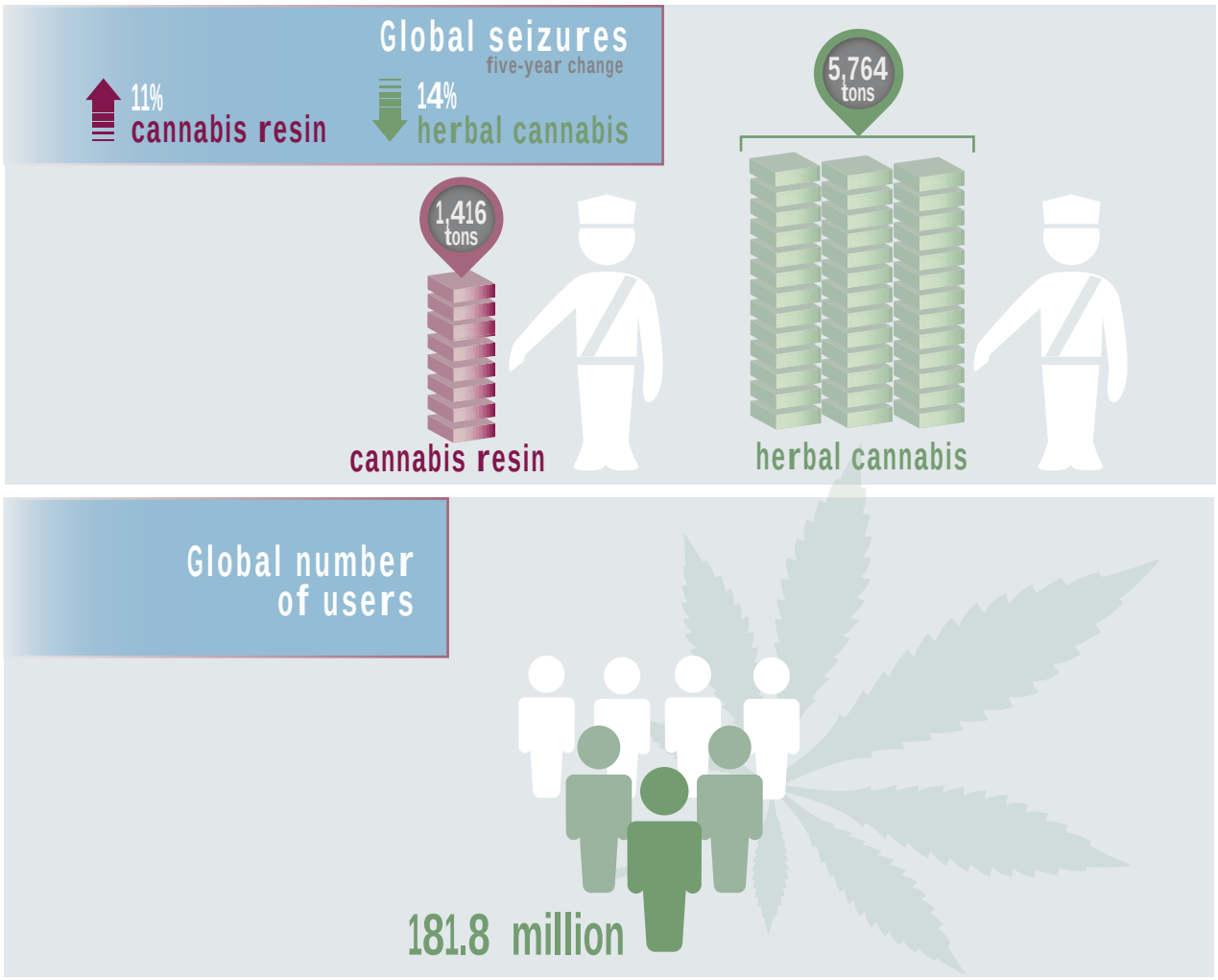
CANNABIS

Key figures



Note: Data for seizures and number of users are from 2013.

Cannabis cultivation: a global phenomenon

Cannabis plants are grown almost everywhere in the world, making global levels of cannabis cultivation and production difficult to estimate. Herbal cannabis is produced in almost every country, while the production of cannabis resin is confined to a few countries in North Africa, the Middle East and South-West Asia. Morocco reported 47,196 ha of cannabis cultivation in 2013, a slight decrease compared with the 52,000 ha reported in 2012, while Mongolia reported 15,000 ha of land covered by cannabis. With 10,000 ha under commercial cannabis plant cultivation in 2012, producing some 1,400 tons of cannabis resin, one of the largest producers of cannabis resin is Afghanistan, where cannabis cultivation is linked to opium poppy cultivation: 38 per cent of villages where opium poppy is grown also report cannabis plant cultivation, compared with only 5 per cent of non-poppy-growing villages.[277]

277 UNODC and Ministry of Counter Narcotics of Afghanistan, *Afghanistan: Opium Survey 2013* (December, 2013).

Increasing cannabis seizures, with regional differences

Cannabis plant cultivation sites range from small-scale, home-growing sites to large-scale industrial farms. Cannabis plant cultivation techniques and equipment have seen an increase in professionalism and innovation, resulting in an increase in the capacity of cannabis plant growers to avoid detection by law enforcement; yet 2013 data show an increase in quantities seized of both herbal cannabis and cannabis resin worldwide (see figure 61 and figure 62). This bucks the declining trend in seizures of herbal cannabis that began in 2011 and may point to increased law-enforcement activities and/or an increase in cannabis production and trafficking, albeit with geographical variations.

Individual drug seizure cases reported to UNODC show that trafficking by land accounted for more than 60 per cent of the total quantities seized and number of cases, with an average of 190 kg per seizure case in the period 2009-2014. Maritime trafficking is the second most

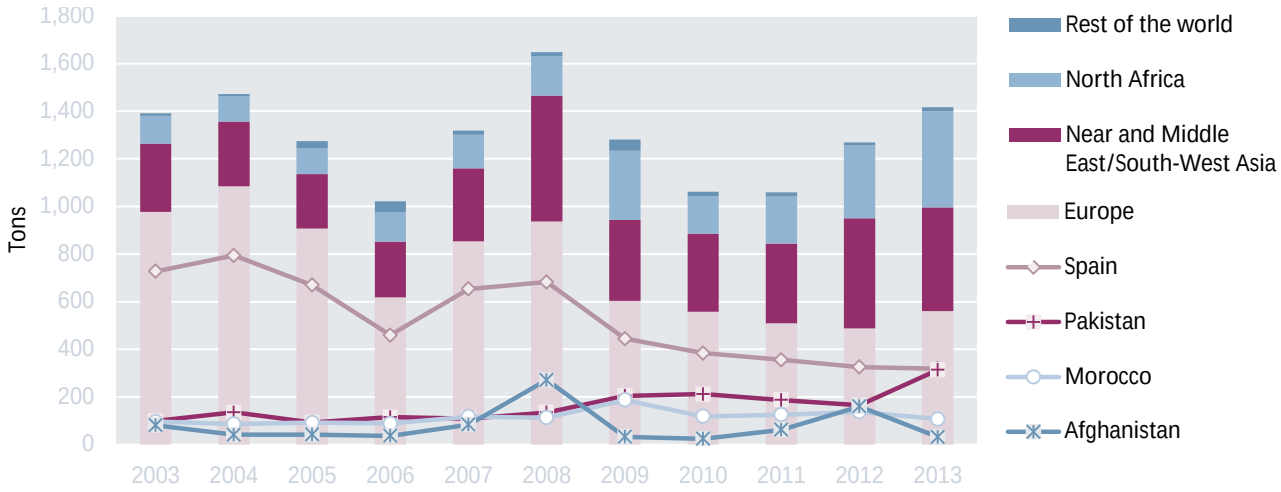
TABLE 8. Reported eradication of cannabis plants, 2013

