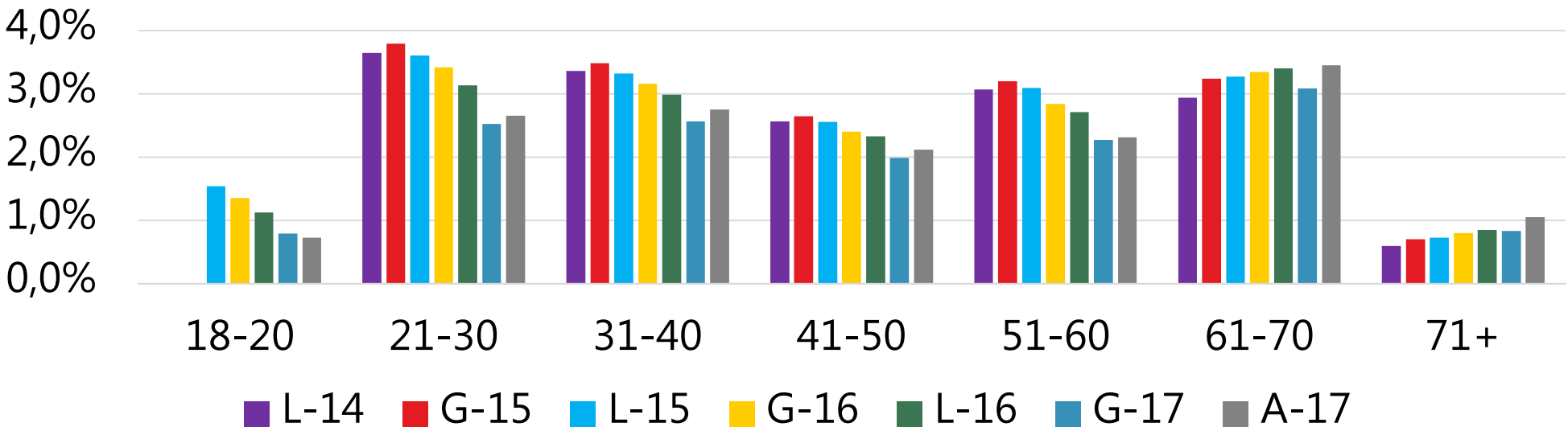


MPG MARIJUANA POLICY GROUP

Source: Colo. Dept of Public Health and Environment,

