

# Report 1

## Cannabis market: user types, availability and consumption estimates

Margriet van Laar, Tom Frijns, Franz Trautmann and Linda Lombi

### Abstract

In this report we will start with a brief overview of recent developments relating to cannabis markets and policies in the seven countries participating in the project (chapter 1). Most of the information in this chapter is based on the National Reports of the EU Member States to the EMCDDA and can be found on the EMCDDA website ([www.emcdda.europa.eu](http://www.emcdda.europa.eu)). One document is of special interest in this regard: the recently published Insight of the EMCDDA making a detailed account of the cannabis markets (Carpentier et al. 2012), which is partly based on the Reitox National reports for 2009. For Portugal and The Netherlands specific case studies of drug policy and cannabis policy, respectively, are described in Part III, report 1 and 2. We will then summarize the latest figures on cannabis use and trends in cannabis use (chapter 2). In chapter 3 an introduction is given into ways to classify or typology cannabis users and how we have defined different user groups in the present study. The remainder of this chapter and the next chapter (chapter 4) describe the findings of the web survey conducted in the seven countries with regard to characteristics of cannabis users, especially their consumption patterns, and the availability of cannabis to different user groups. In the last chapter (chapter 5) an integration will be made of existing data on the prevalence of cannabis use and web survey data on consumption patterns in order to estimate per user group the total amount of cannabis consumed annually in each country.

## 1 Cannabis markets and policies: recent developments

After a global increase in the late nineties and early 2000s, cannabis use in Europe has remained generally stable in the past years and in some countries a decrease could be observed in the general population. Among pupils levels are overall higher compared to the mid-nineties and show both decreasing stable and increasing patterns in the past years (Carpentier et al. 2012; Hibell et al. 2012).

Although there are no precise figures on the size of the cannabis market, there are clear indications that cannabis cultivation nowadays is widespread in Europe. The increased production seems to have resulted in the increasing displacement of imported cannabis resin or hash by locally produced herbal cannabis or marihuana (Carpentier et al. 2012; EMCDDA 2012a). For 2009, it has been estimated that in some two-thirds of 30 reporting European countries (including Bulgaria, the Czech Republic, the Netherlands and the United Kingdom), marihuana is the most used type of cannabis, while in the remaining countries (including Portugal, Italy, and Sweden), hash is the predominant cannabis product.

In many countries a legal distinction is made between cannabis and other drugs, or when drug laws do not formally make a difference, provisions with regard to investigation and prosecution are made to distinguish between substances. However, in Bulgaria, Italy and Sweden, no distinction is made between cannabis and other substances. Moreover, a common trend can be seen across the Member States in the development of alternative measures to criminal prosecution for cases of use and possession of small quantities of drugs, or cannabis specifically, for personal use without aggravating circumstances (EMCDDA 2012; Reuter and Trautmann 2009).

### ***Developments per country***

Until 2011 controlled substances in **Bulgaria** were listed in annexes to the Drugs and Precursors Control Act. Because of the public significance of the problem and for the purpose of faster bringing new substances under control in 2011 the annexes with controlled substances have been transferred from the Art to sub-delegated legislation - a Regulation of the Council of Ministers. The amendment of the act and the change was ratified and promulgated in the SG, No. 61 of 09.08.2011. There are three Schedules. Cannabis is class A (high-risk) drug, together with heroin, cocaine, amphetamines and MDMA (ecstasy). In 2006, specific penalties were introduced for offences not related to distribution, namely one to six years' imprisonment for high-risk drugs (down from 10 to 15 years) and up to five years for risk drugs (down from three to six years); it also specified that minor offences could be punished with a fine. Between 2000 and 2004 the Bulgarian Penal Code stated that "punishment shall not be imposed on a person dependent on narcotic drugs or analogues thereof, provided the quantity such person acquires, stores, keeps or carries, is such that reveals intention of personal use

Cannabis use was very limited in Bulgaria until the mid-nineties. Until 2001-2002, the cannabis market was not considered as very profitable due to the unstable consumption and low prices. Small scale home growing and distribution within social networks was the main way for obtaining cannabis, facilitated by favourable climatic conditions. Thereafter, there were signs for a growing market for cannabis, with increasing involvement of criminal organizations. Supply was mainly realized through growing of marihuana in the South-western part of the country, occasionally in difficult-to-reach areas and by elderly people, for whom cannabis cultivation sometimes seemed to be a means of living. The dismantlement of large-scale plantations between 2000 and 2006 suggests substantial outdoor cultivation of cannabis in Bulgaria, although increased police efforts may also play a role. These efforts may also have reduced the ability of small-scale distributors to access and purchase cannabis on an occasional basis, thereby 'pushing' the market in the hands of commercial distributors. Moreover, changes to the Bulgarian Penal Code may have discouraged small-scale distributors from continuing to operate. In 2004, those caught in possession of a 'single dose' of cannabis were no longer exempt from criminal prosecution. This change in legislation and subsequent fear of prosecution may have led to a drop in the number of independent distributors operating within the market. The commercialisation or more organized market is suggested to have increased prices, while quality of cannabis remained the same.

A new Penal Code has been effective in the **Czech Republic** since 1 January 2010 (National report 2011). To a certain degree, the new legal regulation differentiates drugs according to their health and social risks, as it makes a distinction between cannabis and other drugs as regards the cultivation of cannabis for personal use and the possession for personal use. More specifically, the new Penal Code only distinguishes between the possession of cannabis and other drugs, when a quantity greater than small is concerned (lower maximum punishment for cannabis (one year in prison) than for other drugs (unchanged at two years) (see also table 1). A novelty to the previous legislation has been an introduction of government decree that now precisely states what the small amount is. Despite the fact that the "greater than small" concept was present in the criminal code since 1998, the threshold amounts were until 2010 subject to police and courts discretion. A small amount of drug is considered to be, for instance, up to 15 grams of cannabis, 2 grams of methamphetamine or 1 gram of heroin. In addition to the above-mentioned differentiation of drugs, the Penal Code newly provides for the offence of the unauthorised cultivation of a greater than small quantity of plants containing a narcotic or psychotropic substance. For cannabis, the cultivation in a quantity greater than small carries a sentence of imprisonment for a term of up to six months, while the grower of another psychoactive plant in a quantity greater than small may be punished by a prison term of up to one year. The threshold for small amounts of different types of psychoactive plants (cannabis, coca, psychedelic mushrooms et. al) is stated in the same government decree as mentioned above; for cannabis it is considered to be five plants, irrespective of their weight. The cultivation of plants on a significant scale is punishable by imprisonment for up to three years, and the same offence committed on a substantial scale carries a prison sentence ranging from six months to five years. Until 31 December 2009 cannabis growing was classified as an offence or attempted offence with the general punishment range of 1 to 5 years' imprisonment. The Department of Addictology, First Faculty of Medicine in Prague and General Teaching Hospital in Prague, in cooperation with the National Monitoring Centre for Drugs and Drug Addiction, are investigating whether these legal changes have had an impact on the cannabis markets.

**Italy** plays an important role in the (large-scale) international traffic of cannabis and other drugs, due to its geographical location, on the southern Balkan route at the centre of the Mediterranean Sea, and near the coast of North Africa. In recent years it has been reported that mafia organizations have begun to manufacture drugs themselves, producing roughly several tons of marijuana, since the direct cultivation offers higher earnings and lower risks during transport. There is also increasing involvement of foreign criminal groups, especially in areas with less control by the mafia (Serpelloni et al. 2011).

In 1993, in Italian law, cannabis belonged to a category of drugs that attracted punishments of less severity than other drugs; however, a law enacted in 2006 eliminated this difference on the assumption that all illicit drugs are dangerous. Apart from removing the sentencing distinctions between illicit drugs, the maximum duration of administrative sanctions was increased to one year for any illicit drug.

Data from seizures up to 2009 suggest that the Italian cannabis market is dominated by resin (accounting for some 65–75% of cannabis seizures). However, in recent years relatively large cannabis cultivation sites have been dismantled in Italy within the last decade, which may point to a higher use of herb (see also chapter 3.4.c).

**In the Netherlands**, cannabis use started to gain popularity in the sixties and seventies, and prevalence of use increased rapidly from the eighties until the mid nineties. The sale of small quantities for personal use was tolerated in the seventies first by so-called house dealers in youth centres, later in commercial outlets, the coffee shops (Van Laar and Van Ooyen-Houben 2009; Korf et al. 2002). Their numbers grew rapidly, and so did nuisance related to these coffee shops. Since the mid-nineties, policies aimed at a reduction of their number and stricter regulation. Moreover, cultivation of marihuana (currently also known as high potency 'Nederwiet'), which is nowadays the main type of cannabis consumed in the Netherlands, seemed to occur at an increasingly larger scale in the nineties, and there were indications for a growing role of the Netherlands in exporting cannabis.

Many other changes have occurred in the past decade in the field of cannabis policy and legislation (see Van Laar and Van Ooyen-Houben 2009; Van Laar et al. 2012), although the basic principle of a differentiation between drugs with unacceptable risks and other drugs (listed on schedule I and II, respectively) remained the cornerstone of the Dutch Opium Act. Since 1976, Public Prosecutor give low priority to the investigation of possession of small amounts of a drug for own use. With regards to cannabis (categorized as 'soft drug') small amounts are defined as no more than 5 grams and no more than 5 cannabis plants – under the condition that there is no professional or commercial cultivation of the plants. Apart from measures as of 2004 intensifying the combat of cannabis cultivation and organised crime associated with cannabis production and trafficking, many recent measures have been announced and (partly) implemented with the aim to (further) reduce public nuisance related to coffee shop tourism.

The sale of cannabis is allowed under strict conditions in coffee shops, which have to adhere to specific criteria (see Dutch National Reports). This provision intends to separate the cannabis and hard drugs markets. The Opium Act Directive was extended recently with two new criteria for coffee shops: the closed-club criterion, which allows access to coffee shops only for people who are registered member, and the residence criterion, stipulating that coffee shops are only accessible for adult Dutch residents. The criteria were enforced since May 2012 in the three southern provinces North Brabant, Zeeland, South Limburg). Enforcement in the other provinces was envisaged for January 2013. After the Coalition Agreement - in November 2012 - the minister of Security and Justice announced that the closed-club criterion will be cancelled, but that the resident criterion will be introduced nationwide by the 1st of January 2013. Enforcement will be implemented in consultation with the municipalities and, if necessary, in phases. Nonetheless, these measures may have affected the Dutch cannabis market after 1 May 2012<sup>1</sup>. A (quasi experimental) study is ongoing in which the (partial) implementation of the closed club criterion and the residence criterion are evaluated ([www.wodc.nl](http://www.wodc.nl)).

Moreover, in 2011, an advisory committee advised to classify cannabis with a THC concentration of 15% or more as a hard drug, and to place it on Schedule 1 of the Opium Act. Implementation is announced in the plans of the new Cabinet (Rutte II) of November 2012 and in a letter of the minister of Security and Justice. When enforced this change may also have an impact on the cannabis markets, but so far no specific date of implementation and enforcement has been mentioned.

**In Portugal**, sentences related to controlled substances depend on their classification on one of six lists of the main Drug Decree Law. List 1 is divided into opiates; coca derivatives; and cannabis and derivatives. List 2 is divided into hallucinogenic substances; amphetamines; barbiturates. List 3 contains preparations with controlled substances; list 4 contains tranquillisers and analgesics and lists 5 and 6 contain precursors. A change in the Decree Law in July 2001 decriminalised possession of all drugs for personal use. This reduced the maximum punishment for possession of small amounts of drugs from three months' imprisonment to an administrative fine given by the 'Commission for Dissuasion of Drug Dependence, which prioritised health solutions over punitive sanctions (Santos et al. 2011). Treatment is offered for situations involving problematic use/abuse of cannabis and administrative penalties for up to 10 daily doses, i.e. up to 25g of marijuana or 5 g of hashish may be applied.

<sup>1</sup> Since the web survey described in chapter 1.3 on patterns of cannabis use and retail markets was carried out before this date, it is possible that the data on the Dutch cannabis markets described in this report are not (fully) representative of today's situation.

Cultivation of any amount, even for personal use, remained a criminal offence. While lifetime use of cannabis increased between 2001 and 2007, last year and last month prevalence remained stable. A detailed account of changes in Portugal's drug policy is given in part III, report 1.

Cannabis resin dominates cannabis consumption in Portugal, which is associated with its proximity to the main trafficking route of Moroccan resin through the Iberian Peninsula. However, in 2009 it had been reported that a recent decline in the relative proportion of resin in cannabis seizures could point at an increasing consumption of herb. According to growers, a further increase could be expected by an increasing demand for cannabis, easier access to products (seeds, cultivation material), increased availability of information (especially Internet pages and forums) and by the financial crisis which has affected Portugal and Europe. The majority of cannabis cultivated in Portugal is not aimed to drug trafficking, but occurs at small scale for personal use and small networks of friends.

In **Sweden**, experiments in the 1960s involved decriminalising the use of cannabis and providing legal prescriptions for other narcotics, like amphetamines. During this time period the crime rate rose and problematic drug use increased. The lessons learned from this experience were a restrictive drugs policy, aiming at a drug free society, which is still pursued nowadays. No distinction is made between cannabis and other drugs, and drug enforcement agencies are empowered to arrest drug users in order to take blood or urine samples. If a person is found under the influence of illicit drugs, the penalty is a fine or imprisonment for up to six months.

Prevalence of illicit drug use, predominantly cannabis, is among the lowest in Europe for many years, although problem amphetamine use remains a point of concern. Factors mentioned to contribute to this (relative) 'success' include the geographical location of Sweden (not located along major drug trafficking routes); in addition, income inequalities, which often go hand in hand with criminal activities including drug trafficking, as well as unemployment rates (UNODC 2007). Nonetheless, problems with illicit drugs have increased in Sweden since the mid 1990s, partly due to greater mobility, access to information technology and more open borders in Europe (Bessö et al. 2009).

In 2009, it was estimated that approximately 75-80% of the Swedish cannabis market consisted of resin (mainly from Morocco) and about 20% - 25% consisted of marihuana. While approximately 20-25% of the marihuana was reported to be smuggled to Sweden from other countries, the detection of several sophisticated large-scale marihuana plantations suggested that Sweden is largely self-supporting with regard to marihuana supply. In the 2011 National Report it has been reported that professional, full-scale illegal indoor cultivation of marijuana, initially concentrated to the southern parts of Sweden, is now observed in other parts of the country as well.

Under the Misuse of Drugs Act in **the United Kingdom**, drugs are divided into three classes, A, B and C, which determine the maximum penalties for offences. Cannabis was reclassified from Class B to Class C in 2004, lowering maximum penalties for personal possession from five to two years' imprisonment, and national police guidelines were issued not to arrest but to give an informal warning, if there were no aggravating circumstances. The maximum penalties for supply and production remained the same. In January 2009, cannabis was reclassified from Class C to Class B, raising maximum penalties to five years' imprisonment once again. Revised national police guidelines continued to advise an informal warning for a first offence.

The cannabis market in the United Kingdom had been traditionally dominated by imported cannabis resin but since the early 1990s domestic cultivation has grown and large scale cultivation of cannabis has increased considerably since 2004. In 2009 it had been estimated that "skunk" accounted for between 38% and 81% of the domestic market, with large regional variations (Davies et al. 2009).

### ***Relationship legislation and cannabis prevalence***

There is no simple relationship between legal changes relating to cannabis possession (between 2001 and 2006) and the prevalence of cannabis use (EMCDDA 2011). Increases in penalties for possession may be associated both with increases or stable use, while decreases may be accompanied with both increases, decreases or stable use. Overall, temporary associations are weak. In Italy, an increase in penalties was paralleled with an increase in use, which started, however, before the legal change. In the United Kingdom, a decrease in penalties was associated with a subsequent strong decrease in prevalence, but in Bulgaria it was associated with a minor increase. In Portugal, last year prevalence remained at the same level between 2001 and 2007, following legislative changes in 2001.

Table 1: Legal status of cannabis when used or cultivated/possessed for personal use in the different countries

Country	Offences and penalties related to personal use	Legislation	Level of prosecution	Distinguished from other substances?	Notes
<b>Bulgaria</b>	As with all drugs there are no special texts related to the use of cannabis. It is stated in the Law that "Who without due permission acquire or hold drugs or their analogues, shall be punished: 1. for high-risk drugs or their analogues - with imprisonment of one to six years and a fine of two thousand to ten thousand BGN; 2. for risky drugs or their analogues - with imprisonment of up to five years and a fine of one thousand to five thousand BGN." ... In addition there is a text regarding practically to the use, including of cannabis: "In minor cases under ... the penalty is a fine up to one thousand BGN."	Law on Control of Narcotic Substances and Precursors (1999), art's 3, 7; Penal Code (1968), art's 354a-c	Despite there is no special text related to cannabis use in the Penal Code (the existing ones are oriented to those who produces, processes, acquires or holds) the users (without any other offence) are usually fined or even only warned.	No distinction	By 2000, the Bulgarian legislation included the term "disposable quantity." Then the following text was adopted in the Penal Code: Article 354, para. 3: "Person who is dependent on drugs must not be punished if the quantity that acquires, stores, keeps or carries, is in size, indicating that it is intended for single use." In 2004, the first subparagraph 3. was removed on a proposal of the party "New Time" to which the penalties for possession of drugs have been practically rehabilitated. In 2006, Art. 354a of the Criminal Code was changed again. Then the penalties were reduced and paragraph was added which allows to not apply penalties provided the offense is considered minor, without clearly defining this term.
<b>Czech Republic</b>	As with all drugs, administrative offence if quantity is small, subject to police fine or warning. Possession of a quantity "greater than small" of cannabis or other substances containing THC is punished with up to 1 year imprisonment (possession of other drugs punishable by up to 2 years).	Misdemeanour Act s.30(1) (j); Penal Code s.284(1), Government Decree No. 467/2009 Coll. of 14 December 2009	15 g of dry matter for marijuana and 5 g of hashish are considered a small amount according to Government Decree n. 467/2009 effective from January 2010.	Distinction by law for crimes of personal possession; specific paragraph on growing psychoactive drugs were cannabis is treated separately	Before January 2010, the old Penal Code made no distinction between cannabis and other substances, and it was unclear what was the great and the small amount that made a difference whether to prosecute drug possession criminally or administratively.
<b>Italy</b>	As with all drugs, cannabis-related offences (such as possession for personal use) are punishable by administrative sanctions from the second offence onwards.	DPR 309/90, Art. 75.	THC 1 g; DPR309/90 Art 72-75; Ministry of Health Decree of 11 April 2006<	No distinction.	Sale, production and possession of up to 30 g of cannabis are punishable by imprisonment for one month and/or a fine of €3 350; for more than 5 cannabis plants, the maximum penalties are 6 years' imprisonment.

<b>Netherlands</b>	Possession of any controlled drug is a criminal offence, with possession of up to 30g of cannabis legally punishable by imprisonment for one month and/or a fine of €3350.	Opium Act, Arts. 3C, 11(1); Opium Act Directive	The Directive states that investigation and prosecution of possession of cannabis for personal use (up to 5g) have the lowest judicial priority; the sale of up to 5g of cannabis per transaction in 'coffee shops' is generally not investigated (a transaction includes all sales and purchases made by a single coffee shop in the same day with the same buyer).	Distinction by law	Sale, production and possession of up to 30 g of cannabis are punishable by imprisonment for one month and/or a fine of €3 350; for more than 5 cannabis plants, the maximum penalties are 6 years' imprisonment.
<b>Portugal</b>	As with all drugs, cannabis-related offences such as use, acquisition and detention may receive an administrative sanction.	Law 30/2000, Art.2, n.º 1	Cases are assessed and decided at a Commission for Dissuasion of Drug Dependence (Law 30/2000, Art. 5, n.º 1). Treatment is offered for situations involving problematic use/abuse of cannabis and administrative penalties for up to 10 daily doses, i.e. up to 25g of marijuana or 5 g of hashish may be applied (Law 30/2000, Art. 2, n.º2 and Governmental Decree 94/96)	Distinction by law – the administrative sanction varies according to the class of drug (Law 30/2000, Art. 15, n.º4 c) and Art.16)	
<b>Sweden</b>	As with all drugs, cannabis-related offences, such as use, are punishable by imprisonment for up to 3 years. If judged petty, according to the nature of the substance etc; up to six months or a fine.	Narcotic Drugs Punishments Act (1968:64), ss.1-2	Users are usually fined.	No distinction.	

<p><b>United Kingdom</b></p>	<p>Cannabis-related offences, such as possession, are punishable by up to five years' imprisonment. For adults, police may warn or issue a penalty notice for disorder instead of prosecuting, as part of a three-point escalation process for cannabis possession for personal use.</p>	<p>Misuse of Drugs Act 1971 s.5; ACPO Cannabis Enforcement Guidance</p>	<p>Whilst arrest is always the first presumption, an adult offender is likely to receive a cannabis warning for a first possession offence, and a penalty notice for disorder for a second offence. A third offence will result in arrest and consideration of likely further action including caution, conditional caution or prosecution. All subsequent offences are likely to result in arrest. If any aggravating factors are present the police will escalate the response accordingly. Ultimately, decisions as to the most appropriate disposal for an offender are made by the police and prosecution service.</p>	<p>Distinction by law (class of substance) and police guidance (specific to cannabis)</p>	<p>In January 2009 cannabis was reclassified to Class B.</p>
------------------------------	--	---	---	---	--

Source: EMCDDA, Legal Topics Overview; Focal Point Bulgaria (<http://www.emcdda.europa.eu/html.cfm/index5036EN.html>)

## 2 Prevalence of cannabis use in the population

For Bulgaria, the Netherlands, Portugal, Sweden and England & Wales figures on the prevalence of cannabis use in this report are based on the most recent population surveys. For the Czech Republic, figures from the 2008 survey have been used instead of those from the more recent surveys in 2009 and 2010. The sample sizes of the latter surveys were much lower compared to 2008 (n=1,487 and 1,749 against 4,200) (Mravcik et al. 2011). Moreover, in contrast to the 2008 survey, the two most recent surveys did not assess (or report) data on frequency of use in the past month, which is important in the context of the current study for making consumption estimates per user group. In Italy, figures from the 2008 survey have been given for illustrative purposes, but the response rate was fairly low (33%), posing questions on the representativeness of the data. Therefore, for making annual consumption estimates, figures from indirect methods will be used to estimate the size of the Italian cannabis using population (see later). Also note that in England & Wales figures refer to age group 16-59 years. As the prevalence of cannabis use is generally lower among the very young and older age groups, these figures may be slightly higher compared to countries with a broader age range.

Tables 2.1 and 2.2 give the proportion last year and last month prevalence of cannabis use in each of the countries. Last year users have used cannabis at least once in the last year (or 12 months), while part of these users have also used cannabis at least once in the past month (or 30 days). Usually, those who have used in the last month are considered as more regular users. However, in the current study we will see that this is certainly not true for all of them.

Bulgaria and Sweden have with about 3% the lowest last year prevalence of cannabis use in the population of 15-64 years, followed at close distance by Portugal with almost 4%. Italy and the Czech Republic are on top of the list with 14% and 15%, respectively. The Netherlands and England & Wales are somewhere in the middle with around 7%. In all countries, cannabis use is about two to three times higher among the 15-24 year olds compared to the total population of 15-64 years.

The proportion of users in the past month is much lower in all countries. The ranking is more or less similar as described for the last year prevalence, except for the lower rates in the Italian population compared to those in the Czech Republic. Proportions of last month cannabis users peak in the Czech Republic, where amount one in five (22%) young people of 15-24 year reported the use of cannabis in the last month, while this was about ten times lower among the Swedish population in the same age group (2%).

Among the last year cannabis users, the proportion of young people of 15-24 years is lowest in Italy (22%), followed by the Netherlands and Czech Republic with 42%. The share of young cannabis users is highest (50% or more) in England & Wales, Bulgaria and Sweden. There are also fairly remarkable differences between countries with regard to the proportion of males among those who had used cannabis in the last year or month. In Bulgaria and Italy, about six in ten last year cannabis users is male, while in Portugal this almost nine in ten.

Proportions of young people among last month users do not differ much from those among last year users. Slightly higher proportions are reported in Bulgaria (+4.8%) and slightly lower in the Netherlands (-6.4%). The proportion of males is a fraction higher in most countries among past month users, which may reflect more regular and/or frequent use, with the previously mentioned reservations in mind.

**Table 2.1: Last year prevalence of cannabis use (%) by age and gender**

	Year	Age (years) <sup>I</sup>				Gender (15-64 years)		
		15-64	15-34	15-24	Proportion 15-24 <sup>II</sup>	Males	Females	Proportion males <sup>II</sup>
<b>Bulgaria</b>	2008	2.7%	6.0%	8.7%	55.9%	3.2%	2.2%	59.1%
<b>Czech Republic</b>	2008	15.3%	28.4%	37.4%	42.1%	20.1%	10.4%	66.4%
<b>Italy<sup>III</sup></b>	2008	14.3%	20.3%	22.3%	23.8%	17.3%	12.0%	58.9%
<b>Netherlands</b>	2009	7.0%	13.7%	16.1%	42.1%	9.8%	4.2%	70.3%
<b>Portugal</b>	2007	3.6%	6.7%	6.6%	30.0%	6.4%	0.9%	87.5%
<b>Sweden</b>	2010	2.8%	6.2%	7.3%	53.3%	3.7%	1.8%	68.0%
<b>England &amp; Wales<sup>IV</sup></b>	<b>2010/2011</b>	<b>6.8%</b>	<b>12.5%</b>	<b>17.1%</b>	<b>50.1%</b>	<b>9.3%</b>	<b>4.4%</b>	<b>67.9%</b>

I. Age limits in England & Wales 16 – 59 and in Sweden 16-64 years. II Proportions 15-24 year olds and proportions males among last year users have been recalculated by using Eurostat population data for 2011. III. Low response rate (33%); figures should be interpreted with caution. Indirect estimates on the number of cannabis users will be applied in calculations on annual consumption (see chapter 5)

IV. England and Wales.

Sources: EMCDDA 2012b; National Reports of Focal Points; contact persons of the sample countries; Eurostat.

**Table 2.2: Last month prevalence of cannabis use (%) by age and gender**

	Year	Age (years) <sup>I</sup>				Gender (15-64 years)		
		15-64	15-34	15-24	Proportion 15-24 <sup>II</sup>	Males	Females	Proportion males <sup>II</sup>
<b>Bulgaria</b>	2008	1.4%	3.1%	4.9%	60.7%	1,8%	1,0%	64.1%
<b>Czech Republic</b>	<b>2008</b>	8.6%	16.8%	22.4%	45.0%	12.4%	4.7%	73.0%
<b>Italy<sup>III</sup></b>	<b>2008</b>	6.9%	9.9%	11.0%	24.3%	9.6%	4.8%	66.5%
<b>Netherlands</b>	2009	4.2%	7.7%	8.2%	35.7%	6.3%	2.0%	76.2%
<b>Portugal</b>	2007	2.4%	4.5%	4.1%	28.0%	4.4%	0.5%	89.6%
<b>Sweden</b>	2010	1.0%	2.1%	2.2%	45.0%	1.4%	0.5%	74.3%
<b>England &amp; Wales<sup>IV</sup></b>	<b>2010/2011</b>	<b>3.8%</b>	<b>6.8%</b>	<b>9.0%</b>	<b>47.2%</b>	<b>5.6%</b>	<b>2.1%</b>	<b>72.7%</b>

I. Age limits in England & Wales 16 – 59 and in Sweden 16-64 years. II Proportions 15-24 year olds and proportions males among last year users have been recalculated by using Eurostat population data for 2011. III. Low response rate (33%); figures should be interpreted with caution. Indirect estimates on the number of cannabis users will be applied in calculations on annual consumption (see chapter 5).

IV. England and Wales.

Sources: EMCDDA 2012b; National Reports of Focal Points; contact persons of the sample countries; Eurostat.

### Methodological issues

A critical appraisal of methodological characteristics and differences between countries, which may affect prevalence figures and comparability, is beyond the objectives of this study (see EMCDDA, Statistical bulletin, for a brief overview). Nonetheless, it should be reminded that the reported prevalence figures may suffer from methodological drawbacks. Harmonizing age groups and core questions, as pursued by the EMCDDA, is already a major step forwards in enhancing comparability of figures between countries. However, there are other characteristics that may play a role, like non-response, the context of the survey, i.e. whether the survey is drug or substance use specific or whether questions are embedded in a general health questionnaire, and the survey mode. For example, in Bulgaria, the Netherlands, Portugal and England & Wales questions were asked in an 'interview', like a (computerized) face-to-face interview, which may include self-completed sections for the more sensitive questions, and in Italy and Sweden by mail (mailed questionnaire). The degree of privacy may influence the 'willingness' of respondents to admit drug use. Even in the Netherlands, where there is evidence that asking respondents about their drug use in interviewer completed face-to-face interviews may yield lower prevalence rates compared to online-questioning (Spijkerman et al. 2009). The precise extent of underreporting is hard to estimate. Moreover, undercoverage due to selecting, for example, only people who are included in population registries and are not institutionalized or homeless is another likely source of underestimating the true extent of cannabis use in population surveys.

### ***Trends in cannabis use***

In its 2012 report on the cannabis markets, the EMCDDA concluded that while cannabis use increased from the mid-nineties until the early 2000s in many European countries, the picture became more diverse in the period 2004-2010 (Carpentier et al. 2012).

Six countries, including Bulgaria and Sweden, were mentioned to always report low last year prevalence rates, although it remained unclear whether this also pertained to intensive patterns of use. In Sweden last year prevalence of cannabis use among men aged 16-64 varied between 2.6% and 3.0% in the period 2004-2008 and slightly increased to 4.3% in 2009. Among females, percentages showed minor fluctuations without a clear trend. In Bulgaria general population surveys have been conducted in 2005, 2007 and 2008, suggesting a slight increase in cannabis use from 2007 to 2008, but nonetheless levels remain relatively low.

Trend data from the British Crime Survey (as of 2012 renamed into the Crime Survey for England & Wales) showed a consistent decrease in the past year use of cannabis in the population of 16-59 years from 10.8% in 2003/2004 to 6.8% in 2010/2011 (Smith and Flatley 2011).