Eradication (outdoor)			Eradication (indoor)		
	Plants (no.)	Sites (no.)		Plants (no.)	Sites (no.)
United States	4,024,605	6,376	United States	361,183	2,747
Philippines	2,013,678	451	Germany	93,771	n.a.
Guatemala	2,000,000	n.a.	Czech Republic	66,279	276
Costa Rica	1,461,747	199	Ireland	28,851	391
Brazil	900,744	n.a.	New Zealand	21,202	783
Italy	884,612	1,100	Latvia	14,220	14
Trinidad and Tobago	597,100	117	Italy	10,262	622
Ukraine	483,000	n.a.	Iceland	6,652	323
Belgium	393,888	1,107	Belgium	2,870	105
New Zealand	105,321	n.a.			

Source: UNODC, responses to annual report questionnaire and other official sources.

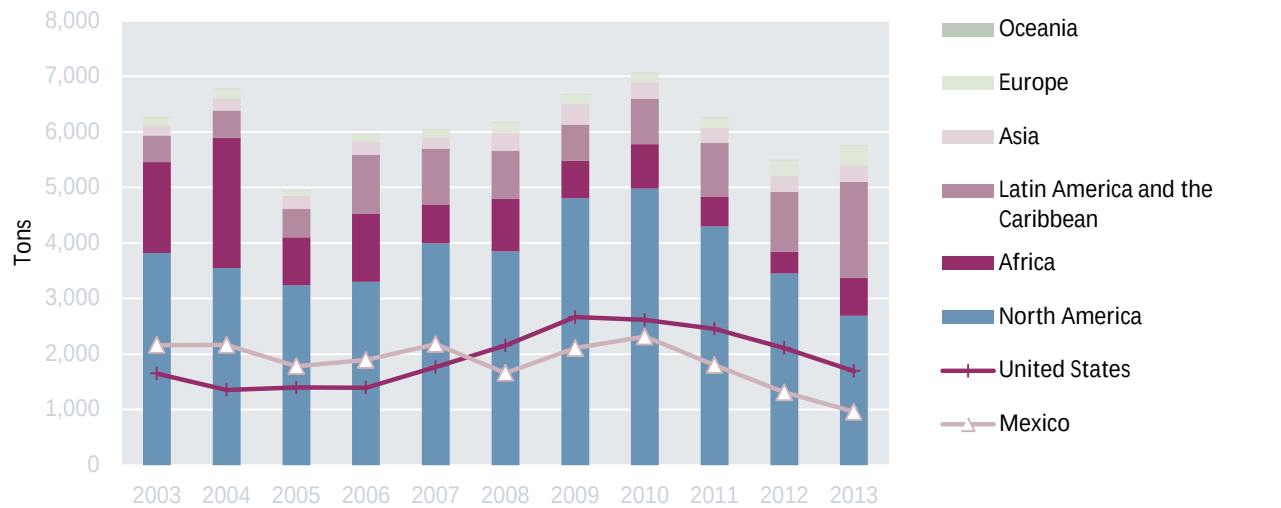
Note: n.a. = not available.

FIG. 61. Global quantities of cannabis resin seized, by region and in selected countries, 2003-2013



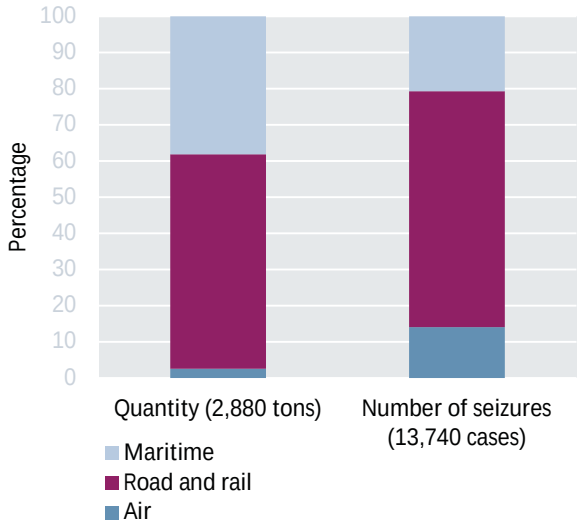
Source: UNODC, responses to annual report questionnaire and other official sources.

FIG. 62. Global quantities of herbal cannabis seized, by region and in selected countries, 2003-2013



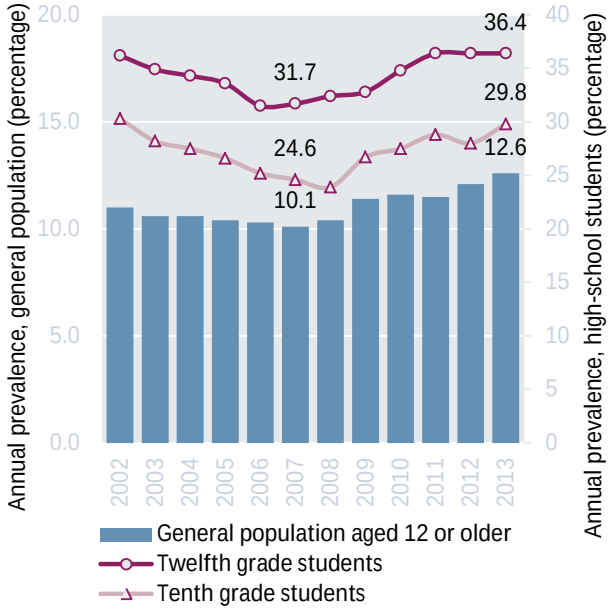
Source: UNODC, responses to annual report questionnaire and other official sources.

FIG. 63. Modes of transportation of seized cannabis, 2009-2014



Source: UNODC, individual drug seizure database.

FIG. 64. Cannabis use in the United States, 2002-2013



Source: United States, SAMHSA.

common method of transportation, but the quantities intercepted are comparatively larger, with an average of 387 kg per seizure case in the same period (see figure 63).