Age of Patients

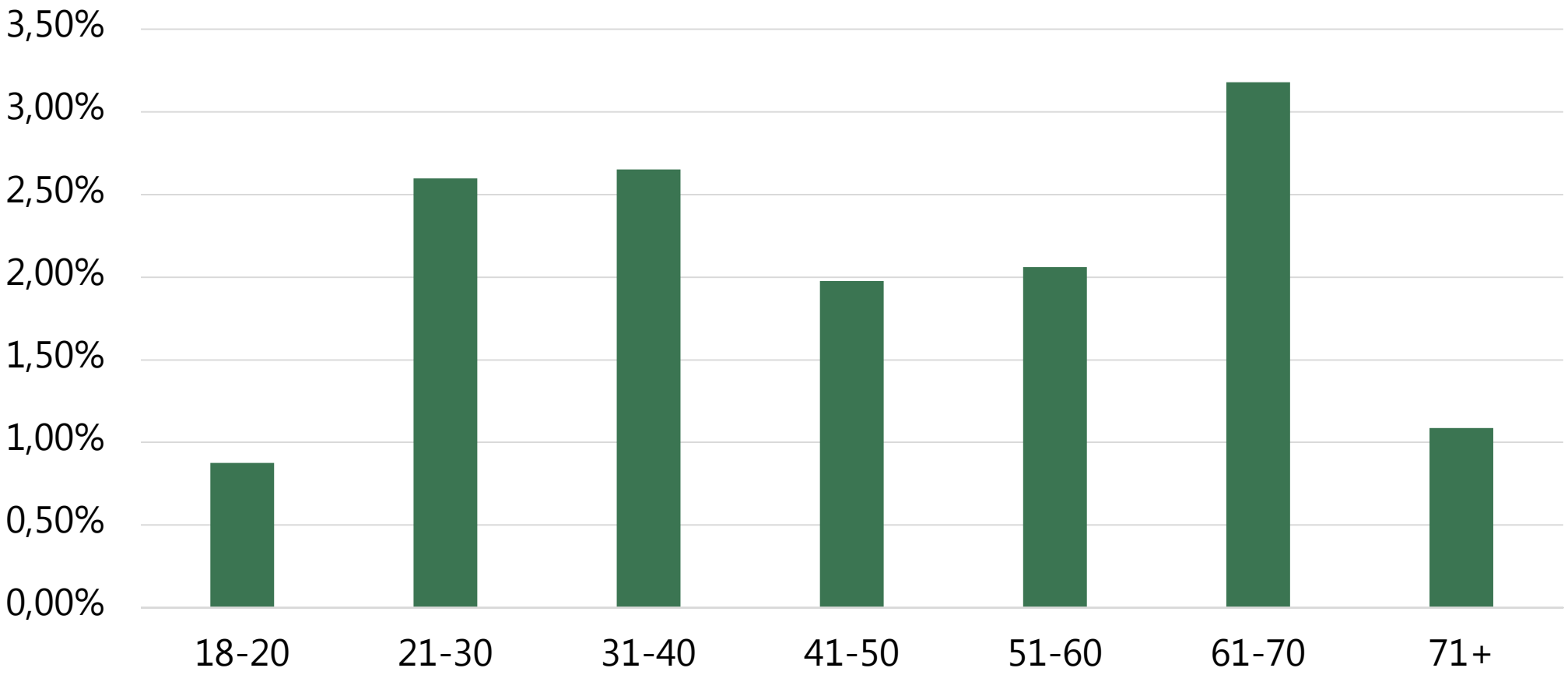




MPG MARIJUANA POLICY GROUP

Source: Colo. Dept of