In Portugal an increase in the lifetime prevalence of cannabis use was found in the general population (15-64 years) from 7.6% in 2001 to 11.7% in 2007. However, last year and last month prevalence remained fairly stable (last year: 3.3% and 3.6%; last month 2.4% in both years). In the most recent survey in 2012 a decrease in both last year and last month prevalence was reported among males.

In the Czech Republic, Netherlands and Italy, recent trends in cannabis use cannot be reliably established. As mentioned in the introduction of this chapter, (general population) surveys were conducted in the Czech Republic in 2008, 2009 and 2010. Prevalence rates were appreciably lower in the 2009 and 2010 surveys compared to 2008. For example, last year prevalence among 15-64 olds was 15.2% in 2008, 11.2% in 2009 and 10.4% in 2010. Last month prevalence rates were 8.5%, 4.1% and 4.2%, respectively. These differences could be interpreted as a decrease in cannabis use or rather reflect methodological differences between surveys.

In the Netherlands trends in cannabis use in the general population are monitored every four years since 1997. The surveys showed that cannabis use remained stable in the general population of 15-64 years between 1997 and 2005. Prevalence rates were overall higher in the 2009 survey. However, a change in data collection method in 2009 (shift from CAPI to CASI) precluded the determination of trends between 2005 and 2009.

In Italy, response rate was very low in the most recent survey in 2010 (13%). The 'reduction' in last year prevalence of cannabis use from 14.3% in 2008 to 5.2% in 2010 can therefore be questioned.

### ***Types of cannabis***

Population surveys rarely differentiate between types of cannabis (i.e. hash or marihuana). The Bulgarian general population survey of 2008 and the British Crime Survey of 2009/2010 are exceptions. Table 2.3 shows that marihuana is by far the most common cannabis type in Bulgaria, with a last year prevalence among 15-34 year olds being seven times higher compared to that for hash. Note that the especially figures on last year use of hash and marihuana do not sum exactly to the figure for 'cannabis', indicating that users of hash had consumed marihuana in this time period as well.

Also in the British Crime Survey of 2009/2010 questions were included on the use of cannabis types: marihuana, skunk, hash and hash oil (Hoare and Moon 2010). Skunk was described as a strong marihuana type with a two to three times higher THC content compared to traditionally imported marihuana. Overlapping terms are "sinsemilla" and "homegrown cannabis" but usually the term "skunk" is used in the England & Wales. This survey showed that 6.6% British people between 16 and 59 years had used cannabis in the past year. The majority of these users had used herbal cannabis (71%), 38% took hash, 6% hash oil and 6% did not know which type they had used. Twenty-nine percent of the last year users had consumed more than one type. About half of the cannabis users (or 3.2% in the general population) had used the stronger form of herbal cannabis (skunk).

Findings from an online poll conducted by the Czech National Focal Point in 2009 and the general population survey in 2008 suggest that approximately one third to a half of cannabis consumers use indoor marihuana, one third use outdoor marijuana, and the remaining one fifth to one third do not know the origin of the cannabis; hashish is used by an estimated 5-10% of cannabis users (Mravcik et al., 2012).

**Table 2.3: Last year and last month prevalence of use of hash and/or marihuana in the general population of Bulgaria in 2008**

	Last year prevalence (%)		Last month prevalence (%)	
	15-64 years	15-34 years	15-64 years	15-34 years
<b>Marihuana</b>	2.6%	5.8%	1.4%	2.8%
<b>Hashish</b>	0.4%	0.8%	0.1%	0.3%
<b>Cannabis (marihuana and/or hashish)</b>	2.6%	6.0%	1.5%	3.0%

Source: *Bulgarian National Focal Point*.

### **Frequency of use**

The EMCDDA model questionnaire for population surveys specifies frequency categories of last month substance use. Many countries have adopted these categories, structurally or in the framework of a field trial. Sometimes the exact numbers of use days have been used in the questionnaires and in other cases the ordinal approach (e.g. 'less than once a week'). Data are available for the Czech Republic, Italy, the Netherlands, England & Wales. For Italy data are available from an older survey (2005) and with the before mentioned reservations in mind. For Bulgaria data on the number of use days in the past month are available but use categories do not match. There are no frequency data for Sweden.

These data show fairly big differences in use frequency. The proportion of last month users who consumed cannabis less than weekly varied from 19% in Portugal to over 40% in the Czech Republic, England & Wales and Italy. Daily or almost daily use was with 9% lowest in the Czech Republic and with 44% highest in Portugal.

**Table 2.4: Frequency (number of use days) among past month users**

	Survey year	Age group	Last month prevalence	1-3 days/ less than once a week	4-9 days/ at least once a week	10-19 days/ several times a week	20 days or more/ daily or almost daily
<b>Bulgaria</b>	2008	15-64	2.2% <sup>I</sup>	54.5 (once)	22.7 (2-8 days)	13.7 (≥9 – not daily)	9.1 (daily)
<b>Czech Republic</b>	2008	15-64	8.6%	42.9	31.9	16.1	9.1
	2008	15-34	16.7%	43.1	31.1	16.8	9.6
<b>Italy</b>	2005	15-64	5.8%	47.6	24.5	10.2	17.6
<b>Netherlands</b>	2009	15-64	4.2%	23.8	21.0	24.8	30.5
	2009	15-34	7.7%	28.9	23.7	23.0	24.4
<b>Portugal</b>	2007	15-64	2.4%	18.5	14	23.4	44.1
<b>Sweden</b>	2010		n.a.	n.a.	n.a.	n.a.	n.a.
<b>England &amp; Wales<sup>II</sup></b>	2010/2011	16-59	3.8%	48.0	14.0	14.0	15.0

Figures should be interpreted with caution. For Italy, indirect estimates on the number of cannabis users will be applied in calculations on annual consumption (see chapter 5). I. Questions on frequency of last month use were differently phrased which might explain the difference between last month prevalence reported in table 2.2 and this table. II. Categories do not sum to 100 due to a weighing procedure (pers. comm. EMCDDA).

Sources: EMCDDA 2012b; National Reports of Focal Points; contact persons BG, CZ, IT.

### **Cannabis use among pupils**

Since the mid-nineties, the use of cannabis and other substances among pupils of 15 and 16 years is monitored every four years in many European countries. In the last survey of 2011, a total of 36 countries participated. Figures for the Netherlands will be made available in a supplement to the main report due to late data delivery. In the 2011 survey of England & Wales, the participation of the approached schools was very low (6%). Participating schools did not differ from those who did not in terms of school size, religious status and urbanization. Nonetheless, as a precautionary measure, the data from 2011 were not compared with those of previous years.

It is clear from table 2.5 that there was a great variation in the lifetime prevalence of cannabis use between the sample countries, with figures for 2011 ranging from 9% in Sweden to 42% in the Czech Republic. Last year prevalence was lower in most countries, although differences were sometimes very small, which may reflect the fact that many young people may have started cannabis use in the 12 months before the survey.

The proportion of pupils who had used cannabis in the last month prevalence was about two to three times lower compared to those who had ever tried the drug. Figures ranged from 3% in Sweden to 14% in the Netherlands and 15% in the Czech Republic. The proportion of pupils who had used cannabis 6 times or more in the last month varied from 0% in Sweden to 6% in Italy.

Compared with last year prevalence data from the general population, the ranking of countries shows similarities but also differences. Sweden scored lowest and the Czech Republic highest in both populations. However, in Bulgaria and Portugal prevalence rates in the general population were at about the same low level as in Sweden, but were clearly higher among pupils in the two former countries.

**Table 2.5: Cannabis use among pupils of 15 and 16 years in the sample countries in 1999, 2003, 2007 en 2011**

Country	Lifetime prevalence				Last year prevalence				Last month prevalence			
	1999	2003	2007	2011	1999	2003	2007	2011	1999	2003	2007	2011
<b>Bulgaria</b>	12%	21%	22%	24%	8%	17%	17%	18%	4%	8%	7%	10%
<b>Czech Republic</b>	35%	44%	45%	42%	27%	36%	35%	30%	16%	19%	18%	15%
<b>Netherlands</b>	28%	28%	28%	27%	23%	23%	25%	23%	14%	13%	15%	14%
<b>Italy</b>	25%	27%	23%	21%	20%	22%	19%	18%	14%	15%	13%	12%
<b>Portugal</b>	9%	15%	13%	16%	9%	13%	10%	16%	5%	8%	6%	9%
<b>Sweden</b>	8%	7%	7%	9%	6%	5%	5%	6%	2%	1%	2%	3%
<b>England &amp; Wales<sup>1</sup></b>	35%	38%	29%	25% <sup>1</sup>	29%	31%	22%	21% <sup>1</sup>	16%	20%	11%	13% <sup>1</sup>

*1. Low response of schools in 2011 (6%).*

Source: ESPAD

## 3 Cannabis use and classifications or typologies of cannabis users

### 3.1 Literature overview

In the (scientific) literature various classifications and more sophisticated typologies of cannabis users have been documented (Fischer et al. 2010; Hammersley and Leon 2006; Korf et al. 2007; Miller and Plant 2002; Senate Special Committee on Illegal Drugs (Senate) 2002; Temple et al. 2011; Van der Pol et al. 2013; Wittchen et al. 2009; Zeisser et al. 2012). The relevance of making classifications is mainly to understand associations between different user types and health or social outcomes, which could aid the identification of specific risk groups for prevention. Classifications are also employed in research on the drugs markets, e.g. to estimate consumption by different user groups (e.g. Hakkarainen et al. 2008; Observatoire Français des Drogues et des Toxicomanies (OFDT) 2002).

Cannabis users have been classified in many ways at widely varying levels of detail. User groups may be labelled as 'light and heavy users', 'occasional, regular, weekly, intensive/daily users', or 'current and past users', but there are no standard definitions underlying these concepts. On the one extreme cannabis users may be classified solely on the basis of their use ever (lifetime), in the past year ('recent use') or in the past month ('current use'), regardless of frequency. Other classifications employ various user characteristics, detailed cannabis use variables, indicators of problem use, or a combination of these.

Methods to profile subtypes of cannabis users include the a-priori classification on the basis of one or two characteristics (e.g. frequency of use in a certain time period, age of onset), which are commonly known as risk factors, or data driven methods

based on latent class or cluster analyses, which consider several variables in association (e.g. Fischer et al. 2010; Korf et al. 2007; Wittchen et al. 2009). Classes or categories may be formed on the basis of a fixed set of variables, and followed by a further characterization using other variables. Examples of studies employing different classifications or investigating typologies are summarized in table 3.1.

**Table 3.1: Examples of classifications and typologies of cannabis users**

Country (source)	Study population	Typology or classification
<b>Germany</b> (Wittchen et al. 2009)	Subjects of 14-24 years with repeated illegal substance use (5 times or more), assessed at baseline and over a 10-years follow-up period	Four classes of cannabis and other illicit drug users: 1. <i>Unproblematic cannabis users</i> (59%) 2. <i>Primary alcohol use disorders</i> (14%) 3. <i>Delinquent cannabis/alcohol DSM IV abuse</i> (18%) 4. <i>Cannabis use disorders with multiple problems</i> (9%) Variables in the latent class analyses included mental problems, somatic, interpersonal and occupational problems, mental disorders and antisocial behaviours. Cannabis use related problems were highest for class 3 and 4, while concomitant mental disorders were highest in class 2 and 4.
<b>Finland</b> (Hakkarainen et al. 2008)	Different sources (e.g. population surveys, field studies).	Five different cannabis user groups were distinguished on the basis of frequencies (number of use days in past year) and amount (gram per day): 1. <i>Experimenters</i> : 1-4 days x 0.2 gram 2. <i>Modest occasional users</i> : 5-12 days x 0.4 gram 3. <i>Frequent occasional users</i> : 13-51 days x 0.4 gram 4. <i>Weekly users</i> : 52-181 x 0.5 gram 5. <i>Daily users</i> : 182-365 x 1 gram
<b>France</b> (Observatoire Français des Drogues et des Toxicomanies (OFDT) 2002)	General population (18+, 1999-2000)	1. <i>Abstainer</i> : never smoked (78% of population) 2. <i>Experimental</i> : past consumption, but not in the last year (n.a.) 3. <i>Occasional</i> : between 1 and 9 times per year (6.5%) 4. <i>Repeated</i> : more than 9 times per year, less than 10 times per month (3.6%) 5. <i>Regular</i> : Between 10 and 19 times per month (1.4%) 6. <i>Excessive</i> : 20 times or more a month (n.a.)
<b>Italy</b> (Fabi et al. 2011)	National school population (15-19 years, N=34,000 in 2010)	Users were classified on the basis of frequency (use days) in the past 30 days: 1. <i>Occasional users</i> : use on 1-5 days in the past 30 days 2. <i>Regular users</i> : use on 6-19 days in the past 30 days 3. <i>Intensive users</i> : use on more than 19 days in the past 30 days
<b>Italy</b> (Cipolla and Martoni 2008)	Recreational setting attendees' in the Italian Romagna cost (N=5,233)	Classification of users based on use frequency: 1. <i>Non-users</i> : never use 2. <i>Occasional</i> : use from "at least once in the last year" to "2/3 times last month" 3. <i>Regular</i> : use from "at least once in the last week" to daily use 4. <i>Experimental</i> : once in the lifetime
<b>Netherlands</b> (Korf et al. 2007)	Regular cannabis smokers (at least once a month) recruited in 28 coffee shop located in 5 Dutch cities and through snowball sampling (N=388)	Three clusters of regular cannabis users, based on demographic, user, detailed cannabis consumption and environmental characteristics: 1. <i>Strongest high type</i> : was relatively young (average 23 yrs), consumed high average monthly dose (35 mg), inhaled higher potency cannabis more deeply, scored highest on dependence symptoms. 2. <i>The consistent high type</i> : was 28 yrs on average, preferred milder cannabis, consumed lowest average monthly dose (8.1 mg), compensated for stronger cannabis by inhaling less deeply and smoking less. 3. <i>The steady quantity type</i> : was oldest on average (38 yrs), were more likely to live and smoke alone, used an average monthly dose (19.5 gram) but did not tend to adjust their smoking behaviour in reaction to stronger cannabis.
<b>Netherlands</b> (Van der Pol et al. 2011)	Frequent cannabis users (18-30 years, who used cannabis at least 3 times a week during the past year; recruited in coffee shops of 5 Dutch cities and through snowball sampling (N=600)	Classification based on use frequency and dependence status: 1. <i>Frequent nondependent users</i> : use on at least 3 days a week during the past year and no 12 months diagnosis of cannabis dependence. 2. <i>Frequent dependent users</i> : use on at least 3 days a week in the past year and a 12 month diagnosis of dependence (DSM IV criteria). A wide range of variables (demographic, detailed consumption indicators, user characteristics, life events, childhood adversities, mental disorders) were entered into analyses to discriminate between dependent and non-dependent frequent users.

<b>Netherlands</b> (Nabben et al. 2010)	Visitors of coffee shops in Amsterdam (N=266), of whom 94% had used cannabis in the past month, and 76% (almost) daily	Risky user: Daily cannabis use or consumption of more than one joint on several days or more per week. Of the past month users 82% could be defined as a risky user.
<b>United Kingdom</b> (Hammersley and Leon 2006)	People from 17 to 45 years old who have smoked cannabis at least once in a lifetime (N=176)	Cannabis users could classify themselves on the basis of descriptions of use patterns: 1. <i>Ex-users</i> : have given up cannabis use 2. <i>Casual users</i> : use cannabis less than a few times a year, might get it offered it and rarely buy it, only for special occasions. 3. <i>Regular controlled users</i> : buy cannabis often or get it and use it a few days a month up to a couple of days a week. 4. <i>Daily or near daily users</i> : often buy or get cannabis and smoke (almost) every day, at evenings up to the whole day
<b>United Kingdom</b> (Miller and Plant 2002)	School students aged 15-16 year (from ESPAD), N=2,641, including 201 heavy cannabis users (40 times in life)	Three clusters of heavy cannabis users were formed on the basis of gender, and a range of variables related to the quality of relationship with family and friends, leisure time, mood and attitudes, aggression and delinquency. They were labelled as: 1. <i>Antisocial behaviour</i> type 2. <i>Unhappy</i> type 3. <i>Ordinary</i> type These types were further profiled on cannabis use variables, other substance use and social status.
<b>Canada</b> (Fischer et al. 2010)	Current cannabis users (use in past 3 months; N=1,303) from the Canadian household survey (N=13,909)	Four classes based on six cannabis-use related variables: 1. Onset ≤ 21 years, occasional use (no use or on <7 days/past month, used less than in past 12 months; used mainly for social reasons and not medically (32%) 2. Onset ≤ 17 years, moderate/regular use (1-7 days in past month), used same or less than in past 12 months, used mainly for social reasons, not medically (20%) 3. Onset ≤ 17 years, moderate-weekly use (1-14 days in past month), consumed same or less than in past 12 months; used mainly for social reasons and half for medical reasons (25%) 4. Onset ≤ 15 years, near daily or daily use, used more than in past 12 months; used mainly for social reasons and half for medical reasons (23%) Class 4 was associated with the highest level of health and cannabis use problems.
<b>Canada</b> (Zeisser et al. 2012)	Regular (monthly) cannabis users aged 15–67 years from high risk population (club drug users, street youth, injecting drug users) (N=665).	Cannabis users were classified on the basis of frequency and quantity: 1. <i>Frequency in the past 30 days</i> : 1–4 days, 5–11 days, 12–20 days, 21–29 days, and 30 or more days 2. <i>Quantity (number of joints or equivalents per day)</i> : 0.1-0.8 joint; exactly 1 joint; 1.1 to 3 joints; 3.5 to 8 joints; 9 or more joints. It was assumed that one joint was equal to 0.5 gram cannabis, five bong or pipe hits or 10 puffs Frequency was the strongest predictor of cannabis use related problems.
<b>Canada</b> (Thomas et al. 2006)	General population of 15 years or older in 2004	Typology based on prevalence and frequency of use and scores on the Alcohol, Smoking and Substance Involved Screening Test (ASSIST): 1. <i>Abstainer</i> : no use in lifetime (55.7% of population) 2. <i>Past user</i> : used at least once in lifetime but not in last 12 months (30.4%) 3. <i>Past recent user</i> : used in past year but not in last 3 months (2.9%) 4. <i>Low-risk user</i> : less than monthly or monthly use in last 3 months and ASSIST score ≤3 (2.8%) 5. <i>Moderate-risk user</i> : Daily or near-daily use in last 3 months AND/OR ASSIST score between 4 and 26 6. <i>Dependent/high-risk user</i> : ASSIST score ≥27
<b>US</b> (Kandel and Chen 2000)	Ever users of cannabis (more than 10 times lifetime) followed from age 15-16 up to 34-35 years (N=708)	Four clusters of cannabis users, based on age of onset of cannabis use, extent of chronic use, persistence of use by age 34-35, labelled as: 1. <i>Early-onset heavy use</i> : onset around 15 years, all were near daily (4 or more days a week) users, and half still used by age 34-35 2. <i>Early onset-light use</i> : onset at around 15 years, half became near daily users and only 10% persisted in use at age 34-35 3. <i>Mid onset-heavy use</i> : onset at around 16 years, two-thirds became near daily users and all still used at age 34-35 4. <i>Late onset -light use</i> : onset at around 19.5 years, one fifth became a near daily user and less than 1% still used at age 34-35. These four user groups were further described on the basis of demographic, substance-use and problem use related variables, psychological problems and family and social context variables.

The EMCDDA also collects data about the frequency of use during last month (1 to 3 days/30; 4 to 9 days/30; 10 to 19 days/30; 20+ days). People who use cannabis daily or almost daily (20 or more days in the past month) are considered as 'intensive user'. Work is in progress to find the most appropriate screening instrument to establish the prevalence of 'problem cannabis use' in the general population.

A categorization based on frequency (defined in varying ways) is most common in cannabis research aimed at establishing effects or outcomes of cannabis use. However, as noted by Temple et al. (2010) this leaves much room for variation in exposure as these studies usually do not take into account the number of consumption sessions or units per day and the amount consumed per unit or day, let alone cannabis potency, which may be relevant in investigating health risks. Moreover, according to these authors "there is a need for studies that examine a broader range of variables relating to overall patterns of cannabis use (e.g. context of use, method of administration, motives for use, subjective effects) to gain a greater understanding of differing patterns of use and how these use factors may be associated with use-related harms and problems experienced by cannabis users".

An example of a classification scheme incorporating some of these elements is proposed (not empirically tested) by the Canadian Senate Special Committee on illegal drugs (2002). They distinguish four groups of cannabis users based on context of use, quantity, frequency, period and intensity of use: experimental, regular, at risk, and excessive users (table 3.2). Smoking alone, in the morning and before work or school are considered to be risk factors. While this model is conceptually interesting from a public health perspective, it is less suitable for making markets estimates as groups are not exhaustive and do not provide sufficient detail on cannabis use patterns.

**Table 3.2: Classification of users by the Canadian Senate Special committee on illegal drugs (2002)**

Type of consumers	Context of use	Quantity	Frequency	Period and intensity of use
Experimental/ occasional	Curiosity	Variable	A few times over lifetime	None
Regular	Recreational, social Mainly in the evening Mainly in a group	A few joints Less than one gram a month	A few times a month	Spread over several years, but rarely intensive
At-risk	Recreational and occupational use (before work or school, for sport) Alone and in the morning Under 16 years of age	Between 0.1 and 1 gram a day	A few times a week, evenings, especially weekends	Spread over several years with high intensity periods
Excessive	Occupational and personal problems\ No-self regulation of use	Over 1 gram a day	More than once a day	Spread over several years with several months at a time of high intensity use

Several studies listed in table 3.1 are worth describing in more detail as they provide relevant information on cannabis use patterns from different perspectives (Hakkarainen et al. 2008; Korf et al. 2007; Zeisser et al. 2012).

In a Canadian study, individuals (15-67 years) recruited from three high risk populations (club drug users, street-involved youth and injecting drug users) were classified on the basis of both frequency and quantity of their cannabis use (Zeisser et al. 2012). Frequency was defined as the number of use days in the past month. Quantity was defined in terms of the number of joints, assuming that one joint was equal to 0.5 gram cannabis, five bong or pipe hits or 10 puffs. In their sample, cannabis use frequency was associated with the amount of use: the higher the number of use days, the higher the number of joints consumed per day (see table 3.3). Using items of the Alcohol Smoking and Substance Involvement Screening Test (ASSIST) to measure cannabis-related problems, it was determined that use frequency significantly predicted each of the cannabis-related problems, independent of cannabis quantity. Compared to those using cannabis on 1-4 days in the past 30 days, the odds of experiencing overall problems was increased in all other frequency groups in a dose-related fashion (OR 2.8 for 5-11 days, OR 4.2 for 12-20 days, OR 9.1 for 21-29 days and OR 11.6 for 30 days or more). Quantity was an independent (corrected for frequency) predictor of only one out of five problems (failure to do what expected) only for those smoking 3.5-8 joints per day. Nonetheless, other studies suggest that quantity, independent of frequency, is an important predictor of cannabis-related problems (Walden and Earleywine 2008).

**Table 3.3: Cannabis users classified by number of use days and number of units consumed per day (Zeisser et al. 2010)**

	Number of use days in the past month				
	1-4	5-11	12-20	21-29	30 or more
0.1-0.8	32%	18%	12%	7%	2%
1	42%	31%	34%	21%	9%
1.1-3	20%	39%	41%	43%	34%
3.5-8	5%	10%	11%	22%	41%
9 or more	2%	2%	2%	7%	14%
	100%	100%	100%	100%	100%

*Adapted from Zeisser et al. (2010).*

Note that Zeisser et al. (2010) assessed quantity as the number of joints, assuming that the amount of cannabis per joint was similar across users. This assumption is questionable, however. For example, in a Dutch study by Korf et al. (2007) a variety of personal and cannabis use variables were measured in a sample of relatively frequent cannabis users in order to construct user typologies to shed light on the relationship between cannabis potency, consumption patterns and harmful effects of cannabis. Consumption variables included: the monthly cannabis dose as calculated by the number of use days per month, the number of joints per typical cannabis day and the cannabis dose per joint. The latter was estimated in two ways: by asking users how many joints they usually would roll from 1 gram of cannabis and by using photo or prompt cards with four different amounts of hash or marijuana shown to the respondents, and asking them to rate which amount would be closest to the amount they normally consumed per joint. Overall, the first method resulted in an average dose of 250 mg and the second of 160 mg per joint. The photo card method was assumed to be most reliable and sensitive, although recent data from a validation study suggest it may give an underestimation of the true amount (Van der Pol et al., submitted). Nonetheless, table 3.4, which gives figures on a few variables measured in this study, suggests that users may not only differ in the number of use days and number of joints, but also in the amount of cannabis they consume per joint.

**Table 3.4: Cannabis user and use characteristics in a Dutch study among three clusters of current cannabis users (from Korf et al. 2007)**

	Cluster I (strongest high)	Cluster II (consistent high)	Cluster II (steady quantity)
% Males	86%	66%	91%
Mean age (years)	22.7	27.7	37.5
Dose per joint (mean)	35 gram	8 gram	19 gram
• Dose per joint (mean)	0.21 gram	0.11 gram	0.14 gram
• Joints per use day (mean)	5.7	3.1	5.1
• Use days per month (mean)	27.4	21.1	26.6

The third study by Hakkarainen and colleagues (2008) aimed to estimate the size of the cannabis markets in Finland, including the total amount consumed in 2004. The investigators used data from population surveys and registration data on problem users to estimate the annual number of cannabis users, while data from qualitative studies were used to estimate drug use patterns among different user groups. Their population survey only measured the prevalence in the past 12 months and last month use, and for the last month users also the frequency of use was measured (number of sessions in the last month). In order to classify users into 5 groups (see table 3.5), a number of assumptions had to be made about their frequency of use in the last 12 months, and their consumption pattern. For example, it was assumed that not all past month users consumed cannabis every month in the past 12 months. Moreover, based on the international literature, the phenomenon of 'sharing joints' was taken into account, which was assumed to play a role especially among experimenters and occasional users. For example, experimenters were assumed to take one joint, with an average dose of 0.4-0.5 gram of cannabis (based on American data), and share it in a 3-person company. Thus their daily dose (or more appropriately 'dose per session') would be between 0.13 and 0.15 gram. Occasional users were assumed to take several of these doses within one consumption session, resulting in an estimated 0.4 gram per session.

By classifying users into the different user groups and taking their assumed consumption per session into account, the investigators calculated the amount of cannabis consumed per user group. Moreover, numbers of cannabis users from population surveys were complemented with estimates of the number of problem drug users (amphetamine and opiates), of

whom 50% were assumed to be underrepresented in general population surveys. It was further assumed that two-thirds of this group used cannabis and that half of these users could be assigned to the group of frequent occasional users and half of them to the group of weekly users. Minimum and maximum estimates were based on the boundaries of the number of use sessions per year within each user group into account. The investigators concluded that, while the modest occasional users were the largest group, the smallest group of the daily users (6%) accounted for the majority (between 52% and 65%) of the total cannabis consumption. If all last years are taken together, the average consumption of a cannabis user would be between 16 and 40 gram per year.

While this study is highly interesting because it takes differences between types of users into account, the consumption pattern data have been drawn mainly from other studies, and assignment into user groups occurred mainly on the basis of assumptions on their frequency of use in the past year.

**Table 3.5: Estimated total consumption of cannabis by user group in the Finnish population in 2004 (from Hakkarainen et al., 2008)**

	Number of users		Amount of cannabis			
	N	%	Minimum		Maximum	
			Kg	%	Kg	%
<b>Experimenters</b> 1-4 sessions x 0.2 g per session	18,000	17%	4	0	14	0
<b>Modest occasional users</b> 5-12 sessions x 0.4 g per session	44,000	41%	88	5	211	5
<b>Frequent occasional users</b> 13-51 days x 0.4 g per day	23,100	22%	120	7	479	11
<b>Weekly users</b> 52-181 days x 0.5 g per day	15,100	14%	393	23	1,367	32
<b>Daily users</b> 182-365 days x 1 g per day	6,000	6%	1,092	65	2,190	52
<b>Total</b>	<b>106,200</b>	<b>100</b>	<b>1,697</b>	<b>100</b>	<b>4,261</b>	<b>100</b>

Finally, in its 2009 World Drug Report, the UNODC has differentiated four different types of users (casual, regular, daily, chronic) on the basis of an international literature review published in the Bulletin on Narcotics (2006) UNODC (2009). Table 3.6 shows 'global' consumption patterns per user group, without taking possible differences between countries into account. The weighted average of the amount of cannabis consumed per past year user was estimated at 172 gram, much higher than the amount in the study of Hakkarainen et al. (2008) (16-40 gram). Note, however, that the UNODC assumed a dose of 0.5 gram per joint, which may be fairly high for European countries.

So far, data on cannabis consumption patterns have not been empirically assessed in detail in one study in different countries and used for making consumption estimates differentiated by user groups.

**Table 3.6: Consumption patterns of different types of users**

User type	% of past year users	Use pattern (year)	Amount consumed per year
Casual users	45%	Sharing joints 1 -11 times (or 4 on average (0.15 gram per time) <sup>1</sup>	0.6 gram
Regular users	41%	100 times or days (0.15 gram per time or day)	15 gram
Daily users	9%	One to four joints on 320 days (on average one gram per day)	320 gram
Chronic users	4%	Ten joints daily (equaling 5 grams)	1,825 gram

*1. One joint of 0.5 gram cannabis may be shared with 3-4 people.*

**Source:** World Drug report UNODC (2009). Bulletin on narcotics (UNODC 2006).

## 3.2 Definition of user types

In the present study cannabis users were classified on the basis of the number of cannabis use days in the past 12 months (annual frequency) into four user groups. This classification is pragmatically chosen as the categories needed to correspond somehow with the data obtained in general population surveys on the prevalence and number of cannabis users. Most countries have data on the prevalence of use in the past year and the past month and within the group of last month users, on the number of use days. Data on the annual number of use days are rarely measured directly. Nonetheless, it was decided to classify users on the basis of annual frequency (use days) instead of extrapolating figures on the basis of frequencies in the past month, as annual frequency appeared to yield better discriminative properties with regard to a number of consumption variables. We will go into more detail about this match. After classifying users, they were further profiled in terms of demographic characteristics, consumption patterns, circumstances of use and problems associated with their cannabis use.