The trend in Europe and Latin America and the Caribbean never actually underwent a decline. The contribution of Latin America and the Caribbean to total global quantities of herbal cannabis seized increased from 20 per cent to 30 per cent in 2013, but the largest quantities of herbal cannabis were seized in North America (47 per cent). The global increase in quantities of cannabis resin seized in 2013 was mainly driven by the rise in Pakistan, from 166 tons in 2012 to 314 tons in 2013, which counteracted the marked decrease in the quantities of cannabis resin reported as seized in Afghanistan. Quantities intercepted in North Africa increased by 31 per cent, mainly owing to increases in Algeria (from 157 tons in 2012 to 212 tons in 2013) and Egypt (from 12 tons to 84 tons), and despite a decrease in Morocco from 137 tons in 2012 to 107 tons in 2013. Spain accounted for 23 per cent of global quantities of cannabis resin seized in 2013.

The Americas: increase in cannabis use and related problems in the United States

With an annual prevalence of use of 8.4 per cent among the population aged 15-64, cannabis is the most widely used illicit substance in the Americas, driven mainly by the high level of use in North America (11.6 per cent). The most recent data point to an increase in the prevalence of cannabis use in the United States, which, because of ongoing changes in legislation in some states, has drawn special attention.

Cannabis use among high-school students in the United States increased in 2013 (from 24.7 per cent in 2012 to 25.8 per cent annual prevalence in 2013), but there has been a significant decline in the use of synthetic cannabis to an annual prevalence of 6.4 per cent in 2013 from 8 per cent in 2012, when it was first included in a school survey.[278] Available data show an increasing trend in cannabis-related treatments in the past decade, along with increasing cannabis-related hospital admissions.[279]

Although the largest quantities of herbal cannabis were still seized in North America (47 per cent), the United States reported decreases in seizures between 2009 and 2013 (see figure 65). Seizures in Mexico followed a similar trend, decreasing between 2010 and 2013. Despite these recent decreases, the United States and Mexico still account for the majority of global herbal cannabis seizures.[280] Mexican authorities report the production of herbal cannabis for both local consumption and for trafficking to the United States, mainly over land, in private vehicles and buses, using various methods of concealment.[281]

Recent data show an increase in cannabis use in South America, especially in Chile (7.5 per cent annual prevalence of use) and Colombia (3.3 per cent), while herbal

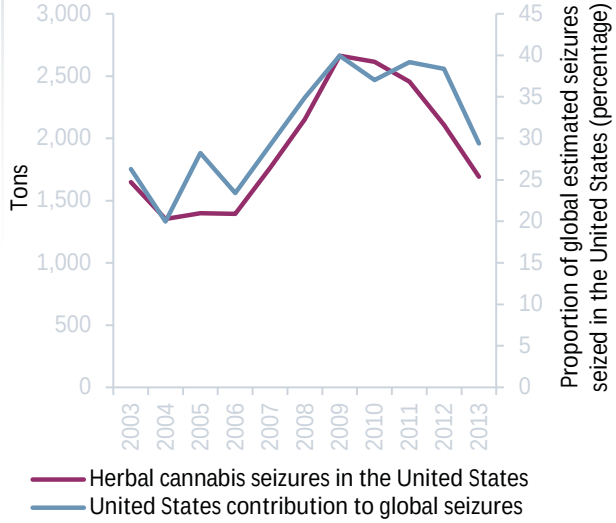
278 L. D. Johnston, and others, *Monitoring the Future National Survey Results on Drug Use: 1975-2014: Overview, Key Findings on Adolescent Drug Use* (Institute for Social Research, University of Michigan, 2015).

279 Z. Mehmedic and others, "Potency trends of Δ^9-THC and other cannabinoids in confiscated cannabis preparations from 1993 to 2008", *Journal of Forensic Sciences*, vol. 55, No. 5, pp. 1209-1217.

280 UNODC, *World Drug Report 2014*.

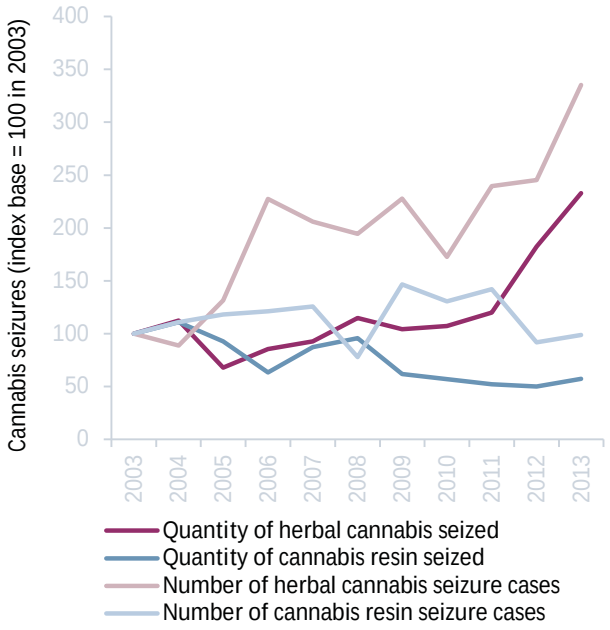
281 Country report submitted by Mexico to the Twenty-fourth Meeting of Heads of National Drug Law Enforcement Agencies, Latin America and the Caribbean.

FIG. 65. Quantities of herbal cannabis seized in the United States and respective contribution to global seizures estimate



Source: UNODC, responses to annual report questionnaire and other official sources.

FIG. 66. Number and quantity of cannabis seizures in Europe, 2003-2013



Source: UNODC, responses to annual report questionnaire and other official sources.

cannabis seizures increased sharply from 821 tons in 2012 to 1,308 tons in 2013, owing to significant seizures in Paraguay (462 tons),[282] Colombia (408 tons) and Brazil (222 tons). It is noteworthy that, in the context of international police cooperation in this region, Brazil and Paraguay conduct joint operations to eradicate marijuana in Paraguay. The Brazilian Federal Police also perform eradication operations in the northeast of Brazil.[283]

Europe: increase in cannabis market indicators, but prevalence of use remains stable

Europe is one of the world's largest consumer markets for cannabis resin, yet the market in Western Europe may now be dominated by herbal cannabis. Of the estimated 2,050 tons of cannabis consumed in the European Union and Norway in 2012, 1,280 tons were estimated by EMCDDA to be herbal cannabis, the use of which is more evenly spread across European countries than the use of cannabis resin, which is concentrated in a few countries.[284]

The quantity of herbal cannabis seized in Europe increased from 284 tons in 2012 to around 362 tons in 2013, primarily due to seizures in South-Eastern Europe. Seizures of cannabis resin also increased in Europe from 480 tons in 2012 to 560 tons in 2013, again primarily due to seizures in South-Eastern Europe, specifically in Turkey, where seizures of cannabis resin increased from 27 tons in 2012 to 94 tons in 2013. However, quantities of cannabis resin seized in Spain, where cannabis resin seizures are the largest in Europe, have decreased for five consecutive years; almost all of the cannabis resin that enters the country continues to be of Moroccan origin and the main mode of transportation is by sea, in speedboats, sailboats and fishing vessels.