Public Health and Environment

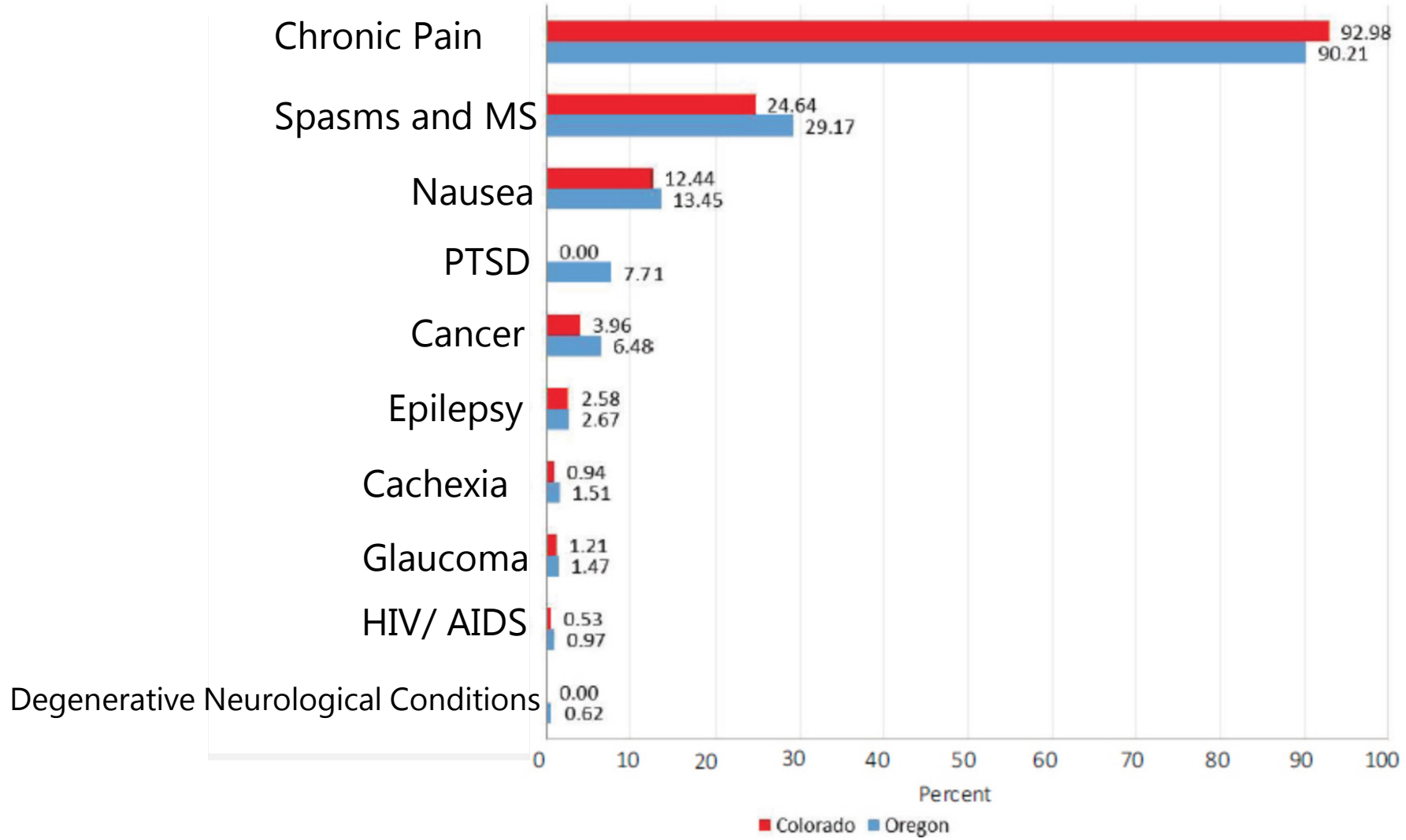
Current Prevalence of Patients by Age Group