In the web survey, annual frequency was measured by two categorical variables. One variable included the following frequency categories: 1-5 days; 6-10 days; 11-20 days; 21-50 days; 51-80 days; 81-100 days; 101-150 days; 151-200 days; 201-250 days; 251-300 days; 301-350 days; >350 days. The other variable included the categories: 'daily', 'almost daily', 'not daily but more than once a week', 'once a week', 'less than once a week, but at least once a month' and 'less than once a month'. Correlations between both measures were high in all countries and within the total sample ( $r=.86$ ,  $P=.0001$ ). As numeric values could be assigned to the categories of the first frequency variable, it was deemed more suitable for quantitative analyses. Therefore, this measure was chosen for classification purposes.

The following four main groups of users have been distinguished, with two subtypes, and an additional group of problem users:

1. **Infrequent users or chippers**<sup>2</sup> = people using cannabis on less than 11 days in the past year ( $\approx$  'less than once a month').
2. **Occasional users** = people using cannabis on 11-50 days ( $\approx$  'less than once a week but at least once a month').
3. **Regular users** = people using cannabis on 51-250 days ( $\approx$  'once a week and 'more than once a week, but not daily or almost daily').
  - a. *Modest regular users* = people using cannabis on 51-150 days.
  - b. *Frequent regular users* = people using cannabis on 151-250 days.
4. **Intensive users** = people using cannabis on more than 250 days ( $\approx$  'daily or almost daily').
  - a. *Almost daily users* = people using cannabis on 251-350 days.
  - b. *Daily users* = people using cannabis on more than 350 days.
5. **Problem users** = use in the past 12 months and having a score of  $\geq 7$  (moderate dependence) or score  $\geq 12$  (severe dependence) according to the Cannabis Abuse Screening Test (CAST) (Cuenca Royo et al. 2012).

The category of problem users may overlap with other categories (especially category 4) and will be analysed separately (see chapter 3.7). The CAST was chosen because this instrument is one of the tools currently under investigation by the EMCDDA to be included in population surveys and it is one of the (optional) modules in the ESPAD survey.

The four group classification was chosen to have sufficient numbers of users per group in most countries. The number of use days is, however, not equally distributed over the different groups. Especially the frequency range for the category of regular users is quite wide (51-250 days) and may be heterogeneous, although conceptually this group can be seen as those who consume at least weekly but not (almost) daily. Splitting up this category into two groups (51-150 and 151-251) did indeed discriminate on a number of core consumption variables (such as number of units consumed on a typical day or amount of cannabis per unit) if the total data set combining respondents for all countries was analysed. Moreover, if we used a six-group classification by splitting up not only the group of regular users but also the group of daily/almost daily users - thus distinguishing six groups in total - an almost linear increase in number of units per day was found. We will show this in the respective chapters, especially for consumption related variables and when relevant differences are found, but focus on the four-group classification due to sample size limitations in several countries (Bulgaria, Portugal, UK), often not allowing a reliable classification into six user groups, especially for variables with multiple answer categories.

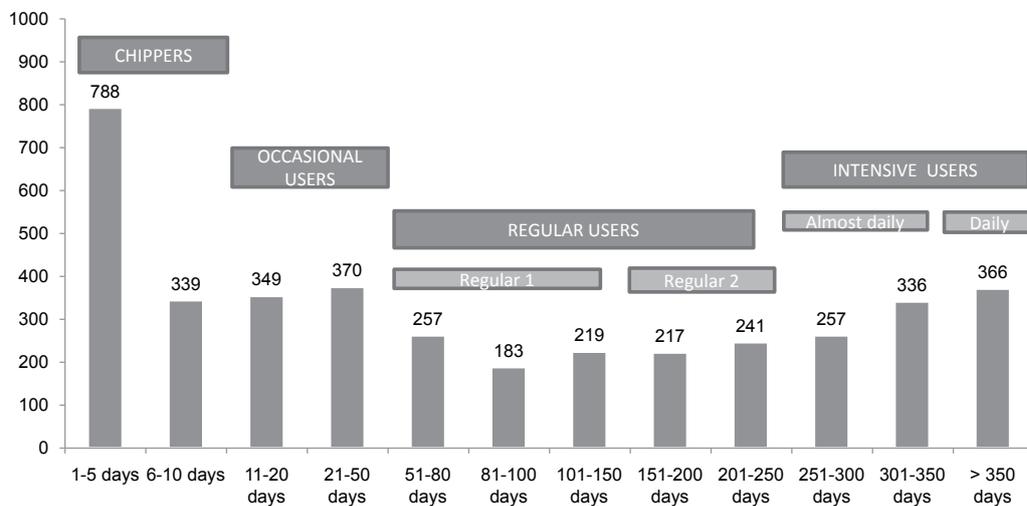
As described in 3.4.d, the cannabis questionnaire was split in three: one for respondents who only used hash in the past 12 months, one for those who only used marihuana, and one for respondents who used both (at least once of each cannabis type). Respondents in the last track who indicated that they used both hash and marihuana reported separately on their use

<sup>2</sup> Drawn from tobacco research, where the term 'chippers' is used to denote infrequent nondependent smokers (e.g. Shiffman 1994).

frequencies of hash and marihuana. We cannot be sure, however, to what extent these two use frequencies overlap. Analyses of patterns of answering and of different ways of combining the frequencies clearly suggest that (partially) summing the frequencies results in overestimation of the total number of use days, and that the highest reported frequency best reflects the total number of use days. For the purpose of classification into user type groups, respondents were thus assigned the highest of these two values as the number of days on which they had used cannabis in the past year.

Using the previously mentioned four category classification, 29% of the respondents in the total sample could be classified as chipper, 18% as occasional users, 28% as regular user and 24% as intensive users (figure 3.1). The average number of use days within these categories was 4.5, 26, 137 and 325, respectively. Table 3.7 shows that these proportions differed between countries, with Italy having the highest proportion of intensive users (34%) within their sample and Bulgaria having the lowest proportion (11%) of intensive users. Note, however, that these figures are more likely reflecting variations in recruitment strategies than prevalence of use. Moreover, it should be kept in mind that the totals of all user groups combined are for most variables not comparable between countries, because of the unequal weights caused by these different frequency distributions. Nonetheless, for ease of reporting, reference will be occasionally made to these totals

**Figure 3.1: Number of respondents in the total sample per frequency category (= number of days used in the past 12 months)**



**Table 3.7: Numbers and proportions of cannabis users by user group and country**

		Chipper	Occasional	Regular	Intensive	Total
<b>Bulgaria</b>	Number	88	26	60	22	196
	%	45%	13%	31%	11%	100%
<b>Czech Republic</b>	Number	117	88	141	139	485
	%	24%	18%	29%	29%	100%
<b>Italy</b>	Number	191	141	332	340	1,004
	%	19%	14%	33%	34%	100%
<b>Netherlands</b>	Number	394	208	240	242	1,084
	%	36%	19%	22%	22%	100%
<b>Portugal</b>	Number	49	20	32	42	143
	%	34%	14%	22%	29%	100%
<b>Sweden</b>	Number	214	182	240	104	740
	%	29%	25%	32%	14%	100%
<b>England &amp; Wales</b>	Number	74	54	72	70	270
	%	27%	20%	27%	26%	100%
<b>All countries</b>	Number	1,127	719	1,117	959	3,922
	%	29%	18%	28%	24%	100%

In the next sections, user characteristics, cannabis use patterns and circumstances of use will be described on the basis of these user types. We will look whether there are differences between user groups and whether these differences are consistent across countries. Note that data for all countries combined are not weighted, so that countries with relatively large samples (Italy, the Netherlands and Sweden) will contribute most to the overall averages.

### 3.3 Demographics

#### **Gender**

About three-quarters of all cannabis users were male, but proportions varied from 57% in Bulgaria to 88% in Sweden. There were significant gender differences between user groups. In all countries, the proportion of females was highest among chippers and lowest among regular and intensive users. Differences in the proportion males and females between user groups were largest in the Czech Republic and England & Wales, and smallest in the Netherlands and Sweden. Remarkably, in Bulgaria, the Czech Republic and England & Wales, the majority of the chippers were female.

**Table 3.8: Proportion of males among different cannabis user groups by country**

	Chipper	Occasional	Regular	Intensive	Total	P= .
<b>Bulgaria</b>	47%	58%	68%	68%	57%	.043
<b>Czech Republic</b>	47%	65%	74%	88%	70%	.000
<b>Italy</b>	57%	74%	83%	88%	78%	.000
<b>Netherlands</b>	63%	71%	74%	74%	69%	.009
<b>Portugal</b>	53%	70%	53%	83%	64%	.010
<b>Sweden</b>	79%	90%	92%	90%	88%	.000
<b>England &amp; Wales</b>	41%	67%	78%	89%	68%	.000

#### **Age**

Table 3.9 shows the average and median ages per user group and country. The majority of the respondents were in their early and mid twenties. Intensive users were on average two years older compared to the other user groups, but differences were only significant in Italy, the Netherlands, England & Wales, and Sweden. (F(user groups)=8.8; P=.000; F (countries)=18.8, P=.000); F (User group x Countries)=2.4; P=.001). The overall lower median ages suggests that the age distribution is skewed to the right.

The large majority of respondents fell in age group 15-34 years: 98% in Bulgaria, 94% in the Czech Republic, 87% in Italy, 88% in the Netherlands, 80% in Portugal, 90% in Sweden and 78% in the England & Wales. The low number of cases in age group 35-64 years will not allow further analyses of use patterns for different age groups (15-34 and 35-64 years).

Table 3.9 therefore gives the proportion of users in age group 15-24 and 25-64 years. Overall about six in ten respondents were between 15 and 24 years, while about four in ten respondents were aged between 25 and 64 years. Differences in the proportions of younger and older users between user groups were significant in the Netherlands, Italy and England & Wales.

The overall average age in age group 15-24 years was 20.7 years (median 21.0) and in age group 25-64 years it was 32.4 years (median 29.0).

Table 3.9: Age distribution by cannabis user group and country

	Chipper	Occasional	Regular	Intensive	Total	P= .
<b>Bulgaria</b>						
Age (yrs) – mean	23.6	24.7	23.2	22.5	23.5	.342
Age (yrs)- median	22.5	24.0	22.0	22.0	22.5	
% 15-24 years	67%	54%	67%	73%	66%	.532
% 25-64 years	33%	46%	33%	27%	34%	
<b>Czech Republic</b>						
Age – mean	22.9	23.4	22.9	23.0	23.1	.943
Age- median	22.0	22.0	21.0	21.0	22.0	
% 15-24 years	69%	68%	72%	73%	71%	.871
% 25-64 years	31%	32%	28%	27%	29%	
<b>Italy</b>						
Age – mean	25.1	24.5	25.6	27.3	25.6	.000
Age- median	24.0	23.0	23.0	25.0	24.0	
% 15-24 years	55%	62%	59%	48%	55%	.008
% 25-64 years	45%	38%	41%	52%	45%	
<b>Netherlands</b>						
Age – mean	25.0	23.8	24.8	27.9	25.4	.000
Age- median	23.0	22.0	22.0	25.0	23.0	
% 15-24 years	64%	71%	68%	50%	63%	.001
% 25-64 years	36%	29%	33%	50%	37%	
<b>Portugal</b>						
Age – mean	29.2	24.3	27.8	28.1	27.3	.159
Age- median	25.0	21.5	24.5	28.0	25.0	
% 15-24 years	49%	75%	50%	31%	48%	.013
% 25-64 years	51%	25%	50%	69%	52%	
<b>Sweden</b>						
Age – mean	25.1	25.0	25.1	27.9	25.8	.012
Age- median	24.0	24.0	22.0	25.0	23.0	
% 15-24 years	57%	55%	65%	48%	58%	.021
% 25-64 years	43%	45%	35%	52%	42%	
<b>England &amp; Wales</b>						
Age – mean	26.5	26.2	29.1	33.3	28.8	.000
Age- median	25.0	23.5	24.5	31.0	25.0	
% 15-24 years	42%	61%	50%	31%	45%	.008
% 25-64 years	58%	39%	50%	69%	55%	
<b>All countries</b>						
Age – mean	25.0	24.4	25.1	27.3	25.5	.000
Age- median	23.0	23.0	22.0	24.0	23.0	
% 15-24 years	60%	64%	63%	51%	59%	.000
% 25-64 years	40%	36%	37%	49%	41%	

**Work status**

Table 3.10 shows that a large proportion of the respondents was student (44%), with rates decreasing from chippers to intensive users. An analysis by age group shows that the overall proportion students was, as expected, higher among the younger user group, but differences between user groups were more pronounced in the older age group. Overall, one in ten cannabis users was unemployed, with slightly higher rates among intensive users. Employment rates were, as expected, higher among the older compared to the younger users, but showed overall little differences between user groups.

**Table 3.10: Employment status by user group and age group\***

		Chipper	Occasional	Regular	Intensive	Total
<b>15-24</b>	Employed full-time	12%	14%	13%	19%	14%
	Employed part-time	8%	8%	8%	6%	7%
	Self-employed full-time	1%	2%	3%	3%	2%
	Self-employed part-time		2%	2%	2%	1%
	Full time student	69%	65%	59%	56%	62%
	Unemployed	5%	8%	9%	11%	8%
	Other	4%	3%	6%	3%	4%
	<i>Number</i>	516	368	566	392	1,842
<b>25-64</b>	Employed full-time	44%	41%	42%	41%	42%
	Employed part-time	9%	6%	12%	10%	9%
	Self-employed full-time	9%	11%	8%	20%	12%
	Self-employed part-time	3%	2%	4%	2%	3%
	Full time student	25%	31%	19%	10%	20%
	Unemployed	7%	6%	11%	12%	9%
	Other	4%	4%	3%	5%	4%
	<i>Number</i>	377	234	347	410	1,368
<b>Total</b>	Employed full-time	26%	24%	24%	30%	26%
	Employed part-time	8%	7%	9%	8%	8%
	Self-employed full-time	4%	5%	5%	12%	7%
	Self-employed part-time	1%	2%	3%	2%	2%
	Full time student	51%	51%	44%	32%	44%
	Unemployed	6%	7%	10%	11%	9%
	Other	4%	3%	5%	4%	4%
	<i>Number</i>	893	602	913	802	3,210

\*Column totals sum to 100% within age group.

### **Comparing survey demographic data with population survey data**

Several countries have reported that younger people and students might have been overrepresented in the web survey. Table 3.11 shows the age and gender distribution as found in the web survey and in the population surveys as described in chapter 2. A direct comparison is nonetheless hampered because of the differences groups (i.e. user groups against last year and last month users). Nonetheless, the data suggest that males tend to be overrepresented in the web survey in Italy and Sweden, while females seem to be slightly overrepresented in the Netherlands and much more in Portugal (table 3.11). Moreover, younger users were clearly overrepresented in the web survey in the Czech Republic, Italy and the Netherlands.

We have no comparative data from general population surveys on work status, except for the Czech Republic (Běláčková et al. 2012). This comparison showed that the proportion of students among last year cannabis users in the web survey was about two times higher compared to that found in the general population survey of 2008. In contrast, employment rates as well as unemployment rates were about two times lower in the web survey compared to the general population survey. Also, the proportion of cannabis users with a university degree was higher. Note that these findings may be associated (to some extent) with the higher proportion of younger users in the web survey.

Table 3.11: Comparison of gender and age distribution among cannabis users in the web survey and the general population survey<sup>1</sup>

	Proportion males				Proportion 15-24 years			
	Web survey		Population survey		Web survey		Population survey	
	Range <sup>II</sup>	Total	Last year	Last month	Range <sup>II</sup>	Total	Last year	Last month
<b>Bulgaria</b>	47% - 68%	57%	59%	64%	54% - 73%	66%	56%	61%
<b>Czech Republic</b>	47% - 88%	70%	66%	73%	69% - 73%	71%	42%	45%
<b>Italy</b>	57% - 88%	78%	59%	67%	48%-62%	55%	24%	24%
<b>Netherlands</b>	63% - 74%	69%	70%	76%	50%-51%	63%	42%	35%
<b>Portugal</b>	53%-83%	64%	88%	90%	31%-75%	48%	30%	28%
<b>Sweden</b>	79%-92%	88%	68%	74%	48%-57%	58%	53%	45%
<b>England &amp; Wales</b>	41%-89%	68%	68%	73%	31%-61%	45%	50%	47%

I. For details about the web survey: see Introduction. II. Range refers to the lowest and highest value of the user groups.

### 3.4 Characteristics of cannabis use

In this chapter we will describe for each of the countries and user groups the following aspects of cannabis use:

- Age of first use
- Main type of unit
- Consumption of cannabis mixed or pure
- Cannabis type (hash or marihuana) and preference
- Number of units consumed on a typical day and estimated amount of cannabis per unit
- Estimate of daily dose and annual consumption

We will go into detail about point e (number of units per day, amount per unit) as these variables are of crucial importance for making annual consumption estimates at country level as described in chapter 5.

Respondents who indicated that they used both hash and marihuana reported separately on many use characteristics for hash and marihuana. Where we report separately for hash and marihuana, these respective figures were used. Where we report on cannabis with no distinction between hash and marihuana, we created single cannabis variables for these respondents. The majority of variables were created by assigning the value corresponding with respondents' preferred cannabis type (see chapter 3.4.d) or, for those who showed no preference, assigning the highest value. The main exception to this approach occurs for the purpose of estimating annual consumption. Here, single measures of the number of cannabis units consumed on a typical use day and the amount of cannabis put into a typical unit were computed as the weighted average of the corresponding figures for hash and marihuana based on the ratio of the number of past year use days of hash and marihuana. Thus, more weight is given to the figures reported for the type of cannabis that is used more frequently in determining the number of units of cannabis that are consumed on a typical use day and the amount of cannabis that goes into a typical unit.

#### **a. Age of first use**

An early age of onset of cannabis use has been associated with the development of substance use problems (not only cannabis) later in life, cognitive decline, mental disorders and problem behaviours, like criminality, reduced school completion rates and sexual risk behaviour (e.g. Horwood et al. 2010; Lynskey et al. 2012; Meier et al. 2012). There is no consensus, however, on the definition of 'early onset'. Usually first cannabis use before 16 or 17 years has been associated with greater risk, compared to those who start at a later age, but other research point at younger or higher age limits.

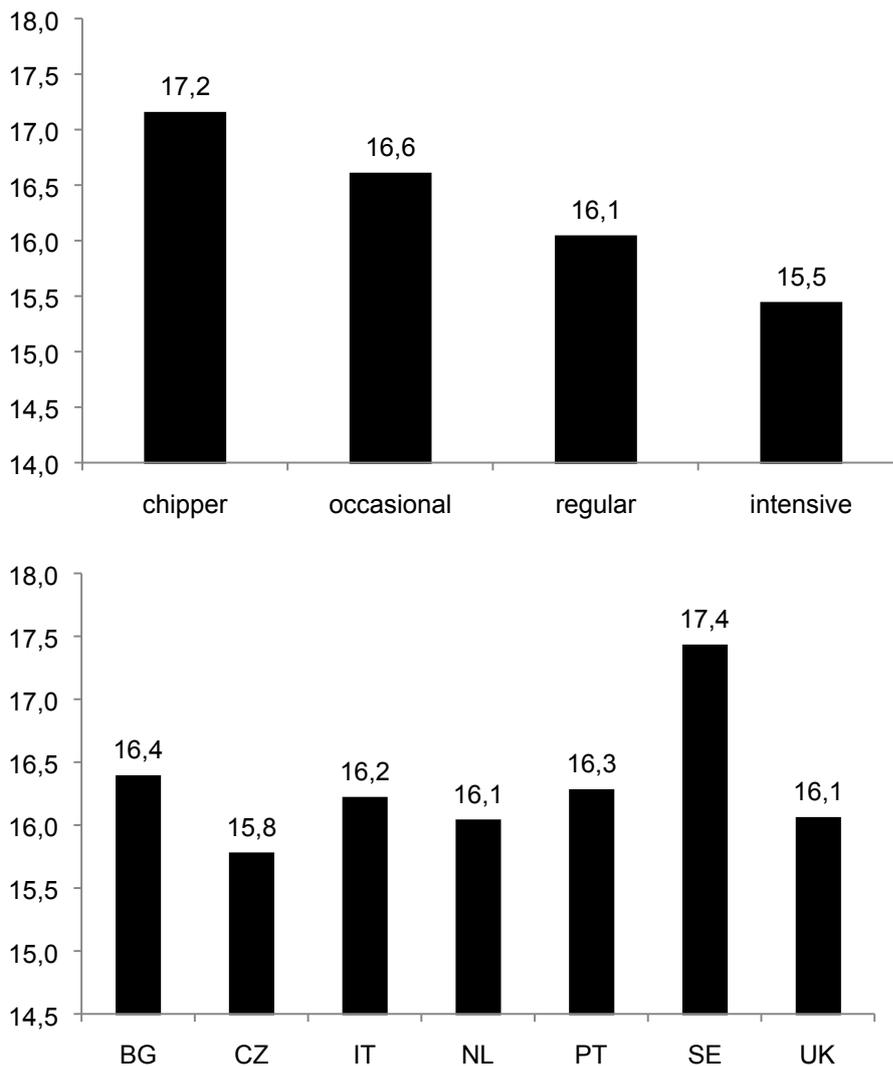
The average age of first use is highly dependent on the age distribution of the samples. As age of first use can never be higher than the actual age of the respondent, the inclusion of a relatively high proportion of young people will therefore 'reduce' the average age of first use. Stated in other words, those with a late onset of use will be underrepresented in relatively young samples.

We have therefore analyzed age of first use by in two ways. First by analyzing differences between user groups and countries by adjusting for age differences (i.e. age was evaluated as covariate in the model at a value of 25.5 years). Second, we have restricted the analyses to age group 25-64 years, which might seem more appropriate but reduces power due to low numbers

of respondents per user group in this age group. In addition, current age was included in the analyses as covariate, to further exclude the impact of differences in age distribution.

Figure 3.2 shows that the average age of first use in the total group and when adjusted for current age differences decreased from chippers to intensive users (Fuser groups=34.3,  $p<.000$ ). Intensive users consumed their first cannabis when they were on average 1.7 younger than chippers. Moreover, there was a main effect of country (F=19.7,  $p<.000$ ). Post-hoc analyses showed that age of first use was overall higher in Sweden compared to all other countries. Differences between other countries were not significant. There was no significant interaction between country and user group ( $P=.057$ ).

**Figure 3.2: Average age of first use by user group (upper panel) or country (lower panel) (means adjusted for current age differences)\***



\* Estimated marginal means, with age included in the analyses as covariate at value 25.5 years

Since adjustment for age differences may have a fairly rigorous impact on the data, we have also analyzed age of first use by restricting the analyses to respondents aged 25 or older. It is assumed that first cannabis use will have occurred before this age by the majority of users and that the risk of under-inclusion of late onset users is minimal.

Table 3.12 shows the mean ages of first cannabis use in each country by user group among respondents older than 25 years. There were significant differences between user types (F=5.5,  $P=.001$ ) and countries (F=8.9,  $P=.000$ ). Taking all countries together, intensive users consumed cannabis for the first time when they were on average 16.6 years, which is younger compared to all other user groups. Chippers were on average oldest (18.3 years). All differences between user groups in the entire sample were significant, but in the individual countries user group differences reached significance only Italy. This might to some extent be related to the relatively small sample sizes per user group among 25-64 year olds only.

Moreover, post-hoc analyses showed that in Sweden the overall age of first cannabis use among respondents older than 25 years was higher (18.9 years) compared to all other countries (between 16.6 and 17.8 years). Moreover, age of first use was significantly higher in the Netherlands compared to Italy.

**Table 3.12: Mean age (years) of first cannabis use among respondents of 25-64 years**

	Chipper	Occasional	Regular	Intensive	Total	P=
<b>Bulgaria</b>	17.5	17.3	16.5	14.7	16.9	.178
<b>Czech Republic</b>	17.1	15.7	17.2	16.7	16.7	.204
<b>Italy</b>	17.5	16.8	16.4	16.2	16.6	.000
<b>Netherlands</b>	18.7	17.3	18.2	16.7	17.8	.058
<b>Portugal</b>	18.6	14.4	16.6	16.8	17.2	.118
<b>Sweden</b>	19.8	18.8	18.0	18.8	18.9	.106
<b>England &amp; Wales</b>	17.3	18.1	16.5	16.0	16.8	.161
<b>All countries</b>	18.3	17.5	17.2	16.6	17.4	.001

### ***b. Main type of unit***

Respondents were asked how they usually consumed their cannabis. There were five answer categories: joints, chillums or dry pipes, water pipes, in food or in beverages. Unfortunately, vaporizers were not included as an option, while comments of some respondents suggested that this method of use is preferred by an unknown part of the users, especially because of health concerns related to smoking. Some of these respondents indicated that they therefore chose 'chillum/dry pipe'.

Table 3.13 shows that overall the majority of the cannabis users - 85% of total sample – consumed their cannabis usually by smoking a joint, followed at quite some distance by a dry pipe or chillum (9%) and water pipe (4%). Ingesting cannabis in food (e.g. 'space cake') or beverages (e.g. tea) as main route of administration was rare. Only 1.3% and 0.3%, respectively, of the respondents mentioned these types of units. There were however, notable differences between countries, both in main type of units and whether there are differences between user groups.

In Bulgaria, Italy, the Netherlands and Portugal over 90% of all users consumed cannabis predominantly by smoking joints, while this proportion was much lower in the Czech Republic (63%), followed by England & Wales (75%) and Sweden (76%). In the Czech Republic, the second most common route of administration was smoking by a dry pipe or chillum, with proportions increasing from 11% among chippers to 45% among intensive users. The popularity of this method has been attributed partly to health concerns related to tobacco smoking, since pure cannabis without tobacco is more easily smoked through pipes than joints (person. communication, CZ contact person), and it seems also to be a more cost-efficient way of smoking. Indeed, a subsequent analysis showed that in the Czech Republic 58% of those who smoked cannabis by dry pipes usually took it pure rather than mixed with tobacco, against 15% of those who smoked joints. Moreover, it has been suggested that people who use cannabis for social, relaxation or self-medication reasons have better control over their dose when taking cannabis by pipes compared to joint. With the first method it is easier to interrupt and resume smoking – and thus titrate the dose depending on one's personal need and to avoid getting too stoned. Also cultural factors may play a role, in that in the region of Moravia (the capital Brno) and small villages, pipes are traditionally used instead of joints.

Also in England & Wales and Sweden, chillums or dry pipes were more relatively frequently employed routes of administration, but at much lower levels (13% and 14%, respectively) and with no or less pronounced differences between user groups. Nonetheless, smoking cannabis by joints is assumed to be by far the most common method to consume cannabis in the United Kingdom, and these findings seem to be rather atypical.

The overall proportion of cannabis users reporting water pipes as their main route of administering cannabis ranged from 1% in Bulgaria to 9% in England & Wales, with highest levels in the latter country found among intensive users (17%).

Differences between user groups in the way they usually consumed their cannabis were overall small, with the exception of the large significant differences found in the Czech Republic. In the Netherlands and Italy, differences between user groups were also significant but much smaller. In Italy intensive users tended to exhibit slightly more variation in the types of units, while in the Netherlands variation was more common among chippers. Nonetheless, in both countries, smoking a joint was by far the most likely consumption manner among all users. In England & Wales, chippers tended to more frequently use a joint, while the higher frequency groups seemed to show more variation in types of units.

Table 3.13: Main type of unit of cannabis by user group and country\*

<b>Bulgaria</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>Total</b>	<b>P= .040</b>
Joint	96.4%	88.5%	96.6%	90.9%	94.8%	
Chillum/dry pipe	3.6%	3.8%	0%	9.1%	3.1%	
Water pipe	0%	0%	3.4%	0%	1.0%	
Food	0%	3.8%	0%	0%	.5%	
Beverage	0%	3.8%	0%	0%	.5%	
<b>Czech Republic</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>Total</b>	<b>P=.000</b>
Joint	84.2%	68.2%	59.7%	45.3%	62.9%	
Chillum/dry pipe	10.5%	27.3%	34.5%	44.6%	30.4%	
Water pipe	1.8%	2.3%	4.3%	7.2%	4.2%	
Food	1.8%	0%	0%	0%	.4%	
Beverage	1.8%	2.3%	1.4%	2.9%	2.1%	
<b>Italy</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>Total</b>	<b>P=.000</b>
Joint	97.3%	98.6%	95.4%	87.3%	93.5%	
Chillum/dry pipe	1.6%	.7%	.9%	6.6%	3.0%	
Water pipe	0%	.7%	3.4%	5.7%	3.2%	
Food	1.1%	0%	.3%	.3%	.4%	
Beverage	0%	0%	0%	0%	0%	
<b>Netherlands</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>Total</b>	<b>P=. 000</b>
Joint	88.4%	94.5%	95.8%	94.5%	92.6%	
Chillum/dry pipe	2.4%	2.5%	2.9%	2.9%	2.6%	
Water pipe	4.2%	2.0%	1.3%	2.5%	2.7%	
Food	5.0%	1.0%	0%	0%	2.0%	
Beverage	0%	0%	0%	0%	0%	
<b>Portugal</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>Total</b>	<b>P=.771</b>
Joint	91.7%	94.7%	100.0%	95.2%	95.0%	
Chillum/dry pipe	4.2%	0%	0%	2.4%	2.1%	
Water pipe	2.1%	5.3%	0%	2.4%	2.1%	
Food	2.1%	0%	0%	0%	.7%	
Beverage	0%	0%	0%	0%	0%	
<b>Sweden</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>Total</b>	<b>P=. 306</b>
Joint	79.9%	70.9%	75.8%	80.4%	76.4%	
Chillum/dry pipe	12.7%	16.8%	14.4%	11.3%	14.1%	
Water pipe	4.4%	11.2%	7.6%	6.2%	7.4%	
Food	2.9%	1.1%	2.1%	2.1%	2.1%	
Beverage	0%	0%	0%	0%	0%	
<b>England &amp; Wales</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>Total</b>	<b>P= .012</b>
Joint	87.7%	77.4%	71.8%	62.3%	74.8%	
Chillum/dry pipe	6.8%	17.0%	14.1%	15.9%	13.2%	
Water pipe	1.4%	5.7%	12.7%	17.4%	9.4%	
Food	4.1%	0%	0%	4.3%	2.3%	
Beverage	0%	0%	1.4%	0%	.4%	
<b>All countries</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>Total</b>	<b>P= .000</b>
Joint	88.6%	84.6%	85.5%	80.8%	85.1%	
Chillum/dry pipe	5.5%	9.9%	9.3%	12.4%	9.1%	
Water pipe	2.7%	4.4%	4.4%	5.8%	4.3%	
Food	3.0%	.7%	.5%	.6%	1.3%	
Beverage	.2%	.4%	.3%	.4%	.3%	

\* Categories sum to 100% within user groups.