In recent years, the price and potency of cannabis products in Europe has increased.[285] In countries with available information, there has been an increase in both the cultivation of cannabis plants and the reported eradication of cannabis plants and production sites. The cannabis market in Europe is marked by high demand and a variety of products, the production of which is sometimes linked to violence and other criminal activities,[286] as organized criminal groups have become involved in the trafficking of cannabis.

Even though domestic production of cannabis is widespread, there are still signs that it may not be sufficient to meet European market demand. For example, in the United Kingdom seizures at the border of both herbal cannabis and cannabis resin are increasing, while seizures of locally grown cannabis plants (sinsemilla) are decreasing. On the one hand, such trends may suggest that domestic production is not sufficient to satisfy demand, which may

282 Country report submitted by Paraguay to the Twenty-fourth Meeting of Heads of National Drug Law Enforcement Agencies, Latin America and the Caribbean.

283 UNODC, responses to annual report questionnaire by Brazil, 2012-2013

284 EMCDDA, "Perspectives on drugs: new developments in Europe's cannabis market", 27 May 2014.

285 EMCDDA, *European Drug Report 2014*.

286 EMCDDA and Europol, *EU Drug Markets Report: a Strategic Analysis* (Luxembourg, 2013).

increasingly rely on imported products. On the other hand, the detection of cannabis plant cultivation sites, usually indoors, may have become a growing challenge for law enforcement, as there is an increasing tendency for criminal groups to run numerous small-scale cultivation sites rather than few large-scale plantations in order to mitigate the risk of detection.[287]

Although the prevalence of cannabis use remains high in Western and Central Europe (5.7 per cent), there is evidence of stabilizing or decreasing trends, especially in countries with long and established cannabis use. Information on the use of NPS in Europe is not comprehensive and does not establish whether the decrease in cannabis use is associated with the emerging use of synthetic cannabinoids or other NPS.

Asia: cannabis consumption remains below global levels

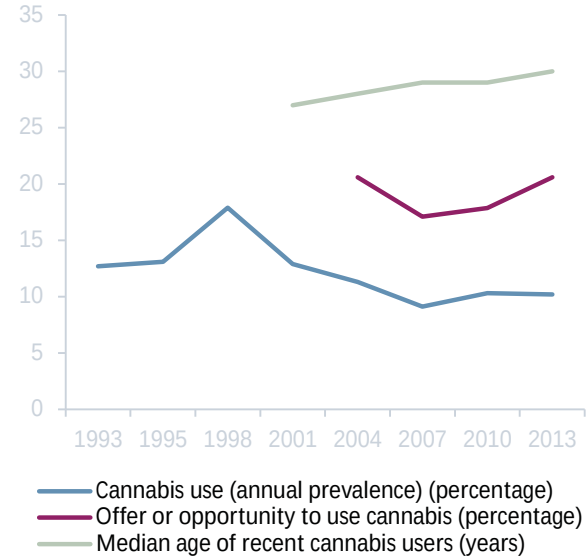
Cannabis consumption in Asia seems to continue to be below global levels, although reliable estimates of prevalence of use are available for only a few countries. Cannabis is the most common illicitly used substance in the region, with an annual prevalence of use among those aged 15-64 of 1.9 per cent. Experts perceive an increase in its use, but the quantities of herbal cannabis seized remained stable overall in most parts of Asia in 2013, totalling 292 tons. South Asia continued to account for the majority of the quantities of cannabis resin intercepted in the subregion, but countries in the Near and Middle East/South-West Asia reported that seizures of cannabis resin originating in Afghanistan were increasing. This trend continued in 2013, marking the increasing importance of Afghanistan in the global supply of cannabis resin and highlighting the fact that the same trafficking routes are being used for the smuggling of different substances. In 2013, Pakistan reported seizures of almost twice the quantity seized in 2012, mentioning Afghanistan as the source country for all the cannabis resin seized.

Oceania: high levels of use, fed by domestic cultivation

Information about drug use in Oceania is limited to Australia and New Zealand, where there are high levels of cannabis use (10.7 per cent annual prevalence of use). With a high frequency of cannabis experimentation and use within the general population, cannabis is the most widely used illicit drug in New Zealand and accounts for most illicit-drug-related hospital admissions. Cannabis cultivation remains a predominantly domestic matter in New Zealand, with no evidence of large-scale imports or exports of cannabis or any of its derivatives.

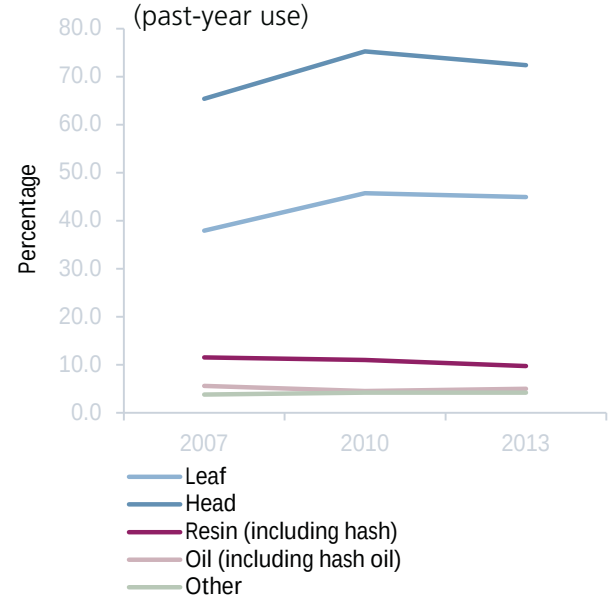
Cannabis is also the most common drug used (both past-year and lifetime use) in Australia, with prevalence and

FIG. 67. Cannabis use in Australia



Source: Australian Institute of Health and Welfare, National Drug Strategy Household Survey, detailed report 2013.

FIG. 68. Forms of cannabis used, recent users in Australia aged 14 years or older (past-year use)



Source: Australian Institute of Health and Welfare, National Drug Strategy Household Survey, detailed report 2013.

frequency of use having remained stable between 2010 and 2013. The median age of cannabis users rose from 27 in 2001 to 30 in 2013, suggesting the existence of an ageing cohort of drug users in Australia, while perceptions regarding cannabis supply suggest an increased general tolerance to cannabis use.[288]

287 Ibid.

288 Australian National Drugs Strategy Household Surveys (NDSHS) http://www.aihw.gov.au/alcohol-and-other-drugs/ndshs/

Herbal cannabis continues to be the most seized illicit drug in Oceania. The quantity of herbal cannabis seized in Australia in 2013 was the highest reported in the past decade,[289] whereas in New Zealand, it remained relatively stable. In Australia, the retail cannabis price has remained stable while THC content is thought to have increased in the past decade,[290] suggesting a potential increase in the availability of the drug.