MPG MARIJUANA POLICY GROUP

Source: Colo. Dept of Public Health and Environment, July 2018

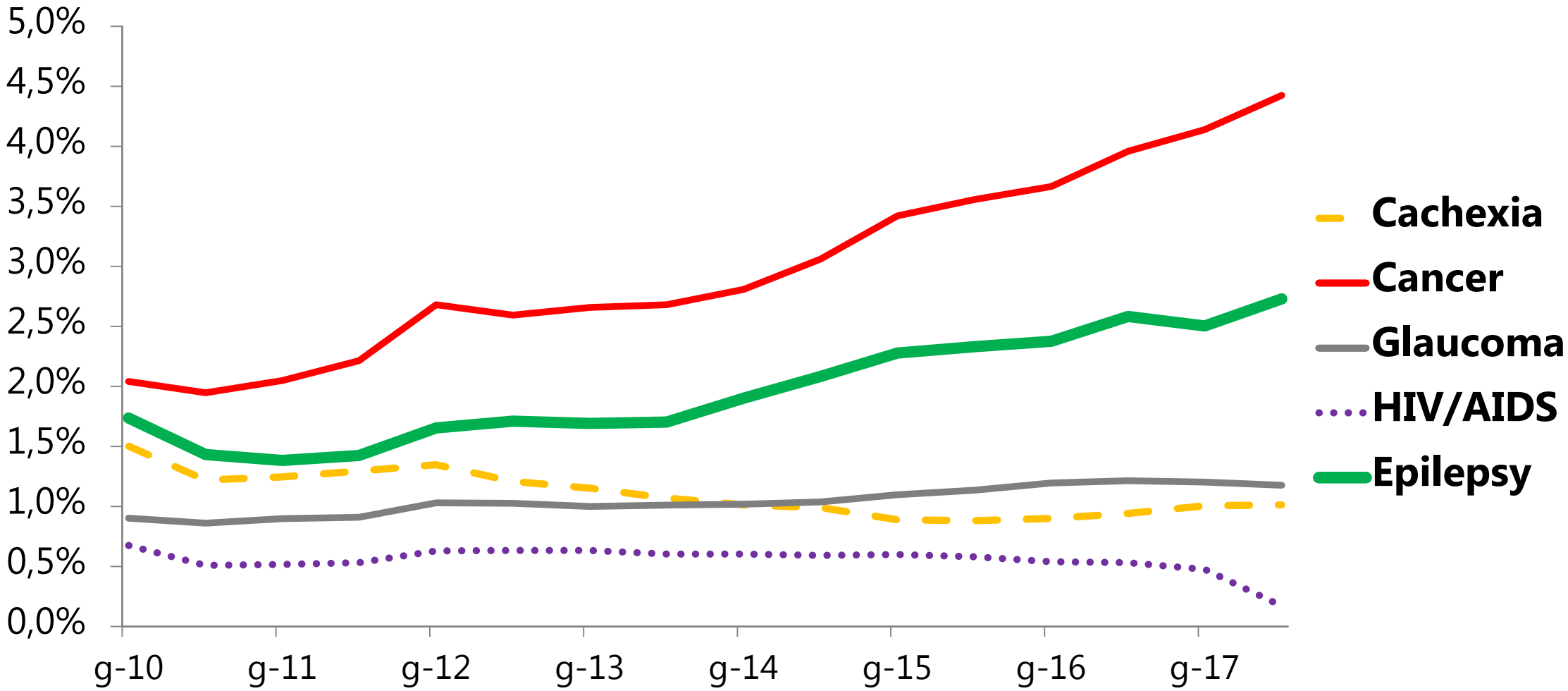
Patients and Reported Conditions



MPG MARIJUANA POLICY GROUP

Source: National Academy of Sciences; Luglio 2016

Prevalence of Conditions among Patients



MPG MARIJUANA POLICY GROUP

Source: Colo. Dept of Revenue

Conclusion

There is **cannibalization** on medical cannabis sales

- Minimum 5% distortion

Medical cannabis demand is changing

- Higher consumption per patients, older patients with more severe pathologies

Risk of **consumption distortion** between the two segments

- Only-medical legalization incentivize non-medical users towards becoming patients
- High potential waste of resources in a welfare state context

European Model: Need for Market Segmentation

Subsidize health care is at risk when integrating cannabis

- It is very complex to effectively separate medical and recreational markets
- Doctors cannot easily verify chronic pain
- Waste of public funding if recipients use it outside their medical scope
- Waste of physicians' time if non-medical users try to obtain a prescription