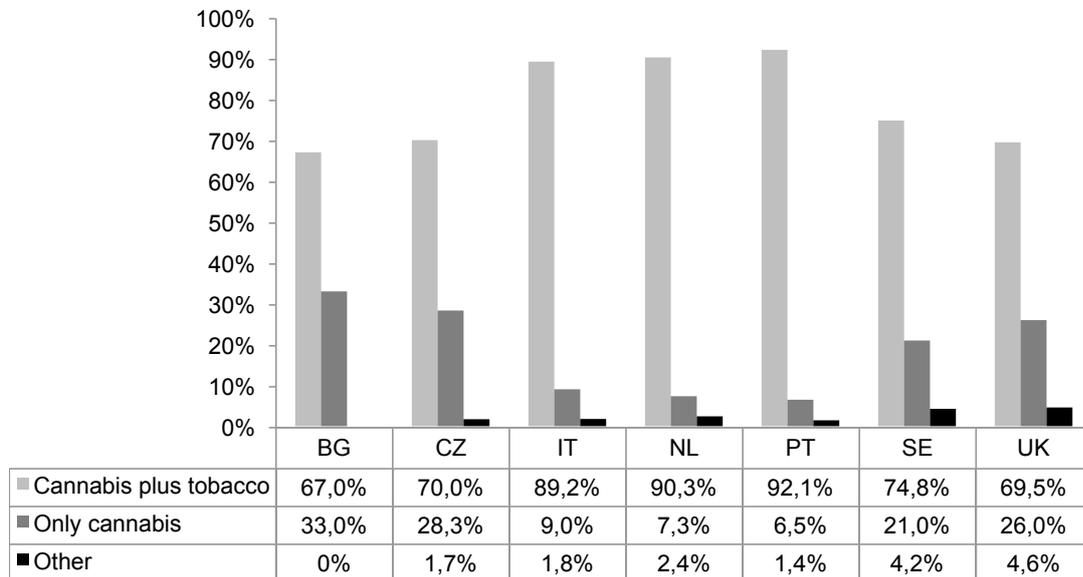
### c. Cannabis pure or mixed

Respondents were asked what they usually put in their joint, chillum, water pipe or other unit. Overall, 82% of the total sample indicated to mix hash or marihuana with tobacco, 15.5% used their cannabis pure, and 2.5% indicated to mix it with other substances. There were no differences between user groups.

The category 'other substances' contained a wide variety of mixtures of substances. Apart from respondents who indicate to mix 'marihuana with hash and tobacco', they reported to mix cannabis, for example, with other herbs (dragon, oregano, cinnamon, herbal tobacco), cacao, min tea, a bit of speed or synthetic drugs.

There were differences between countries, with Bulgaria, England & Wales, the Czech Republic and Sweden reporting the highest proportions (21% to 33%) of users who consume their hash or marihuana 'pure' (figure 3.3). In Italy, Portugal, and the Netherlands cannabis is almost always mixed with tobacco. Mixing with other substances is reported between In Sweden and England & Wales, 4% and 5% of the users, respectively, reported mixing use of other substances, while this did not occur in Bulgaria.

Figure 3.3: Proportion of users consuming cannabis pure or mixed with tobacco or other substances per country



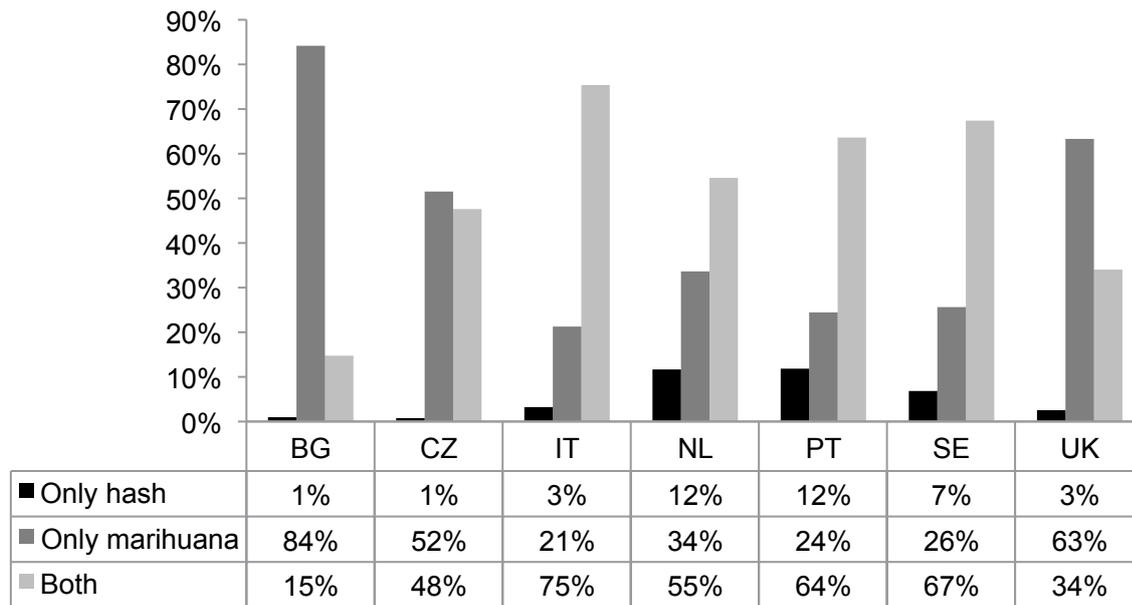
### d. Cannabis type (hash or marihuana) and preference

In Italy, the Netherlands, Portugal and Sweden, the majority of the respondents had used both hash and marihuana in the past 12 months, while in Bulgaria and England & Wales the majority of respondents had only consumed marihuana (figure 3.4). In the Czech Republic about as many respondents had used only hash as both hash and marihuana. A minority of the respondents indicated to have used only hash in the past twelve months, ranging from 1% in Bulgaria and the Czech Republic to 12% in the Netherlands and Portugal.

We have asked respondents also which type of hash or marihuana they usually consumed: locally/domestically produced or imported, and for marihuana also whether it was 'skunk/sinsemilla' or not. However, many respondents indicated that they did not know the answer, or consumed all hash or marihuana subtypes, or the answers were inconsistent with data from other sources. For example, in the Netherlands, locally produced hash ('Nederhash') is a rare product (Niesink and Rigter 2012) but it was nevertheless mentioned by 22% of the respondents who had used hash in the past year, while 21% indicated to use both imported and locally produced hash.

For illustration the data are summarized in annex 1, table A1 and A2, but we will not go into detail on these different subtypes.

**Figure 3.4: Proportion of respondents having used hash, marihuana/skunk or both in the past 12 months**



Having used both types of cannabis at least once in the past 12 months does not mean that both are used with equal intensity. We have defined a 'preference measure' on the basis of the frequency of use of hash and or marihuana in the past 12 months (definition of 'preference': see legend table 3.14). Most respondents showed a preference for one or either cannabis type.

In Bulgaria where hash is hardly used, marihuana is accordingly the most preferred type of cannabis (96%). Also in the Czech Republic marihuana is by far the most preferred (and consumed) type of cannabis – by 96% of the respondents - despite quite some users indicating use of hash in the past year. In the other countries preference for marihuana varied from 38% in Portugal to 83% in England & Wales. The proportion of respondents with a preference for hash varied from 1% in Bulgaria, 2% in the Czech Republic and 9% in England & Wales to 43% in Portugal. The proportion of cannabis users without a preference for hash or marihuana was highest in Sweden and Italy (28% and 26%, respectively).

Preference for hash or marihuana differed significantly between user groups in the Netherlands and Portugal, but in a reversed way. In the Netherlands preference for marihuana increased from 48% among chippers to 82% among intensive users, while in Portugal preference for hash increased with increasing frequency of use (24% among chippers up to 69% among intensive users).

Table 3.14: Preference for hash or marihuana\*

<b>Bulgaria</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>Total</b>	<b>P= .758</b>
Hash	2%	0%	0%	0%	1%	
Marihuana	95%	96%	97%	100%	96%	
No preference	2%	4%	3%	0%	3%	
<b>Czech Republic</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>Total</b>	<b>P= .130</b>
Hash	4%	0%	1%	1%	2%	
<b>Marihuana</b>	<b>93%</b>	<b>97%</b>	<b>97%</b>	<b>99%</b>	<b>96%</b>	
No preference	3%	3%	1%	1%	2%	
<b>Italy</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>Total</b>	<b>P=.606</b>
Hash	17%	21%	23%	22%	21%	
Marihuana	53%	51%	55%	53%	53%	
No preference	29%	28%	23%	25%	26%	
<b>Netherlands</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>Total</b>	<b>P=.000</b>
Hash	22%	25%	18%	9%	19%	
Marihuana	48%	52%	67%	82%	61%	
No preference	29%	23%	15%	9%	20%	
<b>Portugal</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>Total</b>	<b>P=.000</b>
Hash	24%	30%	44%	69%	43%	
<b>Marihuana</b>	<b>39%</b>	<b>55%</b>	<b>50%</b>	<b>21%</b>	<b>38%</b>	
No preference	37%	15%	6%	10%	19%	
<b>Sweden</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>Total</b>	<b>P=.014</b>
Hash	22%	25%	34%	33%	28%	
Marihuana	54%	54%	40%	41%	48%	
No preference	24%	21%	26%	26%	24%	
<b>England &amp; Wales</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>Total</b>	<b>P= .679</b>
Hash	7%	9%	10%	10%	9%	
Marihuana	84%	78%	86%	82%	83%	
No preference	9%	13%	4%	7%	8%	
<b>All countries</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>Total</b>	<b>.000</b>
Hash	17%	19%	20%	18%	18%	
<b>Marihuana</b>	<b>61%</b>	<b>61%</b>	<b>64%</b>	<b>67%</b>	<b>63%</b>	
No preference	22%	19%	16%	15%	18%	

\* No preference refers to the use on a similar number of use days in the past month for hashish and marihuana, plus or minus one frequency category (see footnote 1). Those using only marihuana plus those using marihuana on more use days than hash (with a minimum difference of at least one frequency category) were assigned to the marihuana preference group; and vice versa for hash. Columns sum to 100 within user groups and country.

If we compare these findings with data reported by the EMCDDA on the market share of hash and marihuana, based on seizures, survey data and expert opinions (EMCDDA 2012), we can observe both similarities and differences. In order to make a comparison, it might be most appropriate to look at the figures for regular/intensive users as they are responsible for the largest part of the amount of cannabis consumed in a country (see also chapter.5). Moreover, we have assigned half of those grouped into category 'no preference' to the category 'hash' and half of them to the category 'marihuana'.

Table 3.15 shows that in Bulgaria and the Czech Republic, there is a perfect match between classifications. The predominance of herbal cannabis might be associated with the large geographical distance of these countries from the major trafficking routes for Moroccan hash and/or because traditionally hemp cultivation for industrial and other purposes was already present (EMCDDA 2012). For example, in the Czech Republic, also prior to 2005 when the large domestic production emerged, it was common to have outdoor cannabis distributed almost for free, and indoor cannabis shipped from the Netherlands for retail. For the Netherlands and the UK, there seems to be a match with the predominant type of cannabis, but the market share for marihuana was estimated to be higher in the current web survey. For Portugal, the predominance of hash seems to be confirmed, but data from the web survey also suggest a higher proportion for marihuana. Also, for Sweden and Italy, results

from the web survey suggest a higher estimate of the market for marihuana compared to the EMCDDA sources.

However, data from the EMCDDA is based on seizure data from 2000 up to 2009 and various other sources up to 2009. Possibly, the reported trend since the beginning of the millennium towards an increase in the consumption of domestically produced marihuana has continued in the past three years. For Italy, a recent strong increase in the amount of seized domestic cannabis has been reported in the past years (2008-2011), while the number of seizures (or operations by the police) remained at the same level (Direzione Centrale per i Servizi Antidroga (DCSA) 2012). These data could indeed point at increased herbal cannabis cultivation.

**Table 3.15: Market share of marihuana and hash in the sample countries in /2009 reported by the EMCDDA (2012) and based on the web survey in 2012 (between brackets)\***

	Mainly marihuana		Mainly hash	
	60% - 79%	>80%	55% - 79%	>80%
<b>Bulgaria</b>		X (99%-100%)		
<b>Czech Republic</b>		X (98%-100%)		
<b>Italy</b>			X (35%)	
<b>Netherlands</b>	X (75% - 88%)			
<b>Portugal</b>				X (47% - 74%)
<b>Sweden</b>			X (46%-47%)	
<b>England &amp; Wales</b>		X (86%-88%)		

\* Range between brackets based on values for the regular and intensive users, whereby the type of cannabis (hash or marihuana) selected is similar as indicated by the EMCDDA sources, complemented with half of the proportion of those who had no preference.

Source: Carpentier et al. 2012 and table 3.14.

### **Reasons to use hash or marihuana**

We have also asked respondents in the three sub tracks of the questionnaire what their main consideration is to consume only hash, only marihuana, or to choose between hash and marihuana for those who had used both in the past year. The number of respondents who had used only hash was too low to allow a detailed analysis by country and user group. Overall, 38% of the respondents indicated the type of effects as their main reason to consume only hash, for 26% availability was most important and for 19% taste. A minority indicated that potency (2%) or price (1%) was critical to use only hash, while 14% had other considerations.

Table 3.15 shows the main considerations to use only marihuana by those who had only consumed this cannabis type in the past 12 months. Overall, the type of effects, availability and taste were about equally often reported as the main reasons to choose only marihuana. There were, however, significant differences between countries (P=0001). In Bulgaria, the Czech Republic and to a lesser extent England & Wales, availability was appreciably more important as main reason compared to Italy, the Netherlands and Portugal. In the Netherlands, Portugal and Sweden the type of effects were the most common reasons to use only marihuana. Price and potency were relatively uncommon as main consideration to use marihuana in all countries. The highest proportion of users mentioning 'price' was found in Bulgaria (8%). Note that especially in Sweden and also Portugal 'other' considerations appeared to play a role.

In none of the countries, considerations differed between user groups, except for the Netherlands, where availability was more important among chippers and occasional users (28% and 23%, respectively) compared to regular and daily users (0% and 6%, respectively). It is not exactly clear what should be made by this finding. It suggests that the more infrequent users may be opportunistic users, and consume what is offered or available, rather than pointing at difficulties in obtaining a specific type of cannabis.

**Table 3.15b: Main consideration to use marihuana among respondents who only used marihuana (and not hash) in the past 12 months by country\***

	BG	CZ	IT	NL	PT	SE	E&W	All countries
<b>Total N</b>	147	237	200	346	33	181	162	1306
<b>Availability</b>	46%	43%	14%	18%	12%	24%	36%	28%
<b>Price</b>	8%	3%	2%	3%	0%	1%	3%	3%
<b>Potency</b>	4%	1%	1%	4%	3%	3%	6%	3%
<b>Taste</b>	5%	12%	49%	28%	21%	10%	17%	22%
<b>Type of effects</b>	22%	31%	19%	36%	39%	33%	21%	29%
<b>Other</b>	14%	9%	17%	12%	24%	29%	18%	16%

\* Column percentages sum to 100.

Similarly, among respondents who had consumed both types of cannabis, the type of effects, availability and taste featured as overall the most important considerations to choose between one or either type (table 3.16). However, there were again differences between countries. Availability played a key role in the Czech Republic, Sweden and England & Wales (around 40%) and to a lesser extent in Bulgaria and Italy, while it was hardly mentioned in the Netherlands and Portugal (9% and 7%, respectively). The type of effects is predominant in the Netherlands and Portugal, taste is most important in Italy, and also important in the Netherlands and the Czech Republic. In Bulgaria, price may also be important for some users, but note that the number of respondents in Bulgaria who consumed both hash and marihuana is very low. In other countries price does not seem to be very relevant. While potency is still not for many respondents the main reason to choose for either hash or marihuana, it is more commonly mentioned than among users of only marihuana, especially in Sweden (15%). According to the EMCDDA data on cannabis potency, the mean THC concentration in 2010 in herbal cannabis in Sweden was much lower compared to resin (2% against 9%), which might explain this finding.

Numbers of respondents in Bulgaria, Portugal and England & Wales were too low to conduct analyses per user group. There were significant differences between user groups in Italy ( $P=.006$ ) and the Netherlands ( $P=.001$ ). In Italy, 'other considerations' was more often mentioned among intensive users compared to chippers (19% against 3% for), and availability slightly more among chippers compared to intensive users (37% against 21%). In the Netherlands, availability was reported as main consideration by 17% of the chippers, decreasing to 4% among intensive users, and taste seemed to be more relevant to intensive users when choosing between hash and marihuana (40% against 21% for chippers).

**Table 3.16: Main consideration to choose marihuana or hash among respondents who consumed both types in the past 12 months by country\***

	BG	CZ	IT	NL	PT	SE	E&W	Total
<b>Total N</b>	29	217	728	543	87	470	84	2,158
<b>Availability</b>	28%	43%	26%	9%	7%	41%	40%	27%
<b>Price</b>	21%	5%	8%	4%	5%	5%	5%	6%
<b>Potency</b>	7%	2%	6%	9%	2%	15%	8%	8%
<b>Taste</b>	3%	26%	34%	30%	8%	5%	11%	23%
<b>Type of effects</b>	31%	17%	12%	38%	55%	19%	17%	23%
<b>Other</b>	10%	7%	14%	10%	23%	15%	19%	13%

\* Column percentages sum to 100.

#### **e. Number of units and amount of cannabis per unit**

We will go into more detail into these variables because they form the core data for making annual consumption estimates (chapter 5). We will first describe how these variables were assessed and analyzed.

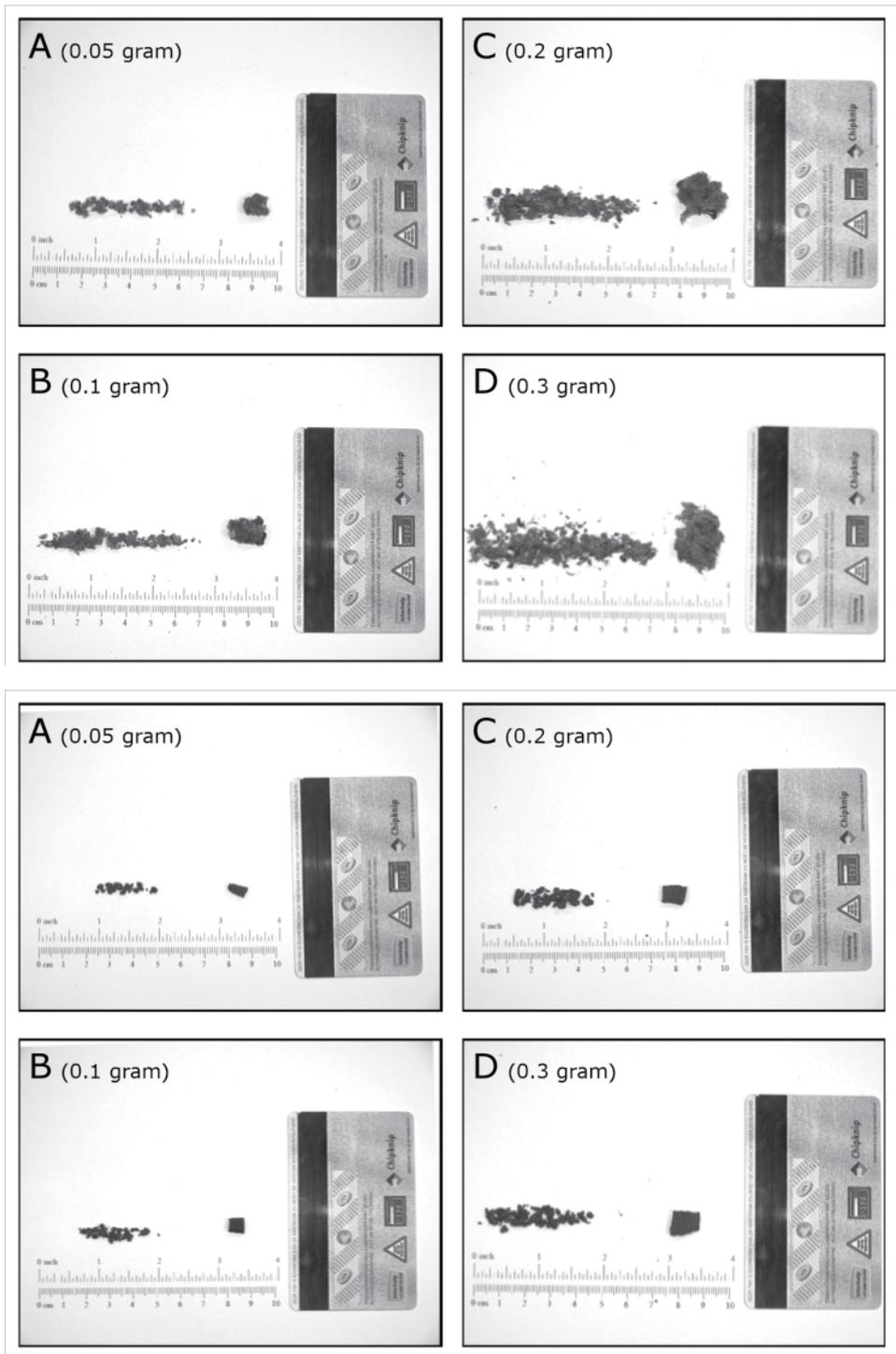
In the web survey respondents were asked to indicate how many units of cannabis they consumed on 'the last consumption day' and on a 'typical cannabis consumption day'. They were also asked to estimate how much cannabis they typically put in their unit. The questions on 'typical consumption' were used in further analyses as it was assumed to better reflect the 'average' situation of users, without situational exceptions. Nonetheless, both measures were strongly correlated (Pearson's  $r=.74$ ,  $P=.0001$  for the units).

With regard to the number of units, respondents could answer in whole numbers ranging from 1 to 50. However, the maximum number of joints smoked on a typical day was truncated at 20, as it was shown that respondents indicating the use of more than 20 units per day were outliers on many other variables, and their answers could be generally considered as unreliable. In the total sample of 15-64 years this was less than 1%.

The amount of cannabis put in a unit appeared to be more difficult to assess. When designing the web survey, it was recognized that cannabis users may have difficulties in estimating the amount of cannabis they usually put in a joint. In a Dutch field study, the dose per joint was estimated in two ways: by asking cannabis users how many joints they usually made out of a gram of cannabis and by showing picture cards with different amounts of hash or marijuana and asking respondents which picture card best reflected the amount they usually put in their joint (Korf et al. 2007). The last method was also applied in the current study (with some adaptations) because the investigators (Korf et al. 2007) assumed that it provided the most accurate estimates. Moreover, in most countries users often do not purchase quantities of cannabis per gram or any other standard amount, which makes the first method unfeasible. In another recent study these different methods have been validated in a naturalistic field experiment ((Van der Pol et al. 2013); see discussion). In the current report the amount of cannabis consumed per month as based on the number of use days multiplied by the number of units per day and the amount per unit will be compared with a method based on prices per gram and amount of money spent on buying cannabis in the past month (see chapter 4.i).

In the web survey subjects could estimate the doses on the basis of four picture cards showing different amounts of hashish and marijuana, both in crumbled and non-crumbled form, together with a ruler (in inches and centimetres) and credit card to facilitate estimation (see figure 3.5). The amounts on the four pictures were: 0.05 gram (A), 0.1 gram (B), 0.2 gram (C) and 0.3 gram (D).

Figure 3.5: Picture cards showing four different amounts of marihuana (upper panel) or hash (lower panel)



There were nine answer categories: less than A; A; between A and B; B; between B and C; C; between C and D; D; more than D. Midpoint values were assigned to intermediate answer categories in the analyses. The first category (less than A) was coded to 0.025 mg. The highest dose (more than D) was coded to 0.4 gram. This deviates from the study by Korf et al. (2007) in which this category has been coded to 0.5 gram. As there was no compelling reason to choose either 0.4 or 0.5 gram, we have decided to use 0.4 gram as conservative estimate, but will show in separate sensitivity analyses how estimates change when applying the 0.5 gram dose.

As the number of units (primarily joints) on a typical day and the amount of cannabis per unit might be different for hashish and marihuana, values for these variables for respondents who consumed both hashish and marihuana were based on weighted averages. Weights were defined on the ratio of the number of use days of hashish and number of use days of marihuana. We will analyze separately whether consumption variables do indeed differ by type of cannabis (hash or marihuana). There are various factors beyond the type of cannabis that may affect figures of the number of cannabis units consumed on a typical use day and the amount of cannabis consumed per unit. These include the type of unit (e.g. joint, dry pipe/chillum or water pipe), and age and gender. If the analysis of variance yielded significant main or interaction effects involving these factors, we have analyzed data at the different levels of these factors. Moreover, we have carried out several sensitivity analyses.

First, there may be variations between countries in the distribution of the number of use days within user groups, which may affect consumption estimates. This factor may be evident especially in the categories of regular and intensive users with fairly broadly defined frequency boundaries. We have therefore also analyzed user groups at a six-level classification, which may reduce variance between countries in the average number of use days per category.

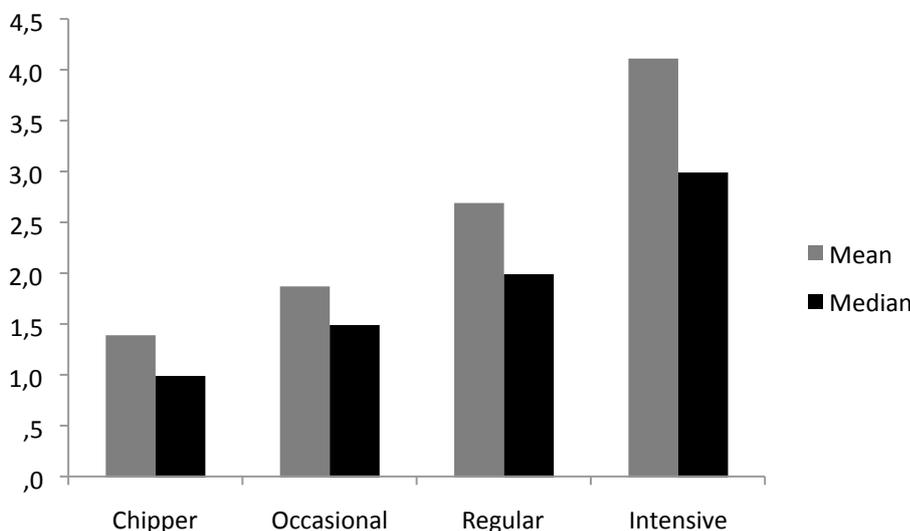
Second, answer categories for reporting the number of cannabis units consumed on a typical day did not allow for decimals. Hence, the lowest number respondents could indicate, was '1'. However, several studies show that part of the cannabis using population, especially the infrequent users, may consume less than one joint per session or day (e.g. Benschop et al. 2011; Nabben et al. 2010; Zeisser et al. 2012). We will examine how estimates change if it is assumed that a certain proportion of the users actually take less than one joint on a typical consumption day.

Finally, the highest dose of cannabis per unit shown on picture card D was 0.3 gram. Answers of people who indicated to use 'more than the amount on picture card D' were coded to 0.4 gram. We will also analyze how average doses change when these answers are coded to 0.5 g instead of 0.4 gram.

**Number of units per typical use day**

Overall, the number of units consumed per typical cannabis use day increased with increasing frequency of use (i.e. user groups) (Pearson's  $r=0.48$ ,  $P=0.0001$ ). Figure 3.6 shows that for all countries combined, the mean number of units progressively increased from 1.4 among chippers to 4.1 among intensive users.

**Figure 3.6: Mean and median number of units consumed on a typical cannabis consumption day per user group**



This pattern was visible in all countries (see table 3.17). Values for chippers ranged from 1.2 units in Bulgaria and the Netherlands to 1.6 units in Sweden and the Czech Republic. Among intensive users the mean number of units varied between 3.6 in Portugal to 5.2 in England & Wales. In most countries the median values were lower than the mean numbers, indicating that the distribution of the number of units was skewed to the right, and that a minority of users were using relatively high numbers of units.

Statistical analyses revealed a significant main effects for user group ( $F = 165.2$ ,  $P = .000$ ) and country ( $F = 6.9$ ,  $P = .000$ ), and a significant interaction between user group and country ( $F = 1.9$ ,  $P = .01$ ). Post-hoc analyses for all countries combined showed significant differences between all pairs of user groups.

Analyses per country showed a significant overall effect of user groups in all countries. Post hoc analyses revealed differences between various pairs of user groups in most countries. However, only in Sweden four homogeneous subsets of users were identified on the basis of pair wise post-hoc analyses. In the Czech Republic, Italy, the Netherlands and England & Wales, three subsets were identified (chippers/occasional users versus regular (/occasional) users versus intensive users). In Bulgaria and Portugal, only two sub sets were found, which might be related to the low number of respondents in some user groups in these countries. In Bulgaria only intensive users were distinguished from the other groups, and in Portugal two subsets with overlapping user groups (chippers/occasional/regular versus occasional/regular/intensive).