Africa: increases in cannabis cultivation and production

Cannabis cultivation, production, trafficking and use occur in all parts of Africa.[291] There is only limited information available on the drug use situation in Africa, but the prevalence of cannabis use in the region is estimated to be high (7.5 per cent of the population aged 15-64) compared with the global average (3.9 per cent), and is particularly high in West and Central Africa (12.4 per cent). In 2013, Egypt, Morocco and Nigeria each reported seizing over 200 tons of cannabis herb. Between 1990 and 2011, Morocco reported the largest annual quantities of cannabis resin seized in North Africa and continued to seize significant quantities of cannabis resin in 2012 and 2013 (137 tons and 107 tons, respectively). Since 2012, however, with 157 tons intercepted in 2012 and 212 tons in 2013, Algeria is now reporting the largest annual quantities of cannabis resin seized in North Africa, which the country attributes to law enforcement efforts.[292]

289 Australian Crime Commission, *Illicit Drug Data Report 2012-13*.

290 W. Swift and others, "Analysis of cannabis seizures in NSW, Australia: cannabis potency and cannabinoid profile", *PLOS ONE*, vol. 8, No. 7 (2013).

291 Report of the Twenty-fourth Meeting of Heads of National Drug Law Enforcement Agencies, Africa (UNODC/HONLAF/24/5).

292 Country report submitted by Algeria to the Twenty-fourth Meeting of Heads of National Drug Law Enforcement Agencies, Africa.

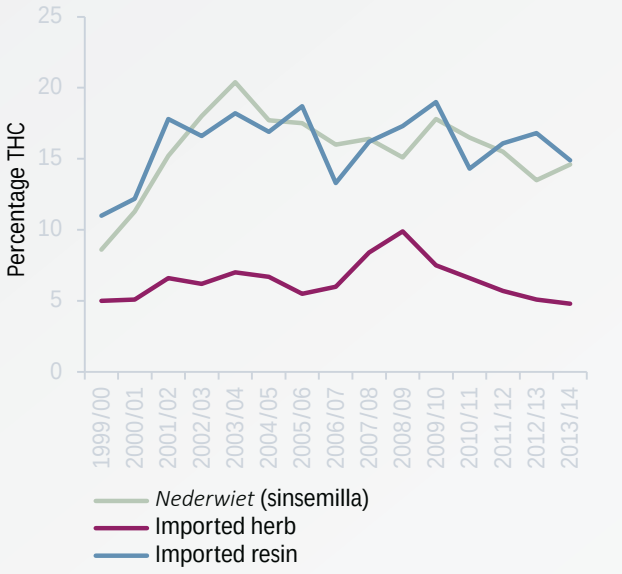
IS CANNABIS BECOMING MORE HARMFUL?

Measured in terms of THC (Δ9-tetrahydrocannabinol) content, cannabis potency is often linked to how harmful cannabis may be. Higher THC content has been associated with anxiety, depression, an increased risk of dependence, psychotic symptoms and effects on the respiratory and cardiovascular systems, particularly among regular users, although anxiety or psychotic symptoms may also occur in recent and inexperienced users.[a] A recent study in south London suggests the risk of psychosis is three times higher in users of high-potency herbal cannabis ("skunk") than in non-users.[b,c]

The presence in cannabis of CBD (cannabidiol), a cannabinoid with anti-psychotic properties,[d,e] may partially counterbalance the harm caused by THC. This interaction should be taken into account when analysing cannabis potency, yet CBD is not frequently monitored, which leads to difficulties in assessing the harm caused by cannabis and public health implications. Globally, cannabis potency data is very scarce, but in countries with available information there are signs of an increase in THC content, particularly in the past decade, and in cannabis-related health problems. A systematic review of THC content in herbal cannabis has suggested that it is increasing, although the increase is not constant and does not exceed 5 per cent globally.[f]

Reporting an average potency of over 10 per cent in 2012,[g] most European countries experienced an increase in THC content, mainly in herbal cannabis, from 2006 to 2012. In the past two decades, there has also been a change in users' preferences in Europe, most notably in the Central and Western part of the region, where cannabis markets are the largest. Data suggest a shift from cannabis resin to herbal cannabis, with increasing use of domestic, as opposed to imported, products, particularly sinsemilla (unfertilized female plants), characterized by high levels of THC and very low levels of CBD.[h]

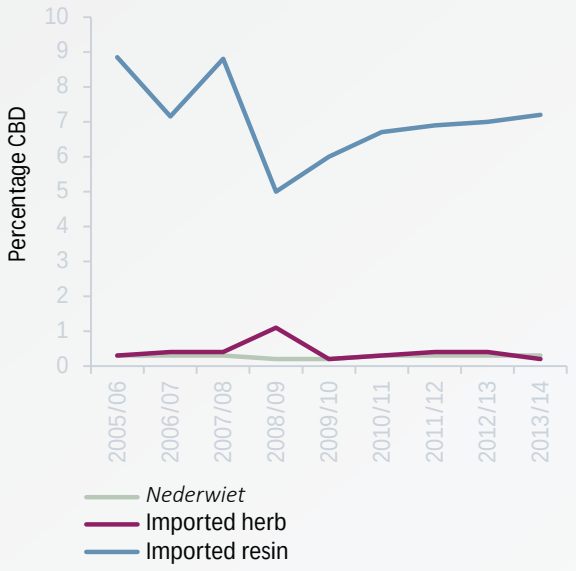
Trends in mean potency (percentage of THC) of cannabis products sold in "coffee shops" in the Netherlands, 1999-2014



Source: Trimbos Institute.

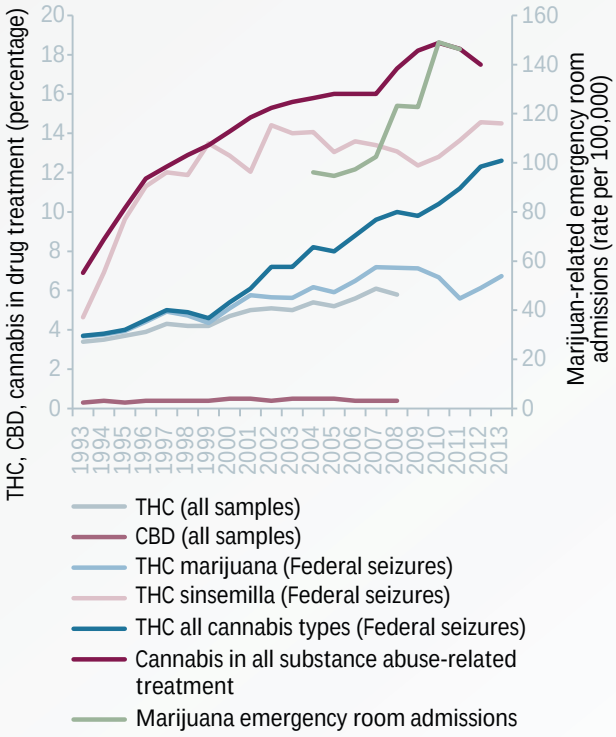
The past decade has seen rapid advancement in cannabis plant cultivation techniques in some European countries, leading to the spread of domestic (indoor) cultivation, thereby reducing reliance on imported cannabis products.[i] Indoor cannabis plant cultivation, using controlled growing conditions and genetically selected strains, has led to an increase in the number of harvests, as well as in yield

Trends in median CBD content of cannabis products sold in "coffee shops" in the Netherlands, 2005-2014



Source: Trimbos Institute.