Heavy non-medical users have high price-sensitivity

- Many might (attempt to) obtain a physician's prescription

The Integration of Medical Cannabis in the European Healthcare

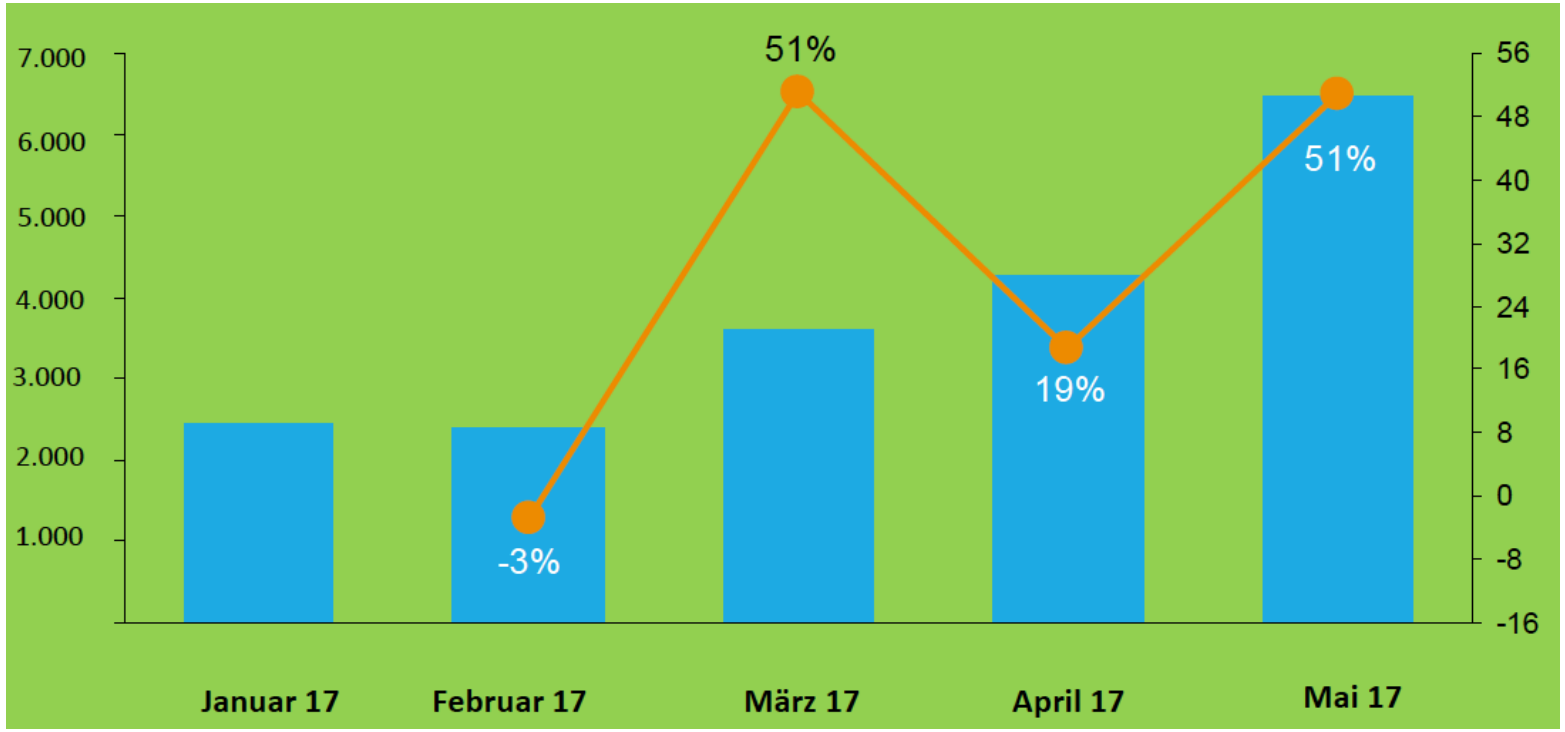
MPG | MARIJUANA POLICY GROUP

Drugs policy in Germany is a mess

Despite legalisation, medicinal cannabis is often unavailable to German patients

Print edition | Europe ›
Feb 1st 2018 | COLOGNE

MEDICAL CANNABIS PRESCRIPTIONS IN GERMANY



Problems in Germany

Demand >> supply

- Many potential patients wait for the product availability to get a physician's prescription

Over-the-counter cost is more than many people can afford

- Almost twice as expensive as the illicit market

Limited Coverage of the National Health System

- Physician use it as a last resort treatment
- Approval of the insurance company need to be given before the start of delivery
- Health insurers in Germany decline a third of requests for reimbursement

MPG | MARIJUANA POLICY GROUP

DISTORTIONS

There is interrelation between medical and recreational cannabis users in those supply architecture which separate the markets (Asplund & Fortin, 2018)

Only-medical regulation:	Product safety and quality is preferred by any type of users
Full legalization:	If medical cannabis is cheaper than the cannabis bought in recreational outlets, there will a diversion to non-medical user
	The over-consumption of medical cannabis will be proportional price difference

MPG | MARIJUANA POLICY GROUP

Size of the Distortion depend on the price differential

Colorado:

- About 30% difference in taxation between recreational and medical cannabis
- About 5% distortion (Asplund & Fortin, 2018)

European country

- Likely 70% tax on recreational cannabis
  - Similar to tobacco
- Medical market subsidized
- **<u>Distortion might be substantial</u>**