**Table 3.17: Number of units consumed on a typical cannabis consumption day per user group and country\***

		Chipper	Occasional	Regular	Intensive
Bulgaria	Mean	1.2	1.5	2.0	4.0
	Median	1.0	1.0	2.0	3.0
	N	64	19	53	18
Czech Republic	Mean	1.6	1.8	2.3	4.0
	Median	1.0	1.0	2.0	3.0
	N	96	79	123	127
Italy	Mean	1.4	1.7	2.7	4.0
	Median	1.0	1.0	2.1	3.0
	N	141	127	289	312
Netherlands	Mean	1.2	1.6	2.4	4.1
	Median	1.0	1.0	2.0	3.0
	N	295	181	207	202
Portugal	Mean	1.4	2.5	2.8	3.6
	Median	1.0	2.0	2.3	2.9
	N	46	17	31	39
Sweden	Mean	1.6	2.4	3.2	4.4
	Median	1.0	2.0	3.0	3.3
	N	175	168	215	90
England & Wales	Mean	1.5	1.7	2.9	5.2
	Median	1.0	1.0	2.0	4.0
	N	54	48	60	62
All countries	Mean	1.4	1.9	2.7	4.1
	Median	1.0	1.5	2.0	3.0
	N	871	639	978	850

\* Differences between user groups were significant in all countries at  $p < .000$ .

Note, however that these 'average findings' do not reflect the degree of variation within user groups. For example, table 3.18 shows that one in ten intensive users consumed no more than one unit a day, and thirty percent uses no more than 2 joints per day. The reverse, i.e. infrequent users who now and then 'binge', is rare.

**Table 3.18: Proportion of cannabis users by number of units usually consumed by user group\***

Number of units	Chipper	Occasional	Regular	Intensive
1	74.4%	47.7%	24.7%	11.3%
. >1-2	16.6%	32.9%	29.3%	18.9%
>2 -3	5.1%	11.9%	22.1%	21.9%
>3-4	2.1%	2.8%	10.2%	12.6%
>4-5	.8%	2.3%	5.7%	12.2%
>5-6	.7%	.9%	3.3%	7.5%
>6-10	.3%	.8%	3.9%	12.2%
>10	0%	.6%	.7%	3.3%

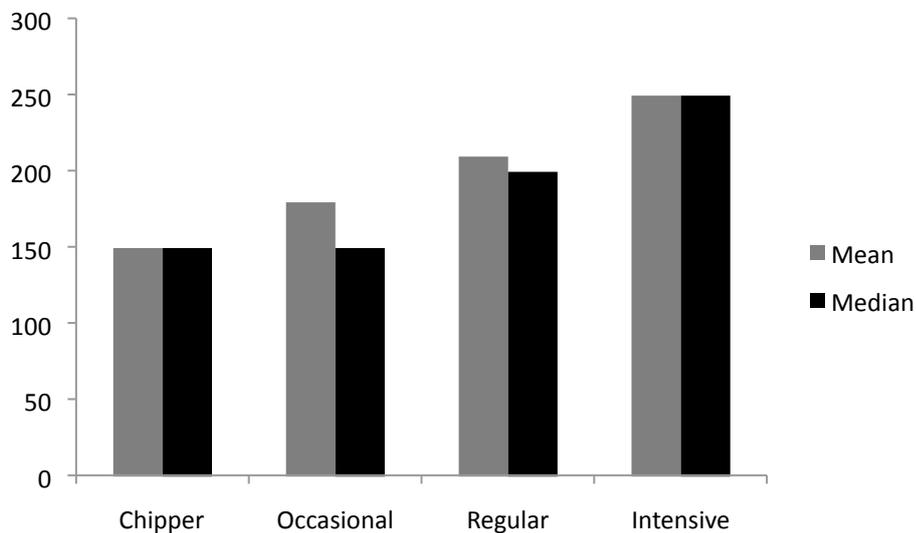
\* Column percentages sum to 100.

Data on the number of joints consumed per day by intensive users found in this web survey are generally in line with findings from (Dutch) studies on frequent cannabis users (e.g. Korf et al. 2007; Van der Pol et al. 2013), but we are not aware of studies in the sample countries that explicitly examined the association between the frequency of use and amount consumed per day. Such an association has been reported by Zeisser et al. (2012) and is also consistent with data from the US household survey in 2001/2002, in which the average number of joints per day increased from 1.2 respondents who used cannabis on less than one day per month (cf. chippers) to 3.9 joints per day for those who used on 20 or more days per month.

### **Amount of cannabis per unit**

Similarly to the pattern of effects reported for the number of units, the amount of cannabis per unit progressively increased from chippers (150 mg) to intensive users (250 mg) (figure 3.7). This pattern was found in most countries, although differences were sometimes small between successive user groups and there were also exceptions. For example, in Bulgaria and the Czech Republic the expected differences were not observed between occasional and regular users (table 3.19). Averages among chippers varied from 113 mg in Portugal to 163 mg in the Netherlands. Among intensive users averages ranged from 181 mg in Portugal to 257 mg in Sweden.

**Figure 3.7: Mean and median amount of cannabis per unit (mg) consumed on a typical cannabis consumption day per user group**



Statistical analyses revealed a significant main effect of user group ( $F = 83.5, P = .000$ ) and country ( $F = 8.4, P = .000$ ), and a significant interaction between user group and country ( $F = 3.1, P = .01$ ). Post-hoc analyses for all countries combined showed significant differences between all pairs of user groups.

The overall effect of user groups was also significant in all individual countries, but post-hoc analyses did not yield significant differences between all pairs of user groups. To some extent this might be related to the relatively small numbers of respondents in some countries.

Table 3.19: Amount of cannabis (gram) consumed per unit per user group and country\*

		Chipper	Occasional	Regular	Intensive
<b>Bulgaria</b>	<b>Mean</b>	<b>.124</b>	<b>.194</b>	<b>.152</b>	<b>.205</b>
	Median	.100	.200	.150	.200
	N	77	22	58	22
<b>Czech Republic</b>	<b>Mean</b>	<b>.154</b>	<b>.196</b>	<b>.193</b>	<b>.245</b>
	Median	.125	.184	.192	.250
	N	110	85	133	133
<b>Italy</b>	<b>Mean</b>	<b>.135</b>	<b>.166</b>	<b>.230</b>	<b>.265</b>
	Median	.100	.150	.243	.277
	N	174	138	323	327
<b>Netherlands</b>	<b>Mean</b>	<b>.163</b>	<b>.175</b>	<b>.202</b>	<b>.246</b>
	Median	.150	.150	.200	.250
	N	362	198	225	228
<b>Portugal</b>	<b>Mean</b>	<b>.113</b>	<b>.169</b>	<b>.177</b>	<b>.181</b>
	Median	.100	.200	.163	.167
	N	48	18	32	39
<b>Sweden</b>	<b>Mean</b>	<b>.160</b>	<b>.178</b>	<b>.220</b>	<b>.275</b>
	Median	.150	.150	.228	.300
	N	200	177	229	97
<b>England &amp; Wales</b>	<b>Mean</b>	<b>.134</b>	<b>.160</b>	<b>.170</b>	<b>.224</b>
	Median	.106	.150	.150	.220
	N	68	50	66	67
<b>All countries</b>	<b>Mean</b>	<b>.150</b>	<b>.176</b>	<b>.208</b>	<b>.250</b>
	Median	.150	.150	.200	.250
	N	1,039	688	1,066	913

\* Differences between user groups were significant in all countries at  $p \leq .001$ .

In spite of these generally consistent findings across countries and user groups, the estimates of the amounts of cannabis consumed per unit depend highly on the validity of the applied method. As mentioned in the introduction of this section, results of a recent 'ecological study' suggest that the photo card method may underestimate the true amount of cannabis put in a joint (Van der Pol et al. 2013). In this Dutch study, a sample of 106 frequent cannabis users drawn from a larger cohort were interviewed in a natural setting, such as their own home or a coffee shop. Using the photo cards, the subjects were asked to estimate the amount of cannabis usually put in a joint. They were asked beforehand to take along a gram of cannabis they usually smoked. After the interview the cannabis sample was weighed using a pocket size scale and the subjects were asked to make a joint in their habitual manner. Thereafter the cannabis sample was weighed again. In addition, the dose was calculated as the inverse of the self-reported average number of joints made out of one gram of cannabis. The results showed that the true average cannabis dose as measured by weighing the amounts was 260 mg. However, the photo card estimate resulted in an average that was half as large (130 mg). The average dose estimated by the number of joints per gram was close to the 'true' average (280 mg). Nonetheless, for both self-reported measures, correlations with the objectively measured amounts were low, which may make them both unsuitable to be applied in studies on *individual* health outcomes of cannabis. However, in (market) studies where *averages* are the main unit of analysis, the joint per gram method seems to be most promising, although only feasible in countries where consumers are accustomed to buy their cannabis in 'grams' or parts of it.

In the current web survey, intensive cannabis users in the Netherlands estimated the average dose per unit at 245 mg (or 247 mg for joints only), which compares well with the average amount objectively measured in the ecological study. However, this result is hard to reconcile with the conclusion that the photo card method underestimated the actual amount of cannabis. The photo cards employed in the ecological study resembled those used in the current web survey but there were also differences: a ruler and a joint were depicted as estimation aids and the amounts were not disclosed on the photos, which were presented in printed versions. In the web survey, a credit card instead of a joint was depicted and the true amounts were reported

on the photos, which may have facilitated the estimation. On the other hand, intensive users in the web survey formed on average a heavier user group compared to the subjects in the field experiment (25 use days against 21 use days and 4.1 joints against 2.7 joints per day). It might be that doses objectively measured in the field study would be higher for more heavy users. If this were true, the web survey would definitely underestimate the amount per joint. However, post-hoc analyses on a subsample of subjects (n=78) using on more than 4 days a week, with an average of 25 use days in the past month and average of 4.2 joints per use day, revealed the same results (true dose: 251 mg; photo card: 125 mg; joint/gram method: 280 mg). Therefore, it is not likely that differences in the intensity of cannabis consumption between users in the field study and web survey explain differences between study outcomes.

Nonetheless, although our web survey yielded an average amount that was close to the amount measured objectively in the field study, the possibility of an underestimation cannot be fully excluded. So far we have no clue to indicate the degree of underestimation.

In conclusion, these data suggest that the more frequently (in terms of use days) cannabis is used, the more units are consumed per day and the more cannabis is put in a unit, although there remain questions on the 'true amounts'. All these factors may contribute to enhance exposure especially among high frequency users.

We will now look whether these consumption variables differ between type of units, between male and females and between younger and older users. Note, however, that in some countries the numbers of respondents per subgroup is fairly low and the results should be interpreted with caution.

### Type of unit

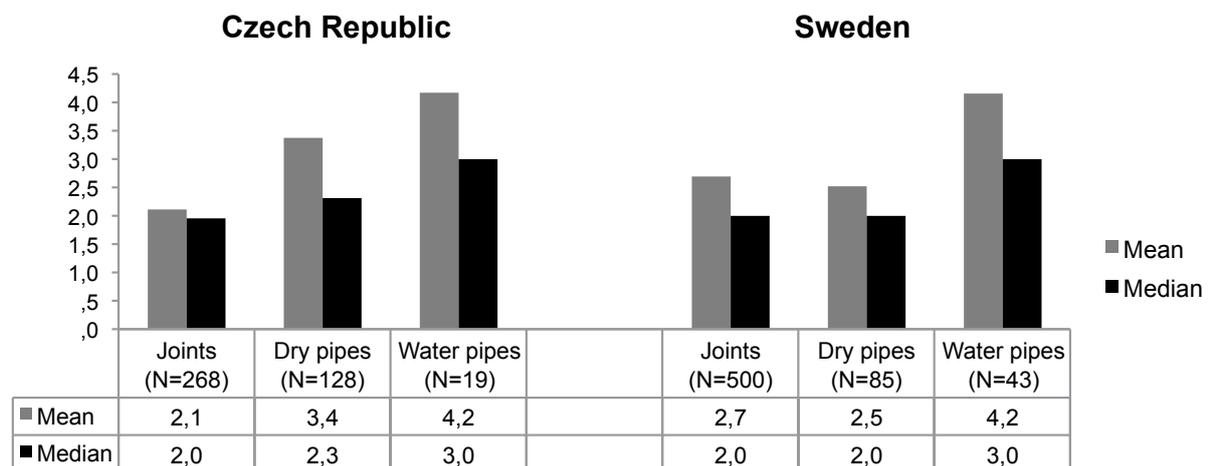
The three most common types of units (joints, dry pipes and water pipes) were included in the statistical analyses, as numbers of respondents who mainly consumed cannabis in food or beverages were too low.

With regard to the number of units smoked per day, the analyses revealed a marginally significant main effect of type of unit ( $F=3.4$ ,  $P=.041$ ) and a significant three-way interaction between type of unit, member state and user group ( $F=1.9$ ,  $P=.004$ ). Analyses per country, revealed a significant main effect of unit type in the Czech Republic ( $F=7.4$ ,  $P=.001$ ) and Sweden ( $F=12.3$ ,  $P=.000$ ) and a significant unit type by user group interaction in the Netherlands ( $F=6.4$ ,  $P=.000$ ).

Post hoc analyses showed that in the Czech Republic both the number of dry pipes and water pipes consumed per typical use day were overall significantly higher compared to the number of joints (see figure 3.8). In Sweden, the number of water pipes, but not dry pipes, was higher compared to the number of joints smoked per day.

In the Netherlands, the numbers of respondents consuming cannabis by dry or water pipe per user type are very low, but the data suggest that chippers who smoke cannabis mainly by dry pipe (n=12) consume on average 0.7 units more per typical day compared to those who smoke joints (1.9 and 1.2 on average). Moreover, daily users who smoked cannabis predominantly in water pipes seemed to smoke more units, but their number was too low to draw conclusions (n=4).

Figure 3.8: Average number of units consumed on a typical cannabis consumption day per type of unit in the Czech Republic and Sweden



Given these differences between countries, it is important to see whether the pattern seen for the number of units per user group changes when the analyses are restricted to the most common type of unit (joints). Table 3.20 shows the results for joints only. The underlined figures show changes from averages for the total number of units as summarized in table 3.17. Overall averages tend to be somewhat lower, most notably in the Czech Republic. However, because other units (than joints) are used by a minority in the other countries, the impact on the overall averages is relatively small. Statistical analyses show the same pattern of effects pointing at a progressively increasing number of joints with increasing frequency of use, as expressed by the different user groups.

**Table 3.20: Mean number of joints consumed on a typical day**

		Only joints			
		Chipper	Occasional	Regular	Intensive
Bulgaria	Mean	1.2	1.5	2.0	4.0
	N	63	18	53	17
Czech Republic	Mean	1.6	<u>1.5</u>	<u>2.0</u>	<u>3.6</u>
	N	82	54	73	59
Italy	Mean	1.4	1.7	2.7	3.8
	N	136	124	275	270
Netherlands	Mean	1.2	1.6	<u>2.5</u>	<u>3.9</u>
	N	262	171	200	192
Portugal	Mean	1.5	2.5	2.8	<u>3.7</u>
	N	41	17	31	37
Sweden	Mean	1.5	<u>2.3</u>	<u>3.3</u>	<u>4.3</u>
	N	141	118	169	73
England & Wales	Mean	1.5	<u>1.6</u>	<u>2.5</u>	<u>5.3</u>
	N	48	37	47	39
All countries	Mean	1.4	<u>1.8</u>	2.7	<u>4.0</u>
	N	773	539	848	687
P=.		.000	.000	.000	.000

Differences between user groups were significant in all countries at  $p < .000$ . Underlined figures refer to differences between the number of joints and the total number units.

The amount of cannabis usually put in a unit was only marginally significant between types of units ( $F=2.9$ ,  $P=.052$ ) and there were no significant interactions with countries or user types. On average 196 mg cannabis was put in a joint, 190 mg in a dry pipe and 198 mg in a water pipe.

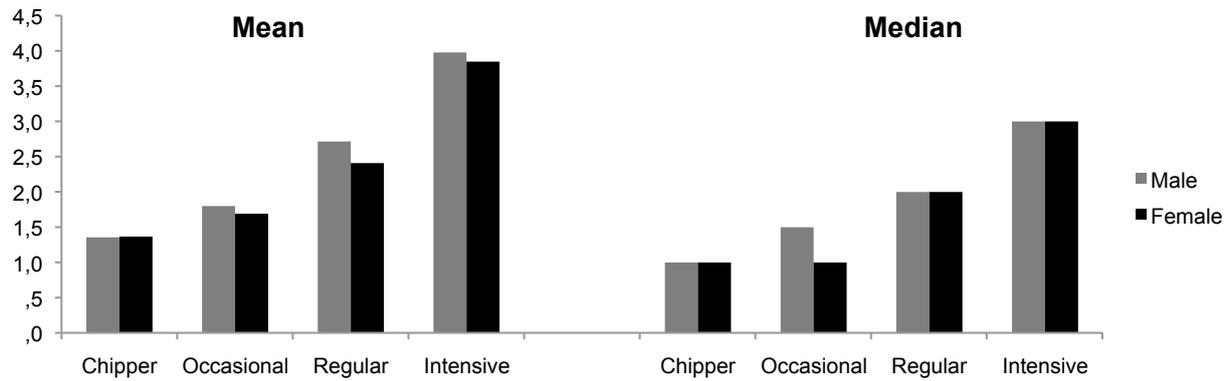
### Gender and age

Because of the above mentioned reported differences, we will refine subsequent analyses into age and gender differences to joints only. We will analyze these factors separately. It will be shown that there are minor differences between males and females and between younger and older users with regard to the number of joints smoked on a typical cannabis day. However, males and younger users tend to consume more cannabis per joint compared to females and older users. We will illustrate this in the next section.

Figure 3.9 shows that there were overall minor differences between male and female cannabis users within user groups in the mean and median number of joints they typically smoke per day. Note, however, that the number of female users was very low in several countries, especially among daily users (less than 8 in Bulgaria, Czech Republic, Portugal, England & Wales and Sweden).

There was no main effect of gender, and only a marginal significant interaction between gender and country ( $F=6.9$ ,  $P=.04$ ) and a marginally three way interaction between gender, country and user group ( $F=1.7$ ,  $P=.04$ ).

**Figure 3.9: Mean and median number of joints smoked on a typical cannabis consumption day by gender and user group for all countries combined**



However, males consumed significantly more cannabis per joint compared to females (212 mg against 155 mg;  $F=41.6$ ,  $P=.0001$ ). Gender differences were comparable across user groups and countries (no interactions). However, analyses at country level showed that gender differences were not significant in Portugal, and only marginally significant in Bulgaria and England & Wales, which might be related to the smaller samples sizes in these countries.

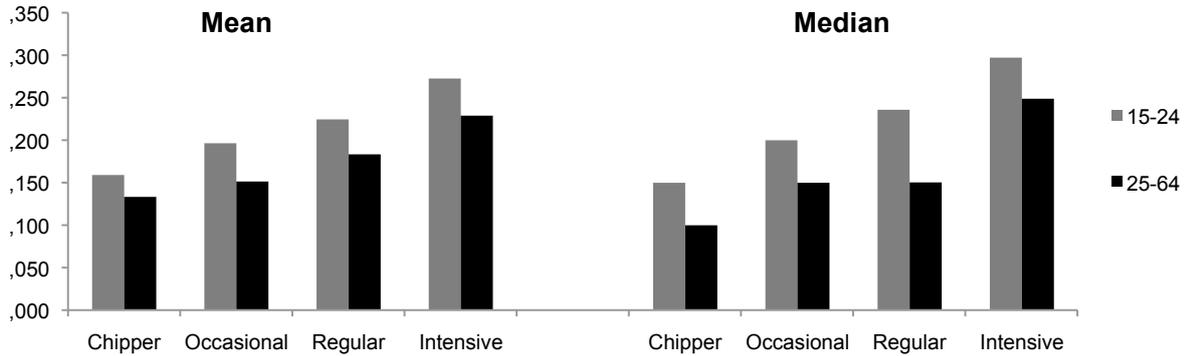
**Table 3.21: Mean amount of cannabis (gram) by gender, user group and country**

Country	Gender	P(gender)	Chipper	Occasional	Regular	Intensive	Total
Bulgaria	Males	.054	.138	.207	.170	.214	.169
	Females		.114	.174	.115	.188	.128
Czech Republic	Males	.001	.172	.231	.207	.253	.218
	Females		.138	.159	.165	.222	.155
Italy	Males	.000	.161	.177	.237	.263	.227
	Females		.093	.133	.202	.229	.153
Netherland	Males	.000	.171	.192	.210	.261	.207
	Females		.150	.151	.188	.210	.170
Portugal	Males	.430	.111	.190	.204	.175	.166
	Females		.110	.145	.147	.223	.138
Sweden	Males	.003	.179	.188	.226	.295	.215
	Females		.123	.199	.169	.221	.155
England & Wales	Males	.042	.154	.180	.186	.216	.187
	Females		.124	.144	.119	.212	.134
All countries	Males	.000	.166	.190	.219	.257	.212
	Females		.127	.152	.173	.216	.155

### Age group

There were no differences between cannabis users of 15-24 years (mean 21 years) and those aged 25-64 years (mean 32 years) in the number of joints usually smoked per day. This was 2.4 joints overall for both age groups. There were also no differences between countries and user groups.

**Figure 3.10: Mean and median amount of cannabis smoked per joint by age group (15-24 and 25-64 years) and user group for all countries combined**



However, younger users consumed significantly more cannabis per joint (overall 209 mg) compared to older users (178 mg) ( $F=45.9$ ,  $P=.0000$ ; see figure 3.10). There was no significant interaction between age group and country or age group and user group. Nonetheless, analyses per country failed to find significant age group differences in Bulgaria, and only a marginally significant difference for the Czech Republic (table 3.22).

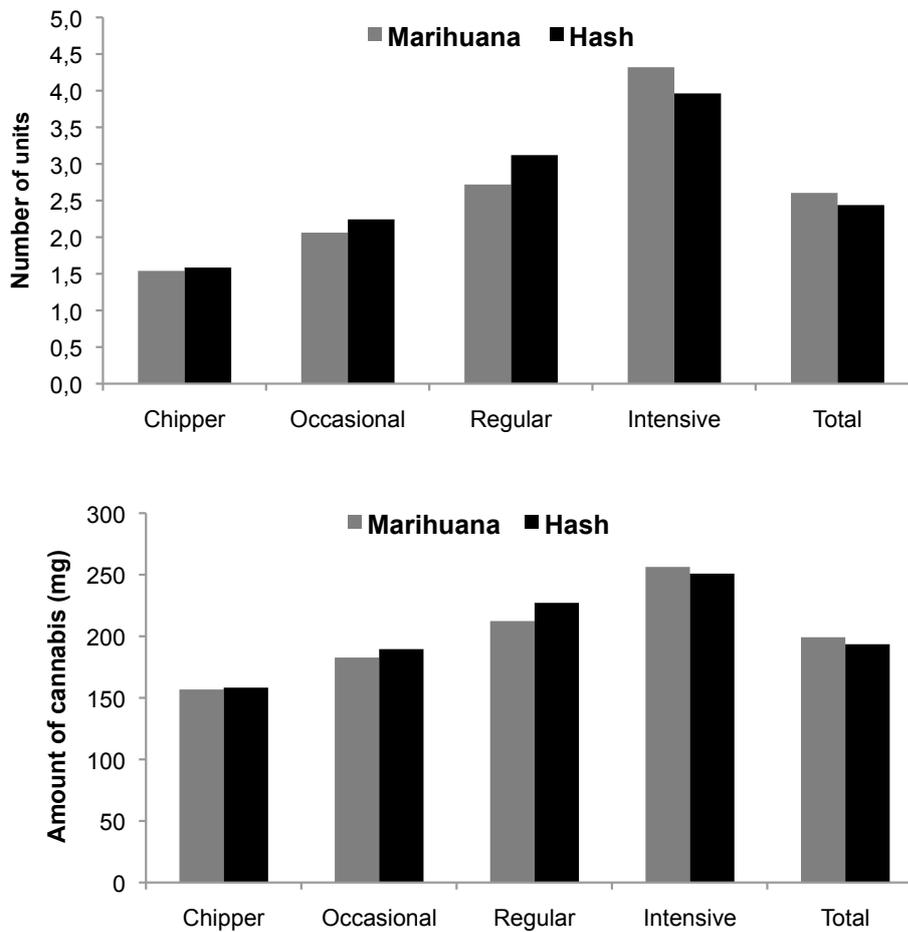
**Table 3.22: Mean amount of cannabis (gram) put in a joint by age group, user group and country**

Country	Age group	p = (age group)	Chipper	Occasional	Regular	Intensive	Total
Bulgaria	15-24	.815	.145	.187	.149	.202	.158
	25-64		.088	.195	.162	.220	.141
Czech Republic	15-24	.032	.152	.217	.214	.249	.201
	25-64		.149	.167	.161	.248	.178
Italy	15-24	.000	.138	.182	.249	.285	.226
	25-64		.123	.139	.205	.235	.193
Netherlands	15-24	.000	.170	.194	.218	.273	.206
	25-64		.148	.148	.176	.222	.177
Portugal	15-24	.003	.121	.196	.199	.223	.176
	25-64		.102	.105	.156	.167	.139
Sweden	15-24	.000	.179	.209	.236	.308	.222
	25-64		.147	.162	.191	.270	.185
England & Wales	15-24	.012	.149	.195	.189	.226	.184
	25-64		.125	.134	.139	.211	.154
All countries	15-24	.000	.159	.197	.225	.273	.209
	25-64		.133	.151	.183	.229	.178

**Type of cannabis (hash or marihuana)**

When users were classified on the basis of their frequency of use of hash or marihuana, there were little differences in the pattern across user groups. Overall, the number of units consumed per day or the amount consumed per unit were virtually the same for hash and marihuana (see figure 3.11).

**Figure 3.11: Average number of units (upper panel) and average amount (lower panel) of hash and marihuana separately by user group**



### **Sensitivity analyses**

#### *Differentiating six user groups*

In order to reduce variance between countries with regard to the number of use days within user categories, the broad categories of regular and intensive users was further split up, yielding in a classification of users at six different levels. This resulted in low numbers (<25) of respondents in one or more user groups in Bulgaria, the Czech Republic, Portugal and England & Wales. Nonetheless, a quite consistent pattern is seen in that the number of number of joints consumed on a typical day increased progressively from 1.4 among chippers to 4.8 among daily users.

The main effects of user group ( $F=163.1$ ,  $P=.0001$ ) and countries ( $F=7.3$ ,  $P=.0001$ ) and user group by country interaction ( $F=2.7$ ,  $P=.0001$ ) were significant. Differences between all successive groups of users in post-hoc analyses were significant in the total sample. Also in most individual countries the pattern shown in figure 3.12 is seen (annex 1, table A3), but not all differences between user groups were significant. Post-hoc analyses identified six homogeneous subgroups of users in the total sample, four in the Netherlands, Sweden and Italy, three in the Czech Republic, Bulgaria, and England & Wales and two in Portugal. The lower number of distinct sub groups might also be related to the smaller sample sizes.

Figure 3.12: Mean and median number of joints by user group (six levels)

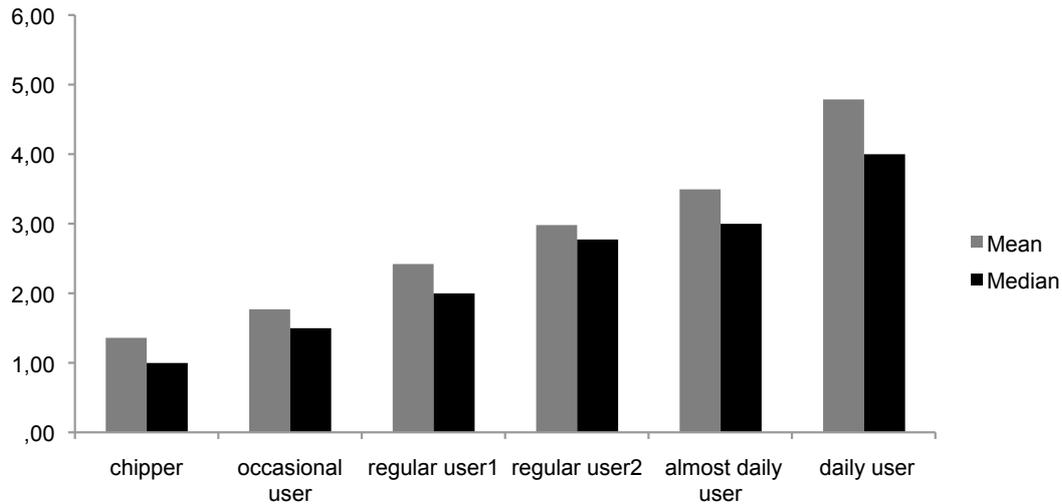
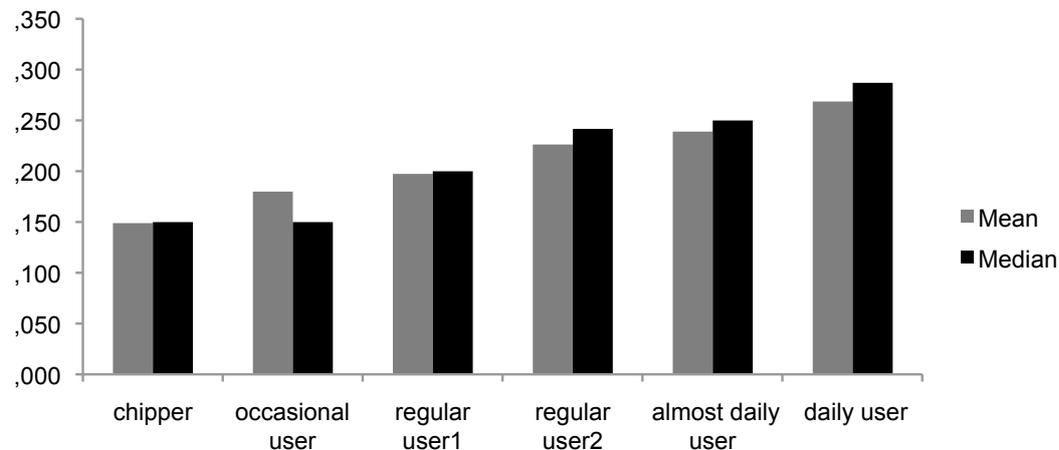


Figure 3.13 shows a similar pattern for the amount of cannabis per joint, although differences between some user groups were fairly small. For all countries combined the average amount of cannabis varied from 149 mg among chippers to 269 among daily users. The main effects of user group ( $F=50.9$ ,  $P=.0001$ ) and countries ( $F=10.3$ ,  $P=.0001$ ) and user group by country interaction ( $F=2.7$ ,  $P=.0001$ ) were significant. Post-hoc analyses showed that chippers and daily users differed significantly from all other groups. Occasional users differed from all subgroups except for modest regular users and frequent regular users differed from all groups but not almost daily users. Thus, four homogeneous sub sets of users could be identified: 1) chippers, 2) occasional and modest regular users, 3) frequent regular users and almost daily users and 4) daily users.