THC and CBD content in cannabis samples, cannabis-treatment admissions and marijuana-related hospital emergencies, United States, 1993-2013



Sources: Z. Mehmedic and others, "Potency trends of Δ^9-THC and other cannabinoids"; and SAMHSA.

and potency. Selective breeding, which mainly focuses on achieving high THC content, has also resulted in the selection of varieties containing less CBD.[j]

Data on cannabis samples sold in "coffee shops" in the Netherlands show that the THC content of the two most consumed cannabis products — imported cannabis resin and domestically produced (Dutch) herbal cannabis or *nederwiet* (mostly sinsemilla) — has stabilized at high levels (around 15 per cent) in recent years, while CBD content has remained low (under 1 per cent) in *nederwiet* but comparatively high in imported resin (7 per cent).[k]

Even within a specific strain of cannabis there may be great variability in content, suggesting that users may be unwittingly exposed to very different levels of THC and CBD.[l] Moreover, the change in users' preferences, from traditional (seeded) herbal cannabis to sinsemilla, suggests an increased level of risk exposure in Europe.

Despite evidence of stabilizing or decreasing trends in the prevalence of cannabis use in Europe, particularly in countries with established levels of cannabis use, there are indications of increases in cannabis-related health problems. Between 2006 and 2012, the number of individuals (first admissions to drug treatment) seeking help for cannabis use in Europe rose from 45,000 to 59,000, nearly half of whom (49 per cent) were daily users; and cannabis has become the most frequent drug reported as the main reason for first-time entrants for treatment.[m] Moreover, cannabis-related emergency episodes have seen an increase in Europe, particularly in countries with the highest prevalence of use.

In Oceania, recent data also suggest that the THC content of cannabis may be increasing. A first systematic analysis of the potency of cannabis at the street level in Australia was carried out in 2013 and showed high levels of THC content. Analysis of samples taken from recreational users in possession of up to 15 g of cannabis revealed an average THC content of just under 15 per cent and a CBD content of 0.14 per cent. The shift towards increasing use of cannabis with high THC and low CBD content has also been linked to an increase in drug treatment demand and in the risk of cannabis dependence and vulnerability to psychosis, but there is little evidence of the direct impact of potency.[n] In New Zealand, there have also been suggestions of an increase in the THC content of herbal cannabis in the past two decades.[o]

The THC content of cannabis in the United States increased from less than 3.4 per cent in 1993 to 8.8 per cent in 2008, whereas CBD content remained low and invariable over time (0.4 per cent in 2008).[p] Federal seizure data show that the THC content of marijuana has increased in the past two decades, from 3.7 per cent in 1993 to 12.6 per cent in 2013, reflecting a higher proportion of sinsemilla in the market (with a THC content

of 14.5 per cent in 2013). Available data in the United States show an increasing trend in cannabis-related treatments in the past two decades, from 6.9 per cent in 1993 to 17.5 per cent in 2012, along with increasing cannabis-related hospital admissions.[q]

a W. Hall, "What has research over the past two decades revealed about the adverse health effects of recreational cannabis use?", *Addiction*, vol. 110, No. 1 (2015), pp. 19-35.

b Marta Di Forti and others, "Proportion of patients in south London with first-episode psychosis attributable to use of high potency cannabis: a case-control study", *The Lancet Psychiatry*, vol. 2, No. 3 (2015), pp. 233-238.

c It should be noted that this is specific to "skunk", as other cannabis products may result in different risks.

d A. W. Zuardi and others, "Cannabidiol, a *Cannabis sativa* constituent, as an antipsychotic drug", *Brazilian Journal of Medical and Biological Research*, vol. 39, No. 4 (2006), pp. 421-429.

e A. Englund and others, "Cannabidiol inhibits THC-elicited paranoid symptoms and hyppocampal-dependent memory impairment", *Journal of Psychopharmacology*, vol. 27, No. 1 (2013), pp. 19-27.

f F. Cascini, F. C. Aiello and G. L. Di Tanna, "Increasing delta-9-tetrahydrocannabinol (Δ-9-THC) content in herbal cannabis over time: systematic review and meta-analysis", *Current Drug Abuse Reviews*, No. 5, vol. 1 (2012), pp. 32-40.

g EMCDDA, *Statistical Bulletin 2014*.

h EMCDDA, *Cannabis Production and Markets in Europe*, EMCDDA Insights Series No. 12 (Luxembourg, Office for Official Publications of the European Union, 2012).

i Phenomenon of "import substitution" referred by Jansen A. M. (2002), "The economics of cannabis cultivation in Europe", paper presented at the 2nd European Conference on Drug Trafficking and Law Enforcement, Paris 26-27 Sept. 2002. Available at: www.cedro-uva.org/lib/jansen.economics.html.

j EMCDDA (2012), *Cannabis Production and Markets in Europe*. EMCDDA Insights Series No.12 (Luxembourg, Office for Official Publications of the European Union, 2012).

k S. Rigter and R. Niesink, *THC-concentraties in wiet, nederwiet en hasj in Nederlandsecoffeeshop*, 2013-2014 (Utrecht, Netherlands Institute of Mental Health and Addiction (Trimbos Institut), 2014).

l D. J. Potter, P. Clark and M. B. Brown, "Potency of Δ^9-THC and other cannabinoids in cannabis in England in 2005: implications for psychoactivity and pharmacology", *Journal of Forensic Sciences*, vol. 53, No. 1 (2008), pp. 90-94.

m EMCDDA, *European Drug Report 2014*.

n Swift and others, "Analysis of Cannabis Seizures in New South Wales, Australia: cannabinoid profile and implications", *PLOS ONE* (2013).

o G. Knight and others, "The results of an experimental indoor hydroponic Cannabis growing study, using the 'Screen of Green' (ScrOG) method-Yield, tetrahydrocannabinol (THC) and DNA analysis", *Forensic Science International*, vol. 202, Nos. 1-3 (2010), pp. 36-44.

p Mehmedic and others, "Potency trends of Δ^9-THC and other cannabinoids in confiscated cannabis preparations from 1993 to 2008" (see footnote 279).

q Ibid.

REGULATED COMMERCIAL CANNABIS[a] MARKETS: WHAT CAN WE LEARN FROM THE STATE OF COLORADO?