MPG | MARIJUANA POLICY GROUP

A Theoretical Model of Legalization for Europe

MPG | MARIJUANA POLICY GROUP

Purpose of Theoretical Model

- **Understanding the potential role of an additional non-profit supplier in a scenario which allows**
  - Commercial Stores
  - Healthcare through pharmacies
- **Describe the dimensions of attractiveness**
  - Heavy Users
  - Non-verifiable patients
- **Define the conditions under which market distortions can be reduced**

MODELS	STRENGHT	WEAKNESS
Commercial Model (US approach)	• Constant stream of revenues • Illicit market minimization through large product variety • Innovation in production with positive externalities	• Commercial interest would promote heavy use • Industry lobbying might prioritize producers' interests over consumers' interests
Medical model in Welfare state context (European approach)	• Treatment is monitored by physicians • It supports the cost of cannabis to patients	• Waste of public funding when there is diversion of medical cannabis to recreational users • Difficult access for patients suffering for condition for which there is no conclusive scientific evidence of safety and efficacy

Cannabis Social Clubs

- **The Cannabis Social Clubs (CSCs) collectively organize the cultivation and distribution for their members**
  - Non-profit and user-driven
  - Active in several Western Countries
- **Uruguay is the first country regulating CSC**
  - Competing with state-run monopoly model
- **Thus far, commercial and CSC supply model have operated as mutually exclusive**

CSC as Third Supply Channel

$$P^{MED} < P^{CSC} < P^{REC}$$

$$C_{ENTRY}^{MED} > C_{ENTRY}^{CSC} > C_{ENTRY}^{REC}$$

- Cheaper price is in the medical market (subsidies or health coverage)
- Lower price in CSCs compared to recreational stores
- To avoid the average recreational user from becoming a member, they need to have a certain degree of entry costs
- No barriers to entry in recreational stores

WHO WOULD BE ATTRACTED BY CSC?

- Medical users who
  - *cannot obtain a prescription from their physician*
  - *do not want to be registered in a centralized government authority*
  - *prefer self-medication given their experience with the plant*

Medical Market

- Heavy non-medical users
  - *with high price-sensitivity*
  - *without privacy concern*
  - *with preference for a non-profit environment*

Recreational Market

MPG | MARIJUANA POLICY GROUP

OPTIMAL SUPPLY MODEL

TYPE OF CONSUMERS	LEGAL SUPPLIER
PATIENTS WITH VERIFIABLE CONDITION	Healthcare
PATIENTS WITHOUT VERIFIABLE CONDITION	Healthcare or Cannabis Social Clubs
RECREATIONAL HEAVY USERS	Recreational Stores or Cannabis Social Clubs
TOURISTS & LIGHT USERS	Recreational Stores

ADVANTAGES OF CSC

- Harm reduction
- Economic Efficiency

Harm Reduction

- **Reduction of perverse relationship between heavy users and profit-oriented cannabis industry without the need to fully ban commercial stores**
- **Better monitoring of the consumption of heavy users through personal quota (form of nudging)**
- **Larger fraction of heavy users in the legal sphere**
  - Increase in the average product quality
  - Increased inclusivity of illicit cannabis dealer within the legal market
- **Lobbying power of commercial model counterbalance by CSC interest**

Economic Efficiency

- **Increased market segmentation between med and rec users and minimization of consumption distortions such as**
  - Non-medical cannabis users purchasing at subsidies price
  - Medical users paying a "sin tax"
- **Saving of medical resources, such as doctors' time, due to the shift of non-verified patients towards the CSCs**
  - Fairer treatment costs for patients without prescription
- **Increased tax revenues collected by the state given the larger fraction of heavy users in the legal sphere**
  - Lower barrier for illicit cannabis dealers to enter the market

MPG | MARIJUANA POLICY GROUP

mail@fortindavide.com

Thanks for the attention

UNIVERSITÉ PARIS 1
PANTHÉON SORBONNE