At country level, an increasing amount of cannabis per joint with increasing frequency is seen in most countries, but not in all (annex 1, table A4). In Bulgaria, post-hoc analyses revealed only two subgroups: daily users versus all the others. In the Netherlands, Portugal and England & Wales also two sub groups were found (bit all different between countries), while in Sweden and Italy four homogeneous sub groups of users could be identified.

Note again, that the relatively small sample sizes in some countries may have played a role in the outcomes.

Figure 3.13: Mean and median amount (gram) of cannabis per joint by user group (six levels)



*Adjusting the minimum number of joints*

Various studies suggest that a significant part of the cannabis users, especially the more infrequent users, take less than one joint per day. For example, Zeisser et al (2012) showed that 32% of those who had consumed cannabis on one to four days in the past month used 0.1-0.8 joints. Of those who used cannabis on 21 days or more this was only 3%. Of the total sample, including a wide variety of use frequencies, 14% consumed less than one joint per use day. Also in three field studies among

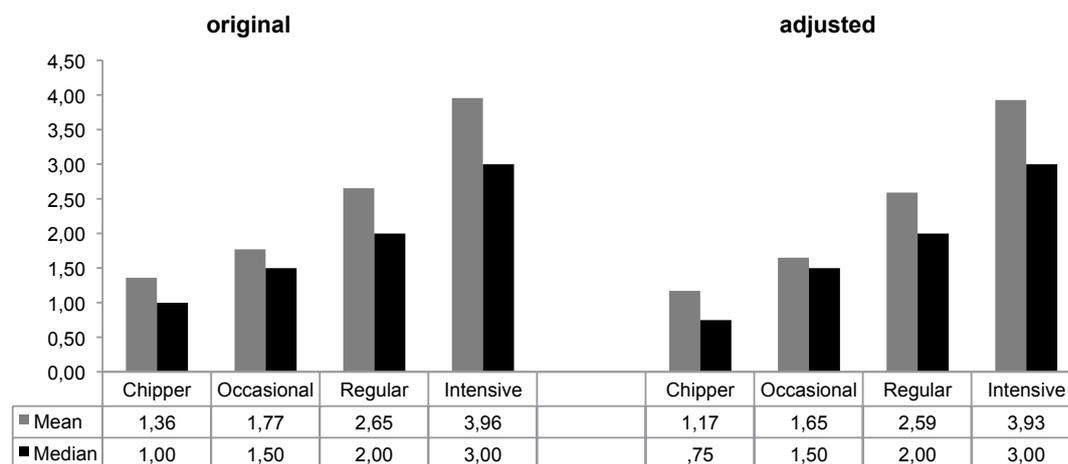
different samples of cannabis users in Amsterdam (recruited in pubs, clubs or coffee shops), the proportion of last year users who consumed less than one joint varied from 2% to 20%, depending on whether the majority of users were occasional/recreational users or more frequent users (Benschop et al. 2009; Benschop et al. 2011; Nabben et al. 2010).

In the current study the lowest number of units consumed on a typical day respondents could answer was '1' and no decimal values were allowed. Hence, this could result in an overestimation of the amount of cannabis consumed. We have therefore recalculated the number of joints smoked on a typical day, assuming that about 50% of the users who indicated to consume one joint on a typical use day actually consumed half a joint. It is clear from figure 4 that the impact of this change is most obvious for the chippers. The mean number of joints is reduced with 0.19 per typical use day and the median drops with 0.25 joint.

This seems to be consistent with the fact that the proportion of users having shared their unit on the last occasion was generally highest among chippers users, and this also applies to the proportion of users indicating that they get or share cannabis from other people instead of buying themselves (see chapter 3.5.b).

Nonetheless, if we would assume that 20% of all respondents who indicated to use 1 joint on a typical day would actually use 0.5 joint, then this would have marginally affected the estimates of the average number of joints per user group.

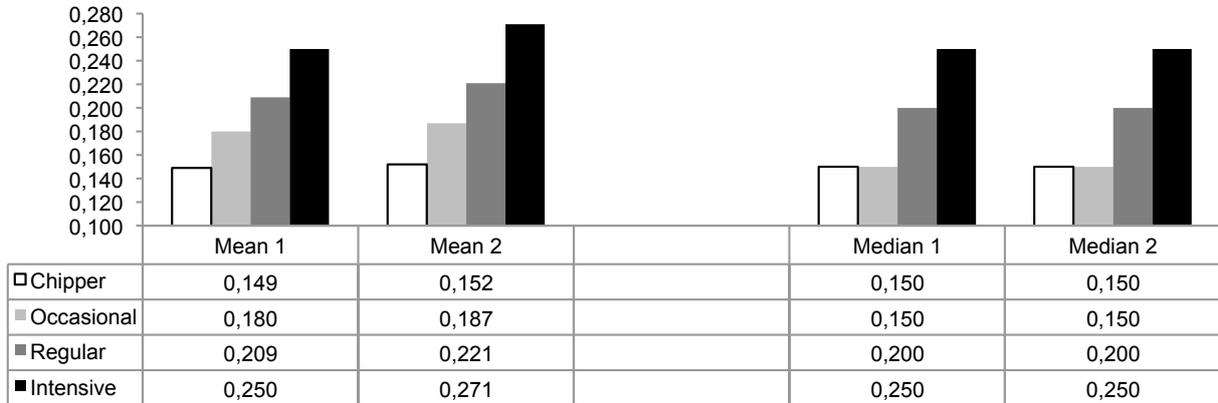
**Figure 3.14:** Mean and median number of joints smoked on a typical use day with one joint as the minimum number (original situation, left panel) and after recoding 50% of this category into 0.5 joint (right panel)



*Increasing the maximum amount of cannabis per unit*

As described earlier in this section, subjects could estimate the doses of cannabis they consumed per unit on the basis of four picture cards showing different amounts of hashish and marihuana. One answer category involved 'more than shown on picture D' (which showed the highest dose =0.3 gram), which was mentioned by some 10% of the total sample. These answers were coded as 0.4 gram. Imagine, however, that the estimated dose would be more in the range of 0.5 gram instead of 0.4 gram. Figure 3.15 shows the mean and median values per user group if the highest dose was set at 0.4 gram or 0.5 gram (see annex 1, table A5). As expected this affected mostly the mean amounts per joint for the regular and intensive users. Among regulars users the mean amount consumed increased from 0.209 gram to 0.221 gram and among intensive users from 0.250 gram to 0.271 gram. However, the median values remained unchanged both in the total sample and in the individual countries.

**Figure 3.15: Mean and median amount of cannabis consumed per joint by user group if the highest dose is set at 0.4 gram (mean 1 and median 1) or 0.5 gram (mean 2 and median 2)**



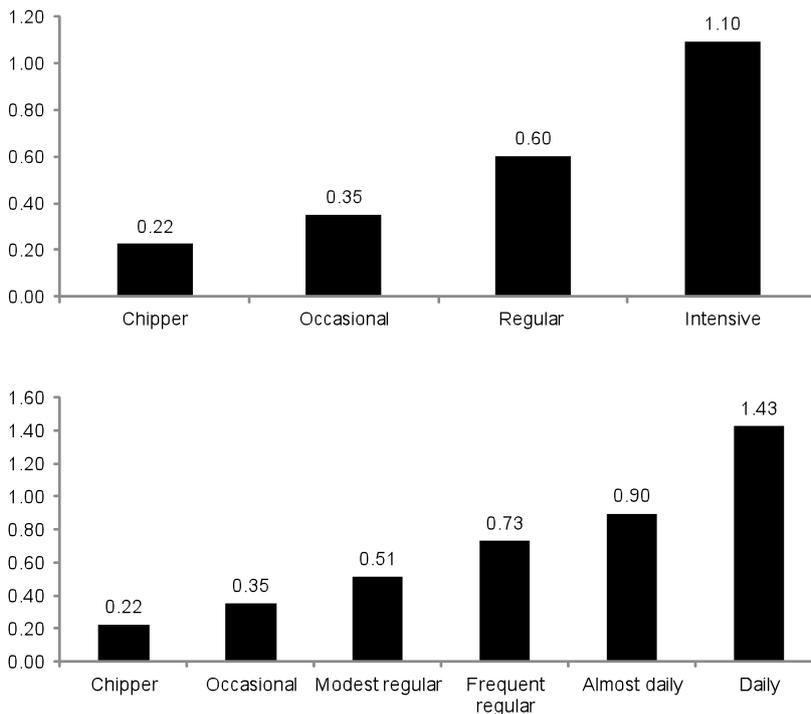
**f. Estimated daily dose and annual consumption**

Now we know how many units cannabis users consume per typical use day, how much they consume per unit and on how many days in the past year, we may calculate the total annual amount of cannabis consumed by each of the user groups. We will first start with estimating the dose consumed on a typical cannabis use day, as this is a variable that has been referred to in previous research and is commonly based on assumptions or extrapolations from local research.

**Daily dose**

Figure 3.16 shows the mean amount of cannabis consumed on a typical use day for the entire sample and including all types of units. Using a four level classification of users, mean amounts increase from 0.22 gram for chippers to 1.10 gram for intensive users ( $F=294.7, p<.0001$ ). All differences between pairs of user groups were significant in post-hoc tests. If we split up users into six different frequency categories, a similar progressive increase in daily dose is seen, with the highest average amount found for daily users (1.43 gram) ( $F=219.6, p<.0001$ ).

**Figure 3.16: Amount (gram) of cannabis consumed on a typical use day by 4-level (upper panel) or 6-level user group (lower panel)**



The daily doses among chippers varied from .18 gram in Bulgaria and .19 gram in Portugal to .26 gram in Sweden and .28 gram in the Czech Republic (see annex 1, table A8). Among intensive users the mean daily doses varied from .64 gram in Portugal and .87 gram in Bulgaria to 1.28 gram in Sweden and 1.31 gram in England & Wales.

Daily doses differed according to the type of unit consumed in the Netherlands ( $F=3.0$ ,  $P=.007$  for the interaction between type of unit and user group) and Sweden ( $F=9.2$ ,  $P=.000$  for type of unit) (restricting the analyses to joints, dry pipes and water pipes). In the Netherlands, analyses per user group suggested a higher daily dose for chippers who consumed cannabis by dry pipe/chillum compared to those who smoked joints (.43 gram against .20 gram). Differences between unit types did not reach significance for the other user groups. Note, however, that the numbers of respondents using cannabis through other types of units than joints is very low. In Sweden respondents who used cannabis in water pipes consumed more per day compare to those who smoked joints (1.2 gram against .69 gram), which is probably due to the higher number of joints rather than a greater amount of cannabis per unit.

The average amounts for the entire sample are very close to those reported in the Finnish study by Hakkarainen et al. (2008), who assumed a daily cannabis consumption of 0.2 gram for experimenters (1-4 use days per year), 0.4 gram for occasional users (5-51 use days per year), 0.5 gram for weekly users (52-181 use days per year) and 1 gram for daily users (182-365 use days per year). However, doses are lower than those reported in the former drugs market study, although a direct comparison is hampered by differences in classifications. Kilmer & Pacula (2009) assumed a dose per use day of 1 gram (range 0.57 – 1.55 gram) for last month users, and a dose of 0.5 gram (range 0.29 – 0.77 gram) for past year users who did not use in the past month. While the dose range for last month users would capture the regular and intensive users, the current study has shown that it is too high for the other user groups (Kilmer and Pacula 2009). Taking the high proportion of last month users who belong to the groups of chippers and occasional users into consideration (see table 4.5), it is likely that these amounts result in an overestimation if all last month users are considered to be regular and intensive users.

On the other hand, if it could be proven that the photo card method underestimates the amounts of cannabis put in joints, the degree of overestimation would be much smaller (see chapter 3.4.e).

### ***Annual consumption per user group***

Next we will estimate the annual consumption per user group by multiplying for each respondent the number of use days with the number of units multiplied and the amount consumed. Thereafter, this variable will be used to calculate other statistics (mean, median, 5% trimmed mean, see later) at group level. Note that this is a different (and more specific) approach than multiplying at aggregated level the average amount consumed with the average number of use days. The latter usually results in a higher estimate when amount and use days are positively correlated

We will make these calculations for the total sample at the 4-level as well as the 6-level user group classification. We will then look whether there is a difference if all types of units are considered or if we select those who only consume joints. Moreover, we will analyze age and gender differences. Finally a model will be applied, in which adjustments have been made for differences between countries with regard to the proportions males and females, age distribution and distribution of use days within each user group. Note that these estimates do not yet take into account the possible impact of sharing cannabis with others (see next chapters).

Figure 3.17 shows that for all countries combined, the average amount increased from about 1 gram for chippers to 363 gram for intensive users. When users were classified into 6 groups it becomes clear that the groups of regular and intensive users are quite heterogeneous. Daily users even consume on average almost twice (or at least twice, when looking at the medians) compared to almost daily users (figure 3.18).

The much higher values for the mean compared to the median values suggest that the distribution of the amount of cannabis consumed is highly skewed to the right. This means that few respondents use high amounts and may have a fairly great impact on the group average. For example, if we look at the intensive users, there were 16 users who consumed more than 1,424 gram cannabis in the past year, which may equal the use of more than 10 joints with the highest cannabis dose (0.4 gram), every day of the year. If we exclude these bulk users, the average for the intensive user group decreased with 29 gram (from 363 to 334 gram). The median value was, as expected, less affected and dropped with 4 gram (from 262 to 258 gram). For making annual consumption estimates per country, it might be more appropriate to use the 5% trimmed mean, which is based on the 2.5% to 97.5% range and therefore excludes outliers. These trimmed means have been included in table 3.23. Using these 5% trimmed means, the amount of cannabis consumed annually by intensive users ranged from 184 gram in Portugal to 374 gram in England & Wales.

Figure 3.17: Amount (gram) of cannabis annually consumed by 4-level user group user group for all units together

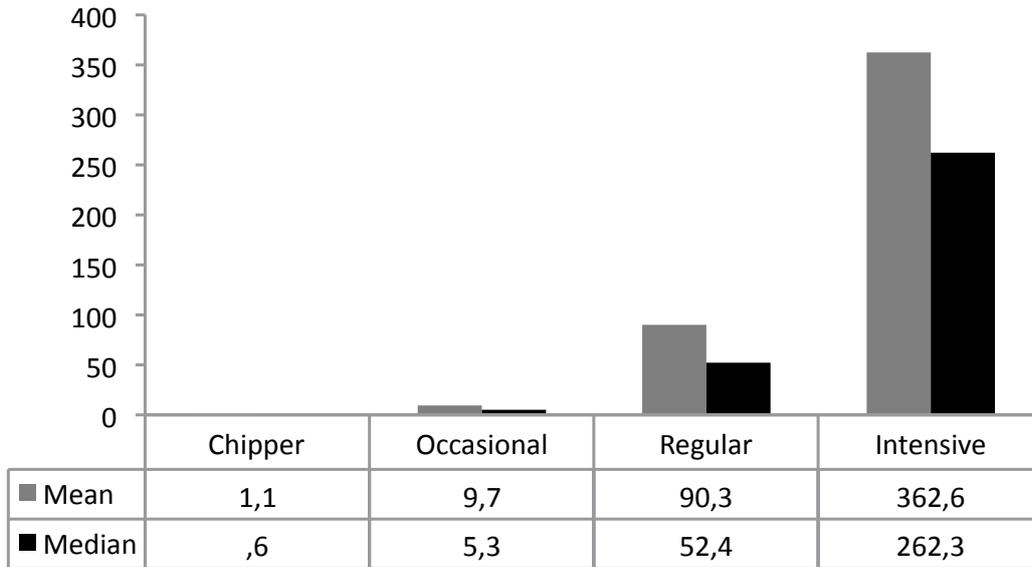
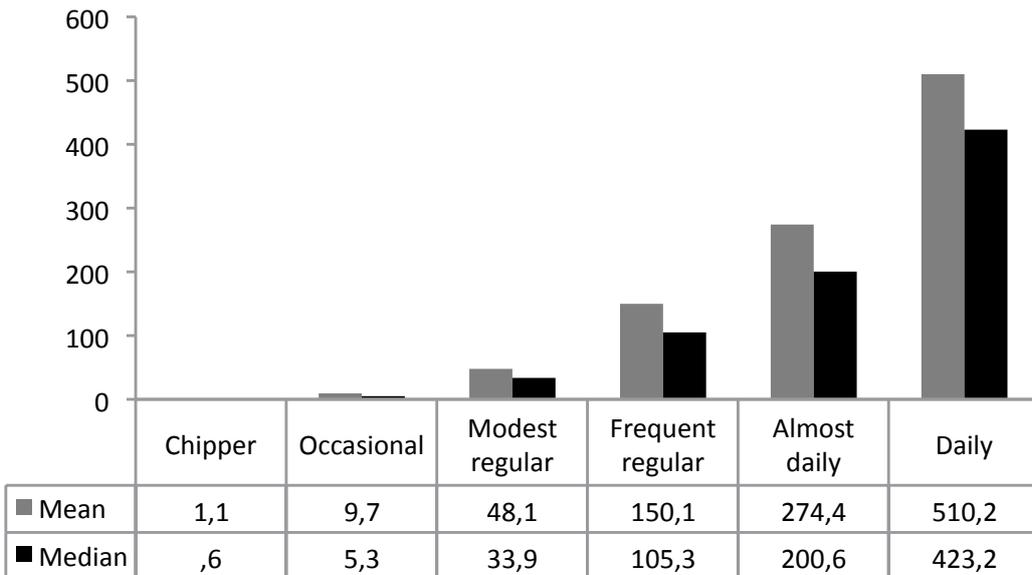


Figure 3.18: Amount (gram) of cannabis annually consumed by 6-level user group user group for all units together



**Table 3.23: Estimated annual consumption of cannabis (gram) by user group and country for all units together (means, 5% trimmed means<sup>1</sup> and medians)**

		Chipper	Occasional	Regular	Intensive
<b>Bulgaria</b>	Mean	0.7	5.8	46.3	285.4
	<b>5% Trimmed mean</b>	<b>0.7</b>	<b>5.4</b>	<b>39.8</b>	<b>282.6</b>
	Median	0.5	4.7	28.2	231.9
<b>Czech Republic</b>	Mean	1.3	10.4	71.6	334.2
	<b>5% Trimmed mean</b>	<b>1.1</b>	<b>9.4</b>	<b>54.3</b>	<b>303.8</b>
	Median	0.8	6.6	35.8	248.0
<b>Italy</b>	Mean	1.1	7.8	106.9	372.3
	<b>5% Trimmed mean</b>	<b>0.8</b>	<b>6.7</b>	<b>89.4</b>	<b>339.9</b>
	Median	0.5	4.7	65.9	275.1
<b>Netherlands</b>	Mean	1.0	7.7	74.9	357.0
	<b>5% Trimmed mean</b>	<b>0.8</b>	<b>6.5</b>	<b>63.3</b>	<b>310.5</b>
	Median	0.6	4.7	45.1	245.6
<b>Portugal</b>	Mean	1.0	10.9	94.5	201.6
	<b>5% Trimmed mean</b>	<b>0.8</b>	<b>10.3</b>	<b>79.5</b>	<b>183.9</b>
	Median	0.5	9.3	50.7	138.5
<b>Sweden</b>	Mean	1.3	13.6	109.8	412.4
	<b>5% Trimmed mean</b>	<b>1.0</b>	<b>9.9</b>	<b>90.7</b>	<b>362.8</b>
	Median	0.7	7.0	65.7	303.1
<b>England &amp; Wales</b>	Mean	1.1	8.4	67.0	441.8
	<b>5% Trimmed mean</b>	<b>0.8</b>	<b>6.8</b>	<b>55.6</b>	<b>373.8</b>
	Median	0.5	5.0	34.3	285.2
<b>All countries</b>	Mean	1.1	9.7	90.3	362.6
	<b>5% Trimmed mean</b>	<b>0.9</b>	<b>7.7</b>	<b>74.0</b>	<b>321.3</b>
	Median	0.6	5.3	52.4	262.3

\*Differences between groups were significant for all countries at  $P=0.0001$ .

1. Based on values within the 2.5% to 97.5% range.

It was found in chapter 3.4.e that the number of units (but not amount of cannabis) in some countries, especially the Czech Republic and Sweden, was higher among those who consume cannabis not in joints but pipes (water and/or dry pipes).

Table 3.24 shows the amount annually consumed if only users of joints are included. When looking at the mean and median differences in cannabis consumption if all units are taken together and if only users of joints are included, the mean amounts drop mostly among intensive users, with values ranging from 10 gram in the Netherlands to 47 gram in the Czech Republic. England & Wales is an exception in that the amount consumed increases with 48 gram when only joints are included.

Note, however, that the medians are much less affected, except for Bulgaria, where the low numbers of intensive users included in the analyses ( $n=22$ ) may play a role. In the Czech Republic, the median among intensive users did not change at all, while the mean increased with 47 gram, as reported above.

**Table 3.24: Estimated annual consumption of cannabis (gram) by user group and country only for respondents who consume mainly joints**

		Chipper	Occasional	Regular	Intensive
<b>Bulgaria</b>	Mean	.7	5.2	46.3	272.8
	5% Trimmed mean				
	Median	.6	4.7	28.2	195.3
<b>Czech Republic</b>	Mean	1.2	9.2	55.5	286.9
	5% Trimmed mean				
	Median	.6	6.2	33.7	248.0
<b>Italy</b>	Mean	1.1	7.9	107.4	352.3
	5% Trimmed mean				
	Median	.5	5.3	65.9	263.5
<b>Netherlands</b>	Mean	.9	7.9	76.1	346.8
	5% Trimmed mean				
	Median	.6	4.7	45.6	245.6
<b>Portugal</b>	Mean	1.0	10.9	94.5	206.2
	5% Trimmed mean				
	Median	.5	9.3	50.7	138.5
<b>Sweden</b>	Mean	1.3	12.6	114.3	396.5
	5% Trimmed mean				
	Median	.7	7.1	67.7	313.0
<b>England &amp; Wales</b>	Mean	1.0	7.9	57.6	489.4
	5% Trimmed mean				
	Median	.6	5.3	28.3	286.4
<b>All countries</b>	Mean	1.0	9.1	89.9	347.5
	5% Trimmed mean				
	Median	.6	5.6	52.4	257.8

\*Differences between groups were significant for all countries at  $P=0.0001$ .

### **Age and gender differences in annual cannabis consumption**

We have described in chapter 3.4.e that there were hardly any gender and age group differences in the number of joints consumed. However, males and younger users put more cannabis in a joint than females and older users. It could therefore be expected that estimates of annual cannabis consumption would also reflect these differences.

Averages indeed tended to be higher for male compared to female users (annex 1, table A7) but the overall analysis revealed no significant main effect for gender, nor any interaction with country or user group. Probably, the wide variability already present within each measure multiplies when estimating annual consumption. Moreover, in several countries the number of female users within use groups was probably too low to detect differences (e.g. less than 10 female intensive users in Bulgaria, Czech Republic, Portugal, Sweden and England & Wales).

Nonetheless, when analyses were carried out per country, there was a significant overall difference in the Czech Republic ( $P=0.006$ ), and marginally significant differences in the Netherlands ( $P=0.030$ ) and Bulgaria ( $P=0.025$ ). In Portugal the significant interaction between gender and user groups pointed at an aberrant pattern of much higher consumption among female intensive users compared to male users. As the number of females in this user group was only 7 we will not attach much significance to this finding.

Similarly, the overall analysis including user type, age group and member state as factors no yielded no significant differences between younger (15-24 years) and older (25-64 years) users, and no interaction with the other factors. At a descriptive level differences between age groups were fairly inconsistent across user groups and countries, and when present they were less strong compared to gender differences. Nonetheless, when data were analyzed per country a significant age group difference was found in the Netherlands ( $F=10.5$ ,  $P=0.001$ ), and a significant age group by user group interaction ( $F=6.2$ ,  $P=0.0001$ ). When analyzed per user group, (marginally) significant age group differences were found for regular users (86 against 56 gram;  $P=0.019$ ) and intensive users (409 gram against 280 gram;  $P=0.008$ ), suggesting higher consumption for the younger compared to the older users.

### 3.5 Circumstances of cannabis use

In this chapter we will describe the circumstances in which respondents consume their cannabis and whether there are differences between user groups and countries. More specifically the following aspects are covered:

- a. Days of the week and periods of the day cannabis is usually consumed
- b. Main location of use
- c. Sharing cannabis.

#### **a. Consumption by days of the week and periods of the day**

Table 3.25 shows on which days of the week respondents usually consume cannabis for all countries combined. There are obvious differences between user groups ( $P=.0001$ ). Perhaps not surprisingly, the majority (75%) of the intensive users consume cannabis as often on weekends as week days. In contrast, the majority of the chippers take cannabis only on weekends (51%) or more often on weekends than on week days (24%). Occasional users are most close to chippers: almost three quarters consume cannabis only or mostly during weekends. Regular users are somewhere in between occasional and intensive users. The use of cannabis more often or only on week days is rare in all user groups.

This consumption pattern is remarkably similar in all countries (annex 1, table x), although there are some differences. The percentage of intensive users consuming as often on week days as weekends varied from 66% in the Czech Republic to 83% in Italy. The proportion of chippers consuming cannabis only during the weekend varied from 34% in Italy to 70% in the Netherlands. If categories only and more often on weekend days are taken together, proportions vary from 61% in Italy and 63% in Bulgaria and Portugal to 84% in Sweden and 85% in the Netherlands.

**Table 3.25: Days of the week on which cannabis is usually consumed by user group**

	Chipper	Occasional	Regular	Intensive	Total
<b>Total N (100%)</b>	1,101	714	1,109	950	3,874
<b>Only on weekend days</b>	52%	31%	7%	1%	23%
<b>More often on weekend days than on weekdays</b>	24%	40%	40%	20%	31%
<b>Just as often on weekend days as on weekdays</b>	18%	24%	46%	75%	41%
<b>More often on weekdays than on weekends</b>	3%	4%	6%	5%	4%
<b>Only on weekdays</b>	3%	2%	1%	0%	1%

Table 3.26 shows that four to six out of ten cannabis users have a preference for using cannabis mostly in the evening, suggesting a predominant social and relaxation function. However, the proportion of users taking cannabis usually all day through is clearly highest for daily users (about one quarter). Still, for almost one quarter of the users the consumption of cannabis is not bound to a specific time period of the day. The overall difference between groups was significant ( $P=.0001$ ).

In most countries, except Portugal, differences between user groups were significant (annex 1, table A13). The proportion intensive users consuming cannabis all day ranged from 19% in Portugal to 37% in the Czech Republic. In most countries, use in the evening is most commonly mentioned, except for Portugal, where between 50% to 80% of the users report to use cannabis mainly at night. This may refer to the same time period as the Portuguese translation for evening refers to time period from about 6 to 8 PM (between work and dinner), while 'at night' both refer to a later time period (e.g. up to after midnight), which is more associated with relaxation.

Table 3.26: Time of the day on which cannabis is usually consumed by user group

	Chipper	Occasional	Regular	Intensive	Total
<b>Total N</b>	1,101	714	1,109	950	3,874
<b>All day</b>	1%	1%	8%	26%	9%
<b>At night</b>	21%	15%	10%	6%	13%
<b>In the evening</b>	54%	60%	50%	39%	50%
<b>In the afternoon</b>	4%	5%	6%	4%	5%
<b>In the morning</b>	0%	1%	1%	0%	0%
<b>No specific time</b>	20%	19%	25%	25%	22%
	100%	100%	100%	100%	100%

### **b. Location where cannabis is usually consumed**

Table 3.27 shows for all countries combined where respondents usually use their cannabis. There were several country-specific answers, collapsed in the category 'other' (see footnote under table). The largest proportion of all users take cannabis usually at their own home, but there is a clear difference between user groups. The more frequent cannabis is used, the more likely it is that this takes place at the users own home, with proportions being almost three times higher among intensive users (64%) compared to chippers (23%). A reverse but less strong pattern is seen for 'using at someone else's home', ranging from 8% for daily users to 23% for occasional users and 27% for chippers. An overall similarly popular location to use cannabis is on the street or in a park, with little differences between user groups.

Other locations are mentioned by less than 6% of the users, except chippers, of whom 16% usually take cannabis at a private party. Use at a seller's home or at the workplace is by (virtually) no respondents indicated as main locations of use. The nightlife and entertainment scene are also not popular as the most common locations of cannabis use. Note that this does not mean that use never happens there, but they are not or only rarely mentioned as the most usual locations.

Table 3.27: Location where cannabis users usually consume their cannabis by user group

	Chipper	Occasional	Regular	Intensive	Total
<b>Total N</b>	1010	675	1049	898	3632
<b>At my own home</b>	23%	40%	52%	64%	45%
<b>At seller's home</b>	0%	0%	0%	0%	0%
<b>At someone else's home</b>	27%	23%	15%	8%	18%
<b>At a private party</b>	12%	5%	1%	0%	5%
<b>At my workplace</b>	0%	0%	1%	0%	0%
<b>At school, college, university</b>	1%	2%	1%	1%	1%
<b>On the street or in a park</b>	16%	16%	19%	15%	17%
<b>At a cafe/pub/bar</b>	2%	3%	2%	2%	2%
<b>Other place of entertainment</b>	3%	3%	1%	0%	2%
<b>At a music concert or festival</b>	4%	2%	0%	1%	2%
<b>Other *</b>	10%	7%	8%	9%	8%
	100%	100%	100%	100%	100%

\* Smart shops and other locations in Portugal; tea house and other locations in the Czech Republic; Coffee shops and other locations in the Netherlands; other locations in Bulgaria, Italy, Sweden and England & Wales.