Recent changes in cannabis policy

In the United States, following the recent implementation of commercial marijuana markets in the states of Colorado[b] and Washington,[c] the states of Alaska[d] and Oregon[e] passed laws in 2014 that make legal the "production, sale, and use of marijuana" for persons aged 21 and older, while the District of Columbia voted to remove criminal and civil penalties for adult possession of marijuana and personal marijuana cultivation.[f] Outside the United States, the parliament in Jamaica[g] recently passed a law allowing for possession of 2 ounces or less, personal cultivation of five or fewer plants and the legal use of marijuana by Rastafarians for religious purposes.[h] Uruguay is currently in the process of implementing the commercial regulation of cannabis following changes to the law in 2012.

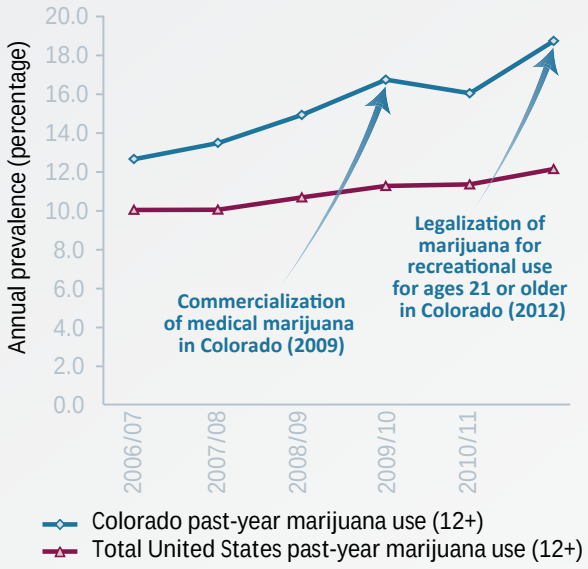
United States, state of Colorado: the first year of a regulated commercial marijuana market

The right to purchase marijuana legally in the state of Colorado occurred gradually. In 2000, voters approved a measure to make medical marijuana legal for the treatment of certain conditions,[i] but the commercialization of medical marijuana did not become widespread until 2009.[j] Three years later, in 2012, Amendment 64 regulated marijuana similarly to alcohol and, as of 1 January 2014, Colorado became the first state to implement retail sales of marijuana for recreational use to adults aged 21 years or older.[k] One year later, 502 licensed medical marijuana dispensaries and 322 retail marijuana stores were operating throughout the state.[l]

According to recent marijuana prevalence estimates for Colorado, adjusted for population growth and underreporting,[m] there were an estimated 686,000 adult residents in 2014 who used marijuana at least once per year. A 2014 report[n] estimated the total market demand of this population and non-residents to be some 130.3 tons (range: 104.2-157.9).[o] Compared with the current estimated supply of 77 tons[p] (42 per cent of which is consumed for medical use), the demand for cannabis is far greater than licit supply can meet. It is thus likely that an estimated 53 tons would need to be supplied by personal home production and by unlicensed or out-of-state producers.

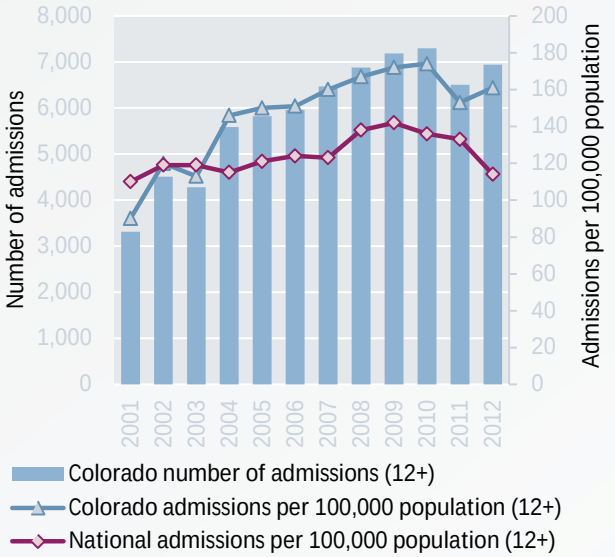
In addition to inhaled or smoked forms of cannabis herb and resin, the commercial marketplace has made available a wide range of THC-containing food products, or "edibles", which may increase the risk of accidental ingestion, acute intoxication, psychosis, poisoning and intoxication-related injury or death.[q] In

Prevalence of past-year marijuana use (aged 12 or older) in the United States, 2006-2013



Source: United States, National Survey on Drug Use and Health, SAMHSA.

Drug treatment admissions for marijuana, by number of admissions and per 100,000 of the population aged 12 or older in the state of Colorado and in the United States as a whole, 2001-2012



Source: United States, Treatment Episode Data Set (2001-2012), SAMHSA.

contrast to inhaled THC-containing products, which take effect after a few seconds or minutes, oral consumption has a delayed effect of between 30 and 90 minutes that lasts from 4 to 12 hours, far longer than psychotropic effects from inhalation, which last around 2 to 3 hours. This may lead to ingestion of greater quantities of THC than desired.[r]

Health impacts

According to the results of the United States National Survey on Drug Use and Health, the prevalence of marijuana use in Colorado is higher, and is increasing faster, than the national average. There is no causal evidence to connect legislation to prevalence of use, but peaks in past-year prevalence appear to coincide with laws easing restrictions on personal consumption.

Mirroring trends in prevalence of use of marijuana in Colorado, the number of primary treatment admissions per 100,000 is high and growing among persons aged 12 or older, and has exceeded the national average since 2003.

Reaching an average of 18.7 per cent, according to the laboratory responsible for state-mandated testing, the THC concentration of legally sold cannabis in Colorado is relatively high.[s] Perhaps serving as an early indicator of the acute effects of increased access to high-potency marijuana and THC-containing products, calls to the Rocky Mountain Poison and Drug Center concerning marijuana doubled between 2013 and 2014. In addition, emergency room data indicate that there has been a number of severe burns from attempted THC extraction from cannabis plants and cyclic vomiting caused by the ingestion of high THC-content products (cases doubled following medical marijuana legalization), and unintentional marijuana ingestion among children (from zero in the five years prior to medical liberalization, to 14 between 2009 and 2011, among admissions to the Children's Hospital of Colorado).[t]

Moreover, according to the Colorado State Patrol, marijuana was related to 12.2 per cent of all citations for driving under the influence of any substance in 2014, while among road accidents involving fatalities the number of drivers who tested positive for marijuana doubled from 37 in 2006 to 78 in 2012. It will, however, be several years before any change specifically attributable to retail marijuana sales and traffic deaths is evident.