Differences between user groups were significant for all countries, except for Bulgaria (annex 1, table A14). For information we have also summarized in table 3.28 the locations of use per country for all user groups combined, but note that differences between groups and differences in the numbers of respondents per group may affect the overall averages per country.

In all countries, someone's own home as main location of use was highest among intensive users, with proportions varying from 40% in the Czech Republic to 80% in England & Wales and 82% in Sweden (annex 1, table A14). In the Czech Republic and Bulgaria, relatively high proportions (39% and 34%) of intensive users consume their cannabis mainly in the street of the park. Use at someone else's home was fairly common among chippers, in most countries - about one in three - except Bulgaria and Czech Republic, with about half of these percentages.

In the Netherlands, coffee shops –outlets for the small scale sale of cannabis - were the main locations for using cannabis for between 3% and 5% of the users. This seems to be low. Note, however that in about three-quarters of the Dutch cities and towns no coffee shops are present. Moreover, their function as a take away place (instead of place of social function) has increased as of 1 July 2008 with the implementation of the (tobacco) smoking ban in the catering industry, including coffee shops.

**Table 3.28: Location where cannabis users usually consume their cannabis by country**

	BG	CZ	IT	NL	PT	SE	E&W	Total
<b>Total N</b>	173	443	945	999	132	693	247	3,632
<b>At my own home</b>	22.5%	26.9%	46.5%	41.2%	40.9%	57.7%	63.2%	44.6%
<b>At seller's home</b>	0.0%	0.5%	0.1%	0.2%	0.0%	0.1%	0.0%	0.2%
<b>At someone else's home</b>	17.9%	8.8%	17.7%	23.2%	16.7%	18.2%	16.2%	18.1%
<b>At a private party</b>	7.5%	5.2%	3.5%	4.4%	3.8%	4.9%	6.5%	4.6%
<b>At my workplace</b>	0.0%	0.0%	0.3%	0.4%	0.0%	0.3%	0.8%	0.3%
<b>At school, college, university</b>	1.2%	1.1%	1.4%	0.4%	15.9%	0.1%	0.8%	1.3%
<b>On the street or in a park</b>	33.5%	28.4%	19.9%	13.3%	11.4%	10.7%	5.3%	16.7%
<b>At a pub/bar</b>	0.6%	10.2%	1.4%	1.2%	2.3%	0.1%	0.8%	2.1%
<b>Other place of entertainment</b>	2.3%	3.6%	0.8%	2.4%	2.3%	0.1%	0.0%	1.5%
<b>At a music concert or festival</b>	1.2%	3.4%	0.4%	2.2%	5.3%	0.7%	2.4%	1.7%
<b>Other</b>	13.3%	11.5%	8.0%	6.5%	0.0%	6.9%	4.0%	7.5%
<b>Tea house</b>	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
<b>Coffee shop</b>	0.0%	0.0%	0.0%	4.5%	0.0%	0.0%	0.0%	1.2%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

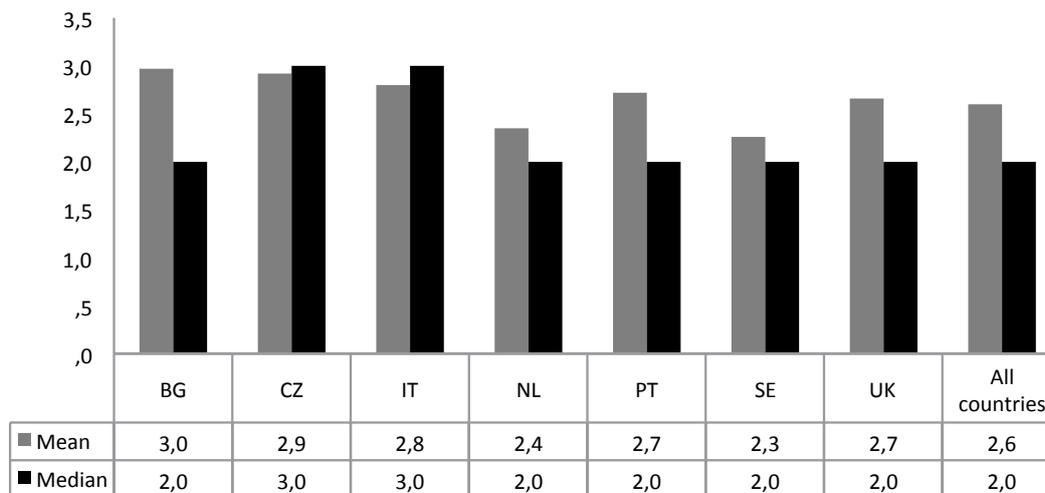
### ***c. Sharing of cannabis***

Cannabis users often take cannabis in company of others, which is compatible with the social and recreational function for a majority of users (e.g. Hall and Degenhardt 2009). Typically, this behaviour is accompanied by sharing cannabis units with one or more others. Table 3.29 shows the proportion of users having shared their cannabis on the last use occasion. It is clear that intensive users are least likely to share their cannabis (67%) while chippers and occasional users seem to be most 'social' in this respect (overall 90% and 81%). Nonetheless, sharing seems to be a common phenomenon, even among intensive users. Nonetheless, there are clear differences between countries, with proportions ranging from 50% in England & Wales to 91% in Bulgaria. Differences between user groups were significant in all countries, except for Bulgaria, where sharing seems to be the rule in all user groups.

Figure 3.19 shows that the respondents shared their cannabis on the last occasion on average with two to three people. When data for all countries were taken together, 30% of the users had shared their cannabis with 1 person, 26% with 2 persons, 23% with 3 persons, 12% with 4 persons, 6% with 5 persons, 2% with 6 persons and 2% with 7 or more persons. There were no significant differences between user groups.

**Table 3.29: Percentage of users who shared their cannabis during the last consumption day by user group and country**

	Chipper	Occasional	Regular	Intensive	Total	P=
<b>Bulgaria</b>	96%	100%	91%	91%	94%	.362
<b>Czech Republic</b>	90%	90%	80%	73%	82%	.001
<b>Italy</b>	95%	81%	81%	75%	82%	.000
<b>Netherlands</b>	91%	89%	74%	56%	79%	.000
<b>Portugal</b>	94%	94%	84%	59%	82%	.000
<b>Sweden</b>	85%	68%	67%	61%	72%	.000
<b>England &amp; Wales</b>	84%	66%	56%	50%	64%	.000
<b>Total</b>	90%	81%	75%	67%	79%	.000

**Figure 3.19: Mean and median number of people with whom cannabis was shared on the last occasion**

A key question is whether sharing may affect the validity of the findings on the number of units typically consumed per day, as questions on the amount of units did not specifically emphasize that users should only indicate their own consumption. In line with Korf et al. (2007) we addressed this issue by looking whether the number of units smoked the last day differed between those who indicated to have shared their unit and those who did not. As both the number of units consumed typically or on the last day as well as sharing of units are associated with the frequency of use, the latter factor was included in the analysis as covariate. The results showed that there was no significant difference between the number of joints smoked by those who had shared and those who did not share (2.36 and 2.21 on average,  $P=.07$ ). If analyzed per user group, there was a significant difference only for regular users between those who shared and those who did not share (table 3.30). It might be that those who shared actually consumed a bit less than the reported number of units.

**Table 3.30: Mean number of units consumed on the last use day by user group among those who shared their unit and those who did not**

User group	Shared	Not shared	P=
Chippers	1.37	1.27	.486
Occasional users	1.71	1.80	.579
Regular users	2.50	2.11	.015
Intensive users	3.51	3.45	.772

Looking at those who did share, the correlation with the average number of units consumed the past time and the number of people shared with was very low ( $r=.055$ ). All in all, it seems that most people who reported the number of units typically smoked largely referred to the number they consumed themselves, as also concluded by Korf et al. (2007) although this might not apply to all respondents.

It can, however, not be determined from these analyses whether people who share and those who do not share are actually different types of users, who really differ in the number of units they consume.

It can be further questioned whether there is a difference in total amount of cannabis consumed per user. Table 3.31 shows the amount (grams) per user and user group among those who indicated to have shared their unit on the last occasion, and those who did not. No significant difference was found in annual consumption between those who share and those who not shared their unit on the last occasion ( $P=.105$ ). There was also no significant interaction between sharing and user group ( $P=.310$ ).

When the user groups are analyzed separately (in spite of a non significant interaction), the chippers who shared consumed significantly less than those who did not share. The difference is not significant for occasional users. For regular users it might seem that those who shared consumed more than those who did not share (but only at  $P=.013$ ) and this seemed also the case for the intensive users but the difference was not even marginally significant ( $P=.151$ ).

These data do not suggest that people who share have indicated higher amounts (mainly numbers of units) while they in fact consumed less themselves, although a trend in this direction for the more frequent user groups can be observed. It should be noted, however, that we have already concluded that the average number of units consumed seems to be slightly higher only among regular users, and this should be the core variable to draw conclusions about sharing.

Taken all the data together it seems that we do not overestimate consumption too much by not taking the sharing of units into account. Possibly, most people have indicated primarily the number of units consumed themselves.

However, this issue remains to be further and it would be recommended for future research to explicitly ask for the number of units consumed by the person him or herself, and/or to ask how many units and what part of a unit is shared.

**Table 3.31: Amount of cannabis (gram) consumed in the past 12 months per individual per user group by those who shared their unit on the last occasion and those who did not**

User group	Shared on last occasion	Not shared on last occasion	Total
Chipper	1.1	1.5	1.1
Occasional user	9.6	10.2	9.7
Regular user	95.3	74.3	90.2
Intensive user	375.5	338.3	363.2

### 3.6 Use of other substances

Respondents were asked whether they had used other drugs than cannabis in the past year or in the past month. Table 3.32 lists the outcomes. The Netherlands is an exception as prevalence rates of ecstasy, cocaine, amphetamine and GHB were appreciably higher compared to other countries. This is probably related to the recruitment strategy, whereby a significant proportion of respondents were recruited through websites on upcoming festivals and parties. Overall, the use of other drugs seemed to be lowest among Italian cannabis users. Note, however, that these data do not reflect 'normal' prevalence rates, as the sample a priori consists of drug users instead of the general population. Subjects were explicitly recruited on the basis of their drug use in the past year, and those who were randomized to the cannabis track, even if they consumed cannabis only a few times in the past year, are probably more likely to have had more experience with other drugs compared, to respondents in a population sample. For illustration, in the British Crime Survey of 2010/2011, the use of Spice, Khat (both 0.2%), BZP (0.1%) and GBL/GHB (0.0%) was very low in the general population (Smith and Flatley 2011). However, 91% of those taking mephedrone had also taken another illegal drug in the last year with 72% using cannabis, 53% cocaine and 48% using ecstasy.

Apart from the Netherlands, cocaine use in the past year is relatively often reported by cannabis users from England & Wales and Bulgaria (14% and 13%), but last month prevalence is much lower, especially in Bulgaria. Last year prevalence of ecstasy use varied from 1.4% in Italy to 21% in England & Wales, with a peak of 60% in the Netherlands. For amphetamine last year use was lowest in Italy and highest in Bulgaria (23%), after the Netherlands (39%).

Heroin use was relatively uncommon in most countries. With a last year prevalence of 12%, methamphetamine was most common in the Czech Republic. Spice or 'synthetic cannabis' peaked in Sweden and Portugal with about one in five cannabis users having consumed these substances in the past year.

Alcohol is, as expected, the most common consumed other substance in all countries. There were small but significant differences between user groups, with slightly lower prevalence rates among intensive and regular users compared to chippers and occasional users (table 3.33). For other drugs minor consistent differences were found between user groups.

**Table 3.32: Last year and last month prevalence (%) of other drug use among cannabis users by country**

		BG	CZ	IT	NL	PT	SE	E&W
<b>Any drug</b>	Last year	27.9%	21.5%	10.3%	54.9%	25.3%	24.8%	26.1%
	Last month	13.0%	9.4%	4.3%	41.5%	13.3%	10.4%	9.9%
– Cocaine	Last year	13.2%	7.3%	5.7%	36.2%	10.4%	3.5%	14.9%
	Last month	1.3%	1.7%	1.1%	20.8%	3.2%	.6%	4.4%
– Ecstasy	Last year	12.5%	13.3%	1.4%	60.0%	8.0%	5.0%	20.6%
	Last month	3.9%	3.9%	.2%	38.6%	4.0%	1.3%	6.1%
– Amphetamine	Last year	23.0%	7.5%	1.7%	39.1%	4.8%	6.9%	3.1%
	Last month	12.5%	2.2%	.3%	25.3%	2.4%	1.9%	.9%
– Heroin	Last year	.7%	1.2%	.9%	1.2%	2.4%	.8%	3.5%
	Last month		.7%	.2%	.8%	.8%	.2%	1.3%
– Methamphetamine	Last year	3.9%	12.1%	1.1%	6.6%	1.6%	1.7%	1.3%
	Last month	1.3%	6.5%	.3%	3.2%		.2%	.4%
– GHB	Last year	.7%	.5%	.2%	20.4%		1.4%	1.3%
	Last month		.2%		11.2%		.5%	.9%
– Spice	Last year	8.6%	4.8%	5.4%	1.9%	20.8%	21.8%	4.4%
	Last month	2.6%	1.0%	3.0%	1.1%	9.6%	10.0%	.4%
– Mephedrone	Last year	.7%	3.4%	.1%	4.7%	4.8%	.9%	5.3%
	Last month		.5%	.1%	1.3%		.3%	1.8%
<b>Alcohol</b>	Last year	91.4%	93.2%	85.0%	92.9%	91.2%	*	93.0%
	Last month	83.6%	87.4%	74.0%	86.5%	83.2%	*	83.3%

\* No data for Sweden (due to a programming error).

**Table 3.33: Use of alcohol in the past year and past month by user group\***

	Chippers	Occasional	Regular	Intensive
Last year	92.2%	93.5%	87.8%	88.6%
Last month	85.9%	86.4%	80.5%	76.7%

\* Excluding Sweden.

### 3.7 Problematic cannabis use

The 6-item Cannabis Abuse Screening Test (CAST) was used as a proxy for problematic cannabis use. This scale is one of the instruments proposed by the EMCDDA to be included in population surveys to get a better picture of the more risk forms of cannabis use, which is comparable across countries. The CAST has also been optionally included in the ESPAD surveys among pupils of 15 and 16 years. In 2011, the CAST was used in 13 out of the 36 countries participating in the ESPAD, including the Czech Republic, Italy and the Netherlands.

In the current study, the frequency of occurrence in the past year of the following items was scored by all cannabis users on a 5-point scale (0 "never", 1 "rarely", 2 "from time to time", 3 "quite often", and 4 "very often").

1. Have you ever smoked cannabis before midday?
2. Have you ever smoked cannabis when you were alone?
3. Have you ever had memory problems when you smoke cannabis?
4. Have friends or members of your family ever told you that you ought to reduce or stop your cannabis use?
5. Have you ever tried to reduce or stop your cannabis use without succeeding?

6. Have you ever had problems because of your use of cannabis (arguments, fight, accident, bad results at school, etc.)? Using full scale scores (0 – 24), cut-off sum scores of 7 and 12 have been found to be predictive of moderate and severe dependence, respectively, in a sample of young adults (18-25 years) (Cuenca-Royo et al. 2012).

Internal consistency was acceptable in the total sample (Cronbach's  $\alpha$  0.73) and in most individual countries (Bulgaria 0.62; Czech Republic 0.73; Italy 0.64; the Netherlands 0.81; Portugal 0.78; Sweden 0.73; England & Wales 0.70). In the total sample, average CAST sum scores correlated significantly with the number of use days in the past 12 months ( $r=0.58$ ,  $P=.0001$ ). In the individual countries correlations were all significant and varied between 0.53 in Italy to 0.65 in the Netherlands and Portugal.

Table 3.34 shows that in all countries the average CAST scores increased progressively from the chippers to the intensive users. There was a significant main effect of user group ( $F=401.1$ ,  $P=.0001$ ) and country ( $F=8.3$ ,  $P=.0001$ ) and significant interaction between country and user group ( $F=3.7$ ,  $P=.0001$ ). All differences between user groups were significant in post-hoc tests. User groups also differed significantly in all individual countries at  $P=.0001$ . Average values for chippers were lowest in England & Wales and Portugal (1.6 and 1.7, respectively) and highest in Bulgaria (3.0), but differences between countries were not significant. Differences between countries among occasional users were marginally significant ( $P=.03$ ). The overall significant difference among regular users ( $F=3.6$ ,  $P=.002$ ) could be attributed in post-hoc analyses to higher scores in Sweden compared to Bulgaria, the Czech Republic and Italy. Averages for intensive users varied from 7.9 in Italy to 10.6 in the Netherlands ( $F=11.9$ ,  $P=.0001$ ). Post-hoc analyses revealed significantly higher averages in the Netherlands compared to Bulgaria, the Czech Republic and Italy.

When evaluating gender and age group effects, it appeared that males had an overall higher summed CAST score compared to females (6.2 against 4.3). These differed not by user type or country. There were no significant age group differences.

When analyzed per item of the CAST (see annex 1, table A9), differences between user groups were significant for all items ( $P=.0001$ ).

**Table 3.34: Mean and median summed scores on the Cannabis Abuse Screening Test (CAST) by user group and country\***

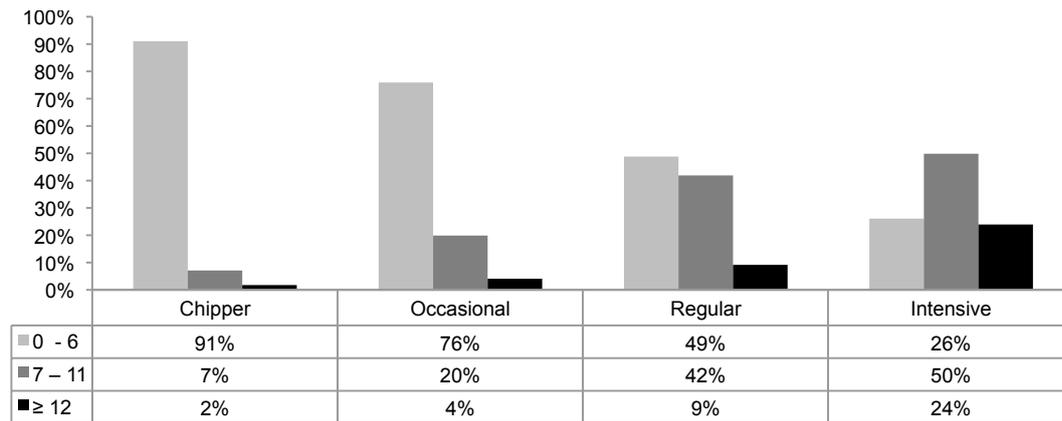
		Chipper	Occasional	Regular	Intensive
<b>Bulgaria</b>	Mean	3.0	4.7	5.8	9.2
	Median	2.0	3.5	5.0	9.0
<b>Czech Republic</b>	Mean	2.3	4.1	6.3	9.0
	Median	2.0	3.0	6.0	8.0
<b>Italy</b>	Mean	2.0	4.2	6.7	7.9
	Median	1.0	4.0	6.0	8.0
<b>Netherland</b>	Mean	2.2	4.3	7.2	10.6
	Median	1.0	4.0	7.0	10.0
<b>Portugal</b>	Mean	1.7	3.8	6.5	9.6
	Median	.0	4.0	6.0	9.0
<b>Sweden</b>	Mean	2.5	5.3	7.7	9.7
	Median	1.0	5.0	8.0	9.0
<b>England &amp; Wales</b>	Mean	1.6	5.0	6.9	9.2
	Median	1.0	4.0	7.0	9.0
<b>All countries</b>	Mean	2.2	4.6	6.9	9.1
	Median	1.0	4.0	7.0	9.0

\*Differences between groups were significant in all individual countries at  $P=.0001$ .

Figure 3.20 shows that one quarter (24%) of all intensive users fulfilled criteria for severe dependence. The large majority of the chippers (91%) scored below any criterion of problematic use. Figures for the individual countries are given in annex 1, table A10. Differences between countries were fairly small for chippers: about nine in ten users fell below a cut-off of 7. However, there was more variation with regard to the proportion of intensive users having a score of 12 or more. The lowest averages were found in Italy (13%), England & Wales (17%) and Bulgaria (17%). The highest average was reported in the Netherlands (41%).

The high summed CAST score among intensive users in the Netherlands might be (somehow) associated with the recruitment of a high proportion of users who entered the web survey through a website for party visitors. Separating those out from other cannabis users by differentiating respondents who had used ecstasy in the past year and those who did not showed a two-point significantly higher sum CAST score among intensive users (11.5 against 9.5) for those who used ecstasy. This outcome did not differ when adjusted for age (which was notably lower among intensive users who consumed ecstasy – i.e. 25 years against 33 years). Cannabis consumption measures did not differ between ecstasy and non-ecstasy users. Moreover, the proportion of intensive cannabis users who had also consumed ecstasy with a CAST score  $\geq 12$ , was higher (49% against 30%, respectively). It is not known how these findings should be explained, but they do point at different subtypes of intensive users.

**Figure 3.20: Proportion of users with CAST scores in range 0-6, 7-11 and 12 or more by user group**



### 3.8 Conclusions

In chapter 3 we have investigated whether there were differences between cannabis user groups and countries on a number of demographic and cannabis use related variables. The results revealed many differences between user groups, which seemed to be more or less 'universal', but there were sometimes also notable differences between countries.

Overall, intensive users were most strongly distinguished from other user groups – especially the chippers and occasional users- in that they had a relatively early onset of first cannabis use, were more often male, were older (except for Bulgaria and the Czech Republic), used more units (mainly joints) on a typical use day, put more cannabis in a unit, less often shared their units with others, consumed cannabis more often at home and during the whole week and all parts of the day, consumed appreciably more cannabis annually and had more symptoms of problematic use, compared to the less frequent user groups.

For most variables there was a gradient in outcome, in that differences tended to increase with increasing frequency of use. This is especially evident for consumption data for six user groups at increasing levels of frequency. Overall, differences between chippers, who consumed cannabis on average less than once a month, and occasional users, who consumed cannabis at least monthly but no more than once a week, were small. Nonetheless, consistent increases were found in average scores for problematic use with increasing frequency and also the difference between chippers and occasional users was significant.

Despite these overall main differences between user groups, there were quite some specific differences between countries:

- **Age of first use:** The average age of first cannabis use was overall clearly higher in Sweden compared to all other countries. While it is hard to explain this difference on the basis of these data, this finding may be associated with the long-standing relatively restrictive Swedish drug policy aimed at a drug-free society.
- **Type of unit:** While the majority of the cannabis users consumed their cannabis by smoking a joint, up to 45% of the intensive users in the Czech Republic preferred smoking cannabis by dry pipes/chillums. Health concerns related to tobacco smoking, better options to titrate the cannabis dose, smoking efficiency and cultural factors, have been put forward as possible explanations for the popularity of this consumption method in the Czech Republic.
- **Mixing cannabis:** Although the majority of the cannabis users mixed their cannabis with tobacco, there were clear differences between countries, with proportions of users who consumed cannabis 'pure' varying from 9% or less in Italy, the Netherlands and Portugal up to 28% in the Czech Republic and 33% in Bulgaria.

- Preference for hash or marihuana: The proportion of users with a preference for marihuana was highest in Bulgaria and the Czech Republic (96%), at close distance followed by the UK (83%). Preference for marihuana was lowest in Portugal (38%), where hash tended to be more popular (overall 43%), especially among intensive users (69%). As indicated in before, in some countries marihuana consumption seems to be more common than would be suggested by other sources several years ago.
- Amount of cannabis consumed: Annual cannabis consumption among intensive users tended to be lowest in Portugal (184 gram) and highest in Sweden and the UK (363 and 374 gram, respectively), but confidence intervals are fairly wide.
- Location where cannabis used: In the Czech Republic and Bulgaria, the street or park is a relatively often mentioned location where cannabis is usually consumed, while this location is least common in England & Wales. In this latter country, the proportion of users who take cannabis at their own home is highest.
- Sharing on the last occasion: Although sharing was common among most users, especially the less frequent users, proportions among intensive users varied from 50% in England & Wales to 91% in Bulgaria. It is hard to explain such differences. Apart from possible cultural differences, it is likely that sharing is associated with the main location of use (see above). Indeed, using cannabis at home is more common among those who did not share compare to those who shared their cannabis.

## 4 Availability of cannabis

In this chapter we will describe for all user groups and countries the following aspects related to the availability and accessibility of cannabis, including buying behaviour:

- a. Way of obtaining cannabis
- b. Usual location of purchase and reasons to buy there
- c. Availability of other drugs at location of purchase
- d. Amount usually bought per purchase and price paid for it
- e. Estimated price per gram
- f. Buying for someone else
- g. Ease of obtaining cannabis and inability to buy
- h. Buying in the past 30 days: number of times and amount of money spent
- i. Comparing methods of estimating consumption in the past month.

### **a. Way of obtaining cannabis**

Table 4.1 shows how respondents usually their cannabis. In all countries, buying cannabis is the most common way to obtain the drug for regular and intensive users. In all countries the proportion of those who usually buy their cannabis increases from chippers to intensive users, while the proportion of those who get it from others decreases. However, having said this there are also notable differences between countries. While buying cannabis is the main way to obtain cannabis for only 14% to 20% of the chippers in the Czech Republic, Portugal and Italy, it is as high as 60% for the chippers in Netherlands. The proportion intensive users who predominantly buy cannabis vary from 53% in the Czech Republic to 89% in the Netherlands. Intensive users who get cannabis mainly from others or share it is rare in Sweden, the Netherlands, England & Wales and Italy (2% to 4%), but higher percentages are found in the Czech Republic and Bulgaria (18% and 19%).

Note that growing may differ between regions in Bulgaria. In their 2009 National Report, the Bulgarian focal point reported that growing of cannabis is mostly concentrated in the South-western part of the country.

Growing cannabis as primary way to obtain cannabis for personal consumption is uncommon in the Netherlands (1% to 5%), followed by England & Wales (0% to 9%), but higher percentages are reported in most other countries, especially among intensive users. The Czech Republic and Italy are on top of the list with 21% and 19%, respectively, of the intensive users who usually grow their own cannabis.

Table 4.1: Way of obtaining cannabis by user group\*

	Chipper	Occasional	Regular	Intensive	Total
<b>Bulgaria</b>					
I buy it	30%	29%	61%	67%	45%
People give or share it with me for free	69%	67%	37%	19%	52%
I grow it	0%	0%	2%	10%	2%
Other	1%	5%	0%	5%	2%
<b>Czech Republic</b>					
I buy it	14%	30%	44%	53%	37%
People give or share it with me for free	73%	57%	39%	18%	44%
I grow it	12%	11%	12%	21%	14%
Other	2%	3%	5%	8%	5%
<b>Italy</b>					
I buy it	20%	48%	73%	70%	59%
People give or share it with me for free	75%	46%	13%	4%	26%
I grow it	2%	5%	9%	19%	11%
Other	2%	2%	5%	6%	5%
<b>Netherlands</b>					
I buy it	60%	68%	90%	89%	75%
People give or share it with me for free	38%	29%	7%	2%	21%
I grow it	1%	1%	1%	5%	2%
Other	1%	2%	2%	4%	2%
<b>Portugal</b>					
I buy it	19%	44%	67%	68%	47%
People give or share it with me for free	77%	56%	13%	11%	41%
I grow it	2%	0%	3%	16%	6%
Other	2%	0%	17%	5%	6%
<b>Sweden</b>					
I buy it	46%	73%	85%	76%	69%
People give or share it with me for free	49%	15%	4%	3%	20%
I grow it	4%	9%	7%	18%	8%
Other	1%	4%	4%	3%	3%
<b>England &amp; Wales</b>					
I buy it	26%	68%	74%	85%	63%
People give or share it with me for free	71%	26%	14%	3%	29%
I grow it	0%	4%	9%	9%	6%
Other	3%	2%	2%	3%	3%
<b>All countries</b>					
I buy it	40%	59%	75%	74%	62%
People give or share it with me for free	56%	34%	15%	6%	28%
I grow it	3%	5%	6%	15%	7%
Other	2%	3%	4%	5%	3%

\*Differences between groups were significant in all individual countries at  $P=0.0001$ .

### **b. Usual location of purchase and reasons to buy there**

For those who *usually* buy their cannabis, table x shows the locations of purchase. There were only significant differences between user groups in Italy ( $P=0.0001$ ). Note, however, that the numbers of chippers and occasional users who usually buy are very low in several countries, not allowing a detailed assessment by user group.

There were clear differences between countries in the main locations of purchase. At street or in a park was mentioned by the majority of the Bulgarian cannabis users (58%), at distance followed by Italy (34%), Portugal (23%), Sweden (27%) and England & Wales (20%).

Home locations (seller or someone else's) are commonly reported locations in many countries. In the Czech Republic, Italy, Portugal and Sweden, cannabis was commonly bought at a seller's home (between 35% and 45%), and also in Portugal and England & Wales this location was regularly mentioned (21% 29%). In Italy, the proportion of cannabis users buying mainly at this location was highest among intensive users (43%) and lowest among chippers (18%). Buying at someone else's home, who is apparently not the seller, was reported by almost one in four to five cannabis users from Portugal (23%) and the Czech Republic (19%).

As expected, coffee shops were the most likely source for buying cannabis in the Netherlands for about nine in ten users. Coffee shops are outlets where the sale of cannabis to adults is tolerated under strict conditions.

Pubs and bars are mentioned by one in ten users in the Czech Republic and Portugal.

Someone's work place, music festivals or other places of entertainment, private parties, public transportation stations, smart shops, school or college or someone's own home were rarely reported as the main location for buying cannabis. This also applied to buying through internet.