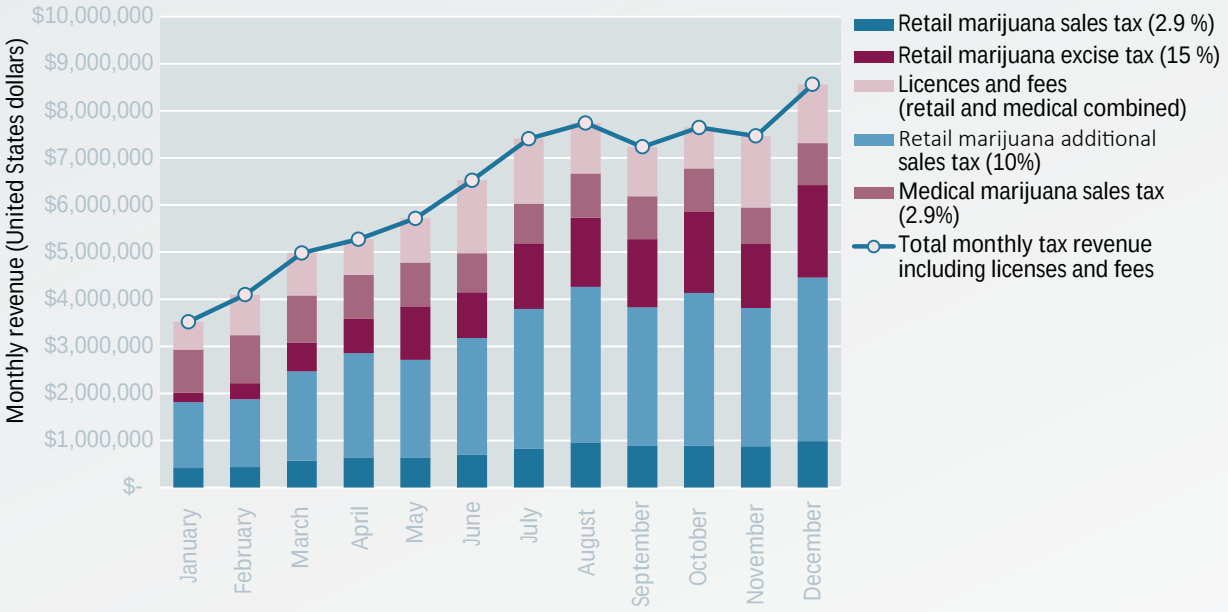
Criminal justice

As expected, arrests for possession (2 ounces or less) and cases brought to state court declined significantly from 2012 to 2013 across Colorado, freeing law enforcement resources otherwise spent on making marijuana-related arrests, whereas marijuana-related arrests in the border counties of the neighbouring state of Nebraska have increased significantly.[u] Arrests at Colorado schools[v] for marijuana charges have also increased, although only slightly, from 273 in 2012/13 to 289 in 2013/14, but several years of data will be required before the impact of commercially available marijuana on youth behaviour can be properly interpreted.

State revenues

Following strong growth in 2014, monthly tax revenues from the retail and medical marijuana markets in the state

Monthly revenue (United States dollars) from sales tax, excise tax, licences and fees for retail and medical marijuana, and total monthly tax revenue, United States, state of Colorado, 2014



Source: United States, Colorado Department of Revenue.

of Colorado ended at nearly triple the revenue earned in January, bringing in over $8.5 million in the month of December alone. In revenue from sales, licences and fees in both the medical and retail marijuana markets, the state is poised to net approximately $76 million[w] in the 2014 calendar year.

a To be consistent with legal language from bills pertaining to cannabis as "marijuana" throughout the Americas, the term marijuana in the present section of the report refers to all cannabis products and in some cases tetrahydrocannabinol (THC) containing products.

b Data from Amendment 64: Use and Regulation of Marijuana (United States, Constitution of the State of Colorado, art. XVIII, sect. 16).

c United States, State of Washington, Initiative Measure No. 502.

d United States, State of Alaska, Ballot Measure No. 2: 13PSUM An Act to Tax and Regulate the Production, Sale, and Use of Marijuana.

e United States, State of Oregon, Measure 91: Control, Regulation, and Taxation of Marijuana and Industrial Hemp Act.

f United States, District of Columbia, Ballot Initiative No. 71, which took effect in July 2014, will allow up to 2 ounces of marijuana and cultivation of up to six plants. As the District of Columbia does not have statehood, thereby falling under Federal governance, this initiative may not fall under the same provision as those of states.

g Jamaica, Dangerous Drugs (Amendment) Act, 2015.

h "Jamaica poised to relax cannabis laws", *The Guardian* (London), 22 January 2015.

i United States, Constitution of the State of Colorado, 0-4-287, art. XVIII, miscellaneous art. XVIII.

j See United States, Department of Justice, "Memorandum for selected United States attorneys on investigations and prosecutions in states authorizing the medical use of marijuana", 19 October 2009.

k In November 2012, Colorado voters passed Constitutional Amendment 64, which legalized marijuana for recreational purposes for anyone over 21 years of age. Retail stores opened on 1 January 2014.

l United States, State of Colorado, Department of Revenue, Enforcement Division, MED Licensed Facilities (Medical marijuana facilities, Retail Marijuana Facilities).

m Demand estimates for 2014 were based on the prevalence of past-year users estimated by the National Survey on Drug Use and Health (NSDUH) 2010 and 2011 survey results, stratified by frequency of use and adjusted for population growth (5.3 per cent) and underreporting (22.2 per cent adjustment among users who use 20 days or less per month and 11.1 per cent for those who use more frequently), see Miles K. Light and others, "Market size and demand for marijuana in Colorado" (July 2015), prepared for the Colorado Department of Revenue, p. 15.

n Light and others, "Market size and demand for marijuana in Colorado" (July 2015), prepared for the Colorado Department of Revenue.

o The total amount estimated for use (130.3 tons) includes an estimated 121.4 tons for residents and 8.9 tons for visitors. The quantity of marijuana in demand for the estimated 184,000 residents under the age of 21 who reported use in the past year was not included.

p Light and others, "Market size and demand for marijuana in Colorado" (see footnote 210).

q T. S. Ghosh and others, "Medical marijuana's public health lessons: implications for retail marijuana in Colorado", *New England Journal of Medicine*, vol. 372, No. 11 (2015), pp. 991-993.

r F. Grotenhermen, "Pharmacokinetics and pharmacodynamics of cannabinoids", *Clinical Pharmacokinetics*, vol. 42, No. 4 (2003), pp. 327-360.

s "State mandated testing of retail marijuana in Colorado", presentation made by Andy LaFrate from Charas Scientific to the 249th American Chemical Society National Meeting and Exposition, Denver, Colorado, March 2015.

t A. A. Monte and others, "The implications of marijuana legalization in Colorado", *Journal of the American Medical Association*, vol. 313, No. 3 (2015), pp. 241 and 242.

u J. M. Ellison and R. Spohn, "Colorado's legalization of medicinal marijuana: the effects on Nebraska's law enforcement and local jail system" (Nebraska Center for Justice Research, University of Nebraska at Omaha, 2015).

v United States, Denver Police Department Versadex and OSI databases.

w United States, Colorado Department of Revenue.