**Table 4.2: Usual locations for purchasing cannabis by country**

	BG	CZ	IT	NL	PT	SE	E&W
<i>N</i>	73	155	545	738	62	464	150
At a coffee shop	1.4%	.0%	.0%	87.1%	.0%	.0%	8.7%
At a pub/bar	.0%	11.6%	4.8%	.4%	8.1%	1.1%	1.3%
At other place of entertainment	4.1%	1.9%	.2%	.1%	1.6%	.4%	.0%
At a private party	1.4%	.0%	1.1%	.8%	.0%	1.5%	.0%
At a music concert or festival	.0%	.0%	.2%	.3%	.0%	.2%	.0%
On the street or in a park	57.5%	12.3%	34.1%	2.7%	22.6%	27.4%	20.0%
At a public transport station	.0%	.0%	.2%	.0%	.0%	1.3%	.7%
At a community centre, youth club association	.0%	.0%	.4%	.0%	1.6%	.2%	.7%
At seller's home	9.6%	45.2%	35.8%	3.3%	21.0%	34.7%	29.3%
At my own home	1.4%	1.9%	3.5%	.7%	4.8%	2.8%	10.0%
At someone else's home	4.1%	19.4%	.0%	2.4%	22.6%	10.3%	16.0%
At a smart shop	.0%	.0%	.2%	.3%	1.6%	.0%	.0%
Through the Internet	2.7%	.0%	.2%	.0%	.0%	3.2%	.7%
At my workplace	.0%	1.3%	.9%	.0%	1.6%	1.3%	1.3%
At school, college or university	1.4%	3.2%	5.0%	.3%	4.8%	.9%	.7%
Other	16.4%	3.2%	13.6%	1.6%	9.7%	14.7%	10.7%

Data from the 2008 general population survey in the Czech Republic point at a difference ranking in location of purchase. The most common places for cannabis transactions in this survey are bars, clubs or restaurants (36 %), followed by private events or homes (31 %), public places (20 %) and sellers' homes (13 %) (Mravcik et al. 2009).

In the Bulgarian National Report (2009) other methods are described, which may be covered by the category 'other'. For example, taxi drivers as suppliers of cannabis may pick up clients from a designated address and then sell them cannabis before dropping them further down the street. Also, sellers may transit a specific route at a specific time, information that is known to potential buyers, who wait along the route (Bulgarian National Focal Point on Drugs and Drug Addictions 2009).

### ***Reasons for buying at a specific location***

Respondents who usually buy their cannabis were asked what the main reason was for buying at that specific location. Table 4.3 summarizes these reasons for each country. The statistical analysis revealed only a significant difference between user in the Netherlands, but in most countries the number of users per cell was insufficient to test for differences.

There were peculiar differences between countries. Personal contacts seem to play an important role in Portugal (63%) and the Czech Republic (56%) and to a lesser extent also in other countries (32% to 46%), except for the Netherlands (6%). This is perhaps logically given the presence of coffee shops, which does not make informal networks necessary. In the Netherlands,

the significant differences between user groups merely pointed at the greater role of habits among intensive users (34%) compared to chippers (19%), and the greater importance of local availability for chippers (60%) compared to intensive users (32%), with the other use groups being somewhere in between.

The risk of police detection as main reason to buy at a specific location was highest in Bulgaria and Sweden (16% in both countries) and lowest in the Netherlands (2%). The proportion of respondents mentioning price varied from about 3% in Sweden and England & Wales to 11% in Bulgaria.

**Table 4.3: Main reason for buying at a specific location by country**

	BG	CZ	IT	NL	PT	SE	E&W
Local availability	23.3%	16.8%	29.5%	45.0%	6.5%	22.0%	27.3%
Price	11.0%	9.0%	3.9%	7.5%	6.5%	3.4%	3.3%
Opening hour	4.1%	1.3%	.9%	1.5%	.0%	.4%	.7%
Personal contacts	31.5%	56.1%	38.9%	6.1%	62.9%	46.1%	46.0%
Habits	4.1%	7.1%	9.7%	28.3%	8.1%	4.1%	1.3%
Risk of police detection	16.4%	4.5%	11.9%	1.6%	9.7%	15.7%	10.7%
Other	9.6%	5.2%	5.1%	10.0%	6.5%	8.2%	10.7%

### ***c. Availability of other drugs at the location where cannabis is usually purchased***

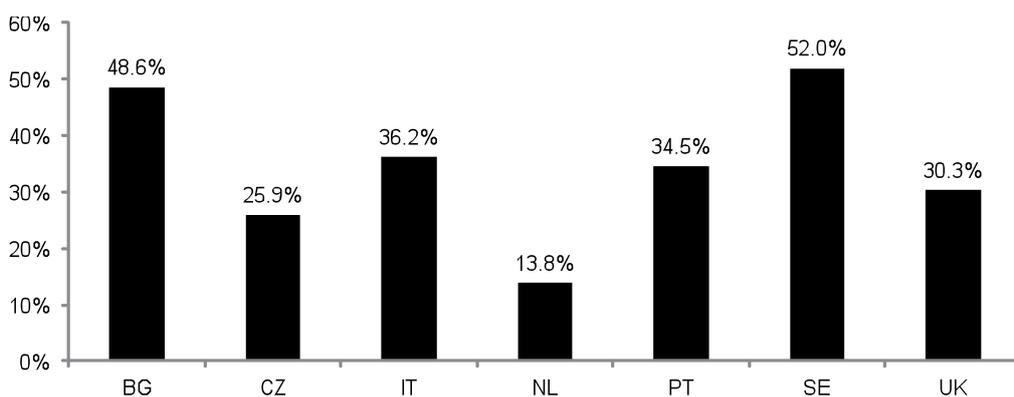
Figure 4.1 shows the percentage of respondents in each country who indicated that there were other drugs (excluding alcohol and tobacco) available at the locations where they usually buy their cannabis. Insofar the numbers of respondents allowed an analysis by user group, the results did not reveal significant differences.

Percentages cannabis users who indicate that other drugs are available vary from 14% in the Netherlands up to 49% in Bulgaria and 52% in Sweden. The relatively low figure for the Netherlands (14%) is consistent with the fact that most cannabis users in the Netherlands buy their cannabis in coffee shops, where the sale of other drugs is strictly forbidden. If the statistical analyses are restricted to those who mainly buy in coffee shops, this percentage further drops to 9%. Nonetheless, also in several other countries which do not officially pursue a separation of markets policy, the majority of users of cannabis are apparently not exposed to other (illicit) drugs when purchasing their cannabis.

In the Czech Republic, the increasing commercialization of the cannabis market in the past decade, due to increased demand and reduction of home growing, seems to have led to an intermingling of the 'hard' and 'soft' drugs markets (Miovsky 2007). Nonetheless, these figures suggest that this would only pertain to a quarter of the cannabis users. As they only refer to those who usually buy their cannabis, not those who grow it, the overall population of cannabis users may be even lower, especially in countries where growing is more common.

These data suggest that in most countries, the cannabis market at retail level seems to be quite 'specialized', albeit to different degrees.

**Figure 4.1: Proportion of users who indicate that other drugs are available at the location where they usually purchase cannabis**



***d. Amount usually bought per purchase and price paid for it***

During the preparation of the study it appeared that cannabis users often do not know precisely how much (grams) of cannabis they typically buy. Therefore, photo cards were used, which depicted four amounts of marihuana and hash (A. 0.5 gram, B. 1 gram, C. 2 gram and D. 5 gram). They were similar to those in chapter 3.4 but showed different amounts. Respondents could choose between nine answer categories: less than 0.5 gram, 0.5 gram, between 0.5 gram and 1 gram, 1 gram, between 1 and 2 gram, 2 gram, between 2 and 5 gram, 5 gram and more than 5 gram. For comparing means, the category 'less than 0.5 gram' was coded to 0.25 gram and 'more than 5 gram' was set at 7 gram. Midpoint values were used for the other intermediate categories. Note that we do not have any information on the reliability and validity of this method. It was, however, the most feasible option to apply in a web survey in countries with widely varying market situations. Respondents who consumed both hash and marihuana were assigned to the type they bought in the greatest amounts.

The results suggest that overall the amounts usually bought progressively increased from 2.2 gram on average for chippers to 4.0 gram on average for intensive users ( $F=24.2$ ,  $P=.0001$ ). All differences between pairs of groups were significant in post-hoc analyses). There were, however, differences between countries. Average amounts among chippers were lowest in Bulgaria (1.3 gram), the Netherlands (1.6 gram) and the Czech Republic (1.8 gram) and were highest in Sweden (3.5 gram). Among intensive users averages amounts usually purchased varied between 2.0 gram in Bulgaria to 5.0 gram in Sweden and 5.3 gram in Portugal.

Table 4.4 shows that differences between user groups did not reach the required (agreed) significance level in Bulgaria, the Czech Republic and Portugal. This might be related to the small(er) number of respondents per user group in these countries, which in fact did not allow a proper subgroup analysis.

In their insight on the cannabis markets, the EMCDDA reported that the majority of the buyers in the United Kingdom would seem to purchase, on average, up to 4 grams (Carpentier et al. 2012), which seems to be consistent with data from the current web survey. For the Czech Republic, the most common practice have been reported to be purchases of one gram or less, with a maximum of two grams. This seems to be slight lower compared to the current web survey, although the medians are more in line with these other data.

Table 4.4: Mean and median amount of cannabis usually bought per purchase

		Chipper	Occasional	Regular	Intensive	Total	P
Bulgaria	Mean	1.3	(3.6)	1.3	2.0	1.6	.036
	Median	1.0	(2.0)	1.0	1.0	1.0	
	N	18	5	29	11	63	
Czech Republic	Mean	1.8	2.7	1.7	2.9	2.4	.019
	Median	1.0	1.0	1.0	2.0	1.0	
	N	12	20	51	62	145	
Italy	Mean	2.7	2.6	3.8	4.7	4.0	.000
	Median	2.0	2.0	3.5	5.0	3.5	
	N	32	63	210	207	512	
Netherlands	Mean	1.6	1.7	2.4	3.1	2.2	.000
	Median	1.0	1.0	2.0	2.0	1.5	
	N	186	125	182	187	680	
Portugal	Mean	(2.8)	(3.1)	4.3	5.3	4.3	.029
	Median	(2.5)	(2.0)	5.0	5.0	5.0	
	N	8	7	19	23	57	
Sweden	Mean	3.5	4.1	4.8	5.0	4.4	.000
	Median	3.5	5.0	5.0	5.0	5.0	
	N	81	117	173	69	440	
England & Wales	Mean	2.3	3.1	3.7	4.7	3.7	.000
	Median	1.3	3.5	3.5	5.0	3.5	
	N	16	33	43	50	142	
All countries	Mean	2.2	2.8	3.4	4.0	3.3	.000
	Median	1.5	2.0	3.5	3.5	3.5	
	N	353	370	707	609	2,039	

Respondents were also asked how much they usually paid for this purchase. For non-Euro countries (Bulgaria, the Czech Republic, Sweden and England & Wales) the national currencies were converted to Euro's using currency exchange rates of March 31 2012 ([www.xe.com](http://www.xe.com)).

Fifty-seven respondents (2.9%) indicated to pay usually over €125 per purchase: 31 in Italy, 8 in the Netherlands, 1 in Portugal, 13 in Sweden and 4 in England & Wales. As it is likely that they were not consumers and probably also bought much more than the maximum allowed amount of 7 gram per purchase, they were considered as outliers and excluded from the analyses. (NB: For the Netherlands, some of these respondents indicated to be owners of coffee shops).

There were major overall differences between countries. Table 4.5 shows that the highest amounts of money spent per purchase were reported in Sweden (between €40 and €53 per transaction) and the lowest in Bulgaria (around €7 to €15).

Overall, chippers (who indicated to usually buy their cannabis instead of getting it) spent on average €20 per purchase, occasional users €27 and regular and intensive users both €31. Analyses for individual countries revealed a less clear pattern for the user groups, except for the Netherlands, where regular and intensive users spent less on buying cannabis than both intensive and occasional users. In Italy regular and intensive users paid less per purchase than occasional users. In Sweden only chippers and regulars users differed significantly. In England & Wales, only intensive users bought significantly more cannabis at a time compared to chippers. In the other countries, differences between user groups were not significant, but again, note the occasionally small number of respondents in some user groups.

Price and amount of cannabis usually purchased were significantly correlated ( $r=0.64$ ,  $P=.0001$  in the total sample). Correlations varied between .57 ( $P=.0001$ ) in Sweden and .69 ( $P=.0001$ ) in England & Wales, except for Portugal ( $r=.27$ , ns).

**Table 4.5: Mean and median prices (€) paid per cannabis purchase**

		Chipper	Occasional	Regular	Intensive	Total	P
<b>Bulgaria</b>	<b>Mean</b>	<b>7.3</b>	<b>14.5</b>	<b>11.5</b>	<b>14.4</b>	<b>11.2</b>	<b>.149</b>
	Median	5.1	15.3	10.2	10.2	10.2	
	N	15	5	28	11	59	
<b>Czech Republic</b>	<b>Mean</b>	<b>20.0</b>	<b>16.8</b>	<b>12.1</b>	<b>17.8</b>	<b>15.8</b>	<b>.372</b>
	Median	8.0	8.0	8.0	8.0	8.0	
	N	12	20	51	62	145	
<b>Italy</b>	<b>Mean</b>	<b>23.5</b>	<b>20.7</b>	<b>31.5</b>	<b>36.6</b>	<b>31.5</b>	<b>.000</b>
	Median	15.0	15.0	20.0	30.0	20.0	
	N	31	63	198	183	475	
<b>Netherlands</b>	<b>Mean</b>	<b>10.9</b>	<b>12.3</b>	<b>16.0</b>	<b>20.3</b>	<b>15.3</b>	<b>.000</b>
	Median	10.0	10.0	15.0	15.0	10.0	
	N	158	118	176	177	629	
<b>Portugal</b>	<b>Mean</b>	<b>15.8</b>	<b>10.8</b>	<b>21.5</b>	<b>31.0</b>	<b>23.5</b>	<b>.168</b>
	Median	17.5	10.0	20.0	20.0	15.0	
	N	6	6	17	21	50	
<b>Sweden</b>	<b>Mean</b>	<b>40.7</b>	<b>47.9</b>	<b>53.0</b>	<b>47.0</b>	<b>48.4</b>	<b>.001</b>
	Median	49.5	55.0	55.0	55.0	55.0	
	N	81	114	165	63	423	
<b>England &amp; Wales</b>	<b>Mean</b>	<b>17.8</b>	<b>31.4</b>	<b>39.1</b>	<b>44.9</b>	<b>36.8</b>	<b>.007</b>
	Median	18.0	24.0	24.0	30.0	24.0	
	N	15	33	43	45	136	
<b>All countries</b>	<b>Mean</b>	<b>20.3</b>	<b>27.1</b>	<b>30.6</b>	<b>30.6</b>	<b>28.2</b>	<b>.000</b>
	Median	10.2	16.5	20.0	20.0	20.0	
	N	318	359	678	562	1917	

**e. Estimated price per gram**

Now we have estimated how many grams respondents usually buy per purchase and how much they pay for it, we may try to estimate the prices per gram. We will do this separately for hash and marihuana, as prices for both cannabis types may differ. Although we have asked for more detailed information on the types of hashish or marihuana (e.g. locally or domestically grown or imported) quite some users did not know which type they usually consumed, or the answers were not deemed reliable (i.e. inconsistent with other sources). In the analysis, prices per gram over €70 (0.4%) were excluded from the analysis. They were likely due to imprecision in estimates (erroneous answers, suggesting mistakes in decimals).

Table 4.6 shows that mean prices per gram marihuana varied from €7.6 in the Czech Republic to €13.3 in Sweden. Prices per gram of hash varied from a low €6.0 in Portugal to €14.4 in the Czech Republic, but note that median values are much lower in these countries (table 4.7).

Differences between user groups were not significant for hash. When analyzed per country, a significant difference in marihuana price between user groups was found in the Netherlands ( $P=.004$ ), indicating that prices per gram were lower for regular and intensive users (€7.8 for both groups) compared to occasional users and chippers (€9.3 and €9.6, respectively). The marginally significant differences in Italy ( $P=.034$ ) and Sweden ( $P=.019$ ) also suggested decreasing marihuana prices from chippers to intensive users (€13.9, €12.4, €12.3 and €9.9 per gram for Italy; €14.8, €13.8, €12.1 and €10.5 per gram for Sweden). This would be consistent with the fact that drugs bought in larger quantities are cheaper, thus lowering the price per gram (bulk discounts).

Table 4.6: Price per gram marihuana from different sources at retail level

Country		Other sources (EMCDDA)			This study		
		N	Mean	Median	N	Mean	Median
Bulgaria		24	7.0	7.0	59	10.7	10.2
Czech Republic		269	7.8	7.9	143	7.6	8.0
Italy		:	8.5	:	468	11.6	10.0
Netherlands	Imported	14	5.9	:	556	8.5	7.5
	Dutch	58	9.3				
Portugal*		:	:	:	47	11.4	10.0
Sweden		42	10.9	10.5	403	13.3	13.2
England & Wales	total	:	3.3	:	135	12.1	12.0
	skunk		6.7				

\* The data may not be fully representative for retail level.

Source: EMCDDA 2012b; Niesink and Rigter 2012.

Table 4.7: Price per gram hash from different sources at retail level

Country	Other sources (EMCDDA)			This study		
	N	Mean	Median	N	Mean	Median
Bulgaria	:	11.5	12.5	9	10.5	5.1
Czech Republic	7	8.6	9.9	80	14.4	8.0
Italy	:	11.2	:	421	9.9	7.1
Netherlands	57	9.7	:	394	9.7	8.3
Portugal*	:	3.6	:	41	6.0	2.9
Sweden	42	9.7	10.0	347	12.8	11.0
England & Wales	:	3.3	:		10.4	12.0

\* The data may not be fully representative for retail level.

Source: EMCDDA 2012b; Niesink and Rigter 2012.

Tables 4.6 and 4.7 also give the prices at retail level reported by different sources to the EMCDDA (EMCDDA 2012b). Note that the figures are for 2010, except for the Netherlands, where the latest figures for January 2012 have been presented. Prices may have changed in the past years.

There are both similarities and changes from the prices in the web survey. While most price data, regardless of the source, show considerable ranges, it must be reminded that the way prices have been calculated in the web survey may include different estimation errors (e.g. estimating amounts on the basis of photo cards, neglect of price differences between types of marihuana or types of hash).

In Bulgaria, prices have also been reported for marihuana from Dutch origin: a mean of €12 per gram and median of €12.5. It is not known, however, what the share of Dutch marihuana is in the Bulgarian market. Prices on the basis of the web survey are consistent for hash but higher for marihuana.

For the Czech Republic prices for marihuana from both sources seem to match. The number of samples for hash reported by the EMCDDA is too small to allow a comparison.

In a study collecting cannabis samples annually from Dutch coffee shops, the mean price per gram of Dutch marihuana (most popular) and imported hash, the two most common cannabis types in the Netherlands, were €8.1 and €9.1, respectively in January 2010, and €9.3 and €9.7, respectively in January 2012 (Niesink and Rigter 2012). These prices fit well with those found in the web survey. The slightly lower price for marihuana might be due to the fact that a minority of users may consume imported marihuana, which is much cheaper.

For Italy and England & Wales marijuana prices are also higher in the web survey. For Italy, price data collected in 2011 among 12 cities by local police squads revealed a price range for one gram marijuana from €7.2 and €9.4, which seems indeed to be lower compared to the web survey (Ministry of Interiors – Central Directorate for Antidrug Services). The price for one gram hash varied between €8.3 and €11.5, which seems to correspond with the web survey estimates.

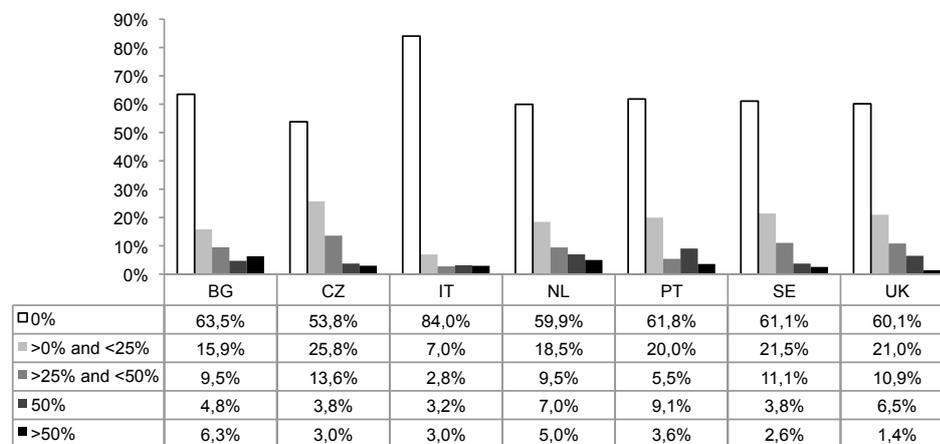
**f. Buying for someone else**

Quite a number of cannabis users (on average 47%) had also bought cannabis in the past 12 months for someone else, with fairly small differences between countries (43%-54%). Overall, intensive and regular users had more often bought cannabis for others (55% and 56%) than occasional users (39%) and chippers (25%). Moreover, in the past year, intensive users had bought cannabis on average for 16.3 persons, regular users for 9.2 persons, occasional users for 6.4 persons and chippers for 3.4 other persons. Differences between all user groups were significant, except for chippers and occasional users.

We have also asked users why they bought cannabis for someone else. The most frequently cited reason was “somebody asked me a favour” (67%). This proportion varied between countries from 57% in England & Wales to 81% in the Czech Republic. At a distance, “convenience” ranked as second most frequent reason with proportions varying from 5% in the Czech Republic to 21% in the Netherlands and 24% in England & Wales. “To cover my costs of my cannabis” was mentioned overall by 7%, but higher proportions were mentioned in Bulgaria (16%), Italy (11%) and Czech Republic (8%). To earn extra money was mentioned by between 2% (Netherlands) to 11% (Italy) of the users.

Apparently, part of the cannabis users do not consume all the cannabis they purchase themselves. Figure 4.2 depicts how many cannabis respondents who usually buy their cannabis usually give away or sell to others. The proportion cannabis users who seem to keep all the cannabis they buy themselves varies from 54% in the Czech Republic to 84% in Italy. Between 7% (Italy) and 26% (the Czech Republic) give or sell less than 25%. Proportions of users who give or sell more than half of their purchase are relatively low.

**Figure 4.2: Proportion of cannabis usually sold or given away and country\***



\* Percentage of users according to the proportion of cannabis sold or given away.

**g. Buying in the past 30 days: number of times and amount of money spent**

Of those respondents who usually buy their cannabis, 78% had also done this in the past 30 days (figure 4.3). This proportion was highest for intensive and regular users (95% and 87%, respectively), followed by occasional users (67%), and chippers (43%). Nine percent of the intensive users bought cannabis (almost) daily, and the large majority seems to buy cannabis at least weekly. Among those who had bought cannabis at least once in the past month, the average number of purchases increased from 1.8 among chippers to 8.9 among intensive users (see annex 1, table A15 for country data).

**Figure 4.3: Number of purchases of cannabis in the past 30 days by user group**

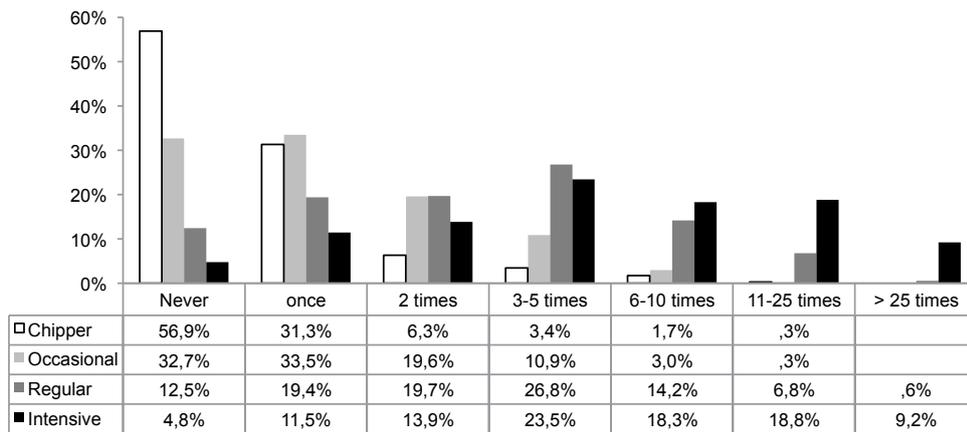


Table 4.8 gives the mean and median amount of money spent in the past 30 days. Note that in Portugal and Bulgaria the number of users per user group, especially the chippers and occasional users, is very small.

For the entire sample, the amount of money spent per month doubles from chippers and occasional to regular users and then again to intensive users. The difference between occasional users and chippers was not significant.

In most countries and user groups, the means are (much) higher than the medians suggesting a skewed distribution with outlying values. In the total sample 99% of the expenditures fell within a range of 1 to 400 Euro. One percent fell between 400 and 600 Euro.

There were notable differences between countries. Swedish cannabis users spent overall the highest amounts of money to buy cannabis and users from Bulgaria, the Czech Republic and Portugal the lowest amounts.

**Table 4.8: Mean and median amount of money (€) spent in the past 30 days by user group and country\***

		Chipper	Occasional	Regular	Intensive
<b>Bulgaria</b>	<b>Mean</b>	<b>15.7</b>	<b>13.6</b>	<b>33.7</b>	<b>71.9</b>
	Median	10.2	15.3	28.1	76.5
	N	8	3	26	10
<b>Czech Republic</b>	<b>Mean</b>	<b>16.3</b>	<b>20.8</b>	<b>37.9</b>	<b>72.6</b>
	Median	10.0	16.0	28.0	60.0
	N	6	12	46	57
<b>Italy</b>	<b>Mean</b>	<b>70.4</b>	<b>30.2</b>	<b>77.4</b>	<b>132.5</b>
	Median	20.0	20.0	50.0	100.0
	N	13	44	186	189
<b>Netherlands</b>	<b>Mean</b>	<b>16.0</b>	<b>21.0</b>	<b>56.9</b>	<b>141.2</b>
	Median	10.0	15.0	40.0	125.0
	N	80	95	161	169
<b>Portugal</b>	<b>Mean</b>	<b>8.3</b>	<b>8.3</b>	<b>36.3</b>	<b>80.8</b>
	Median	5.0	10.0	40.0	62.5
	N	3	3	16	20
<b>Sweden</b>	<b>Mean</b>	<b>57.9</b>	<b>75.1</b>	<b>116.8</b>	<b>185.0</b>
	Median	44.0	55.0	88.0	165.0
	N	34	68	135	63
<b>England &amp; Wales</b>	<b>Mean</b>	<b>25.2</b>	<b>48.0</b>	<b>87.6</b>	<b>145.2</b>
	Median	24.0	24.0	60.0	120.0
	N	6	22	34	48
<b>All countries</b>	<b>Mean</b>	<b>30.9</b>	<b>39.9</b>	<b>75.4</b>	<b>132.7</b>
	Median	15.0	24.0	50.0	100.0
	N	150	247	604	556

\*Among those who had bought cannabis at least once in the past 30 days.

#### ***h. Ease of obtaining cannabis and inability to buy***

Indicators of the ease of obtaining cannabis included the estimated time respondents needed to obtain the cannabis they usually purchased, the ease to obtain cannabis within 24 hours and whether they sometimes wanted to buy cannabis but were not able to do so.

Table 4.9 shows that the proportion of cannabis users who estimated to obtain their cannabis within half an hour is by far highest in the Netherlands (71%), at some distance followed by the Czech Republic (44%), and was lowest in Sweden (22%), Italy (27%) and Portugal (28%). The proportion of users it may take more than two hours to obtain their cannabis varied from 5% in the Netherlands and 17% in the Czech Republic to between 30% and 40% in the other countries.

While population density and country size may probably play a role in these statistics, the presence of coffee shops in the Netherlands where most cannabis users indicated to buy their cannabis will probably explain differences between the Netherlands and other countries. Note, however, that this survey was conducted just before certain policy measures were implemented in the Netherlands (see chapter 1), which might have had an impact on these variables.

Differences between user groups were significant in Bulgaria and Italy, but note that the number of users per cell was often too low to conduct subgroup analyses. In Bulgaria the proportion of intensive users who needed less than half an hour to obtain their cannabis was higher (58%, n=7) compared to chippers (18%, n=4). In Italy a similar pattern was found (%, n=74 against 21%, n=7); moreover, the proportion chippers who estimated it might take them more than 24 hours to get their cannabis was higher compared to intensive users (30%, n=10 against 12%, n=26).

**Table 4.9: Estimated time needed to buy the amount of cannabis usually purchased**

	BG	CZ	IT	NL	PT	SE	E&W	All
<b>Less than half an hour</b>	34.3%	43.5%	26.7%	70.9%	28.3%	22.4%	27.9%	42.2%
<b>0,5-1 hour</b>	30.0%	30.5%	22.0%	19.1%	21.7%	23.3%	19.7%	22.0%
<b>1-2 hours</b>	5.7%	9.1%	11.7%	5.1%	11.7%	19.8%	22.4%	11.6%
<b>Between 2 and 12 hours</b>	14.3%	9.7%	9.8%	2.8%	5.0%	16.3%	9.5%	8.8%
<b>Between 12 and 24 hours</b>	2.9%	3.9%	13.0%	.6%	8.3%	5.4%	3.4%	5.4%
<b>More than 24 hours</b>	12.9%	3.2%	16.9%	1.5%	25.0%	12.8%	17.0%	10.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.10 shows that the proportion of users who indicate that cannabis is very easy to obtain within 24 hours, is highest in the Netherlands (82%). This finding is consistent with the previously mentioned data. In other countries the proportion 'very easy' varies from about 32% in Italy and Portugal to 57% in the Czech Republic. One in five users in Italy indicates that it is fairly or very difficult to obtain cannabis within 24 hours.

As expected the amount of time to obtain cannabis and ease to obtain cannabis were significantly correlated ( $r=-.057$ ,  $p<.000$ ).

In virtually all countries, the proportion of respondents indicating that it was very easy to obtain cannabis was obviously higher among intensive users compared to less frequent users, except for the Netherlands, where cannabis was very easy available for the majority of all user types.

**Table 4.10: Proportion of cannabis users indicating how easy or difficult it is to obtain cannabis within 24 hours**

	BG	CZ	IT	NL	PT	SE	E&W	All
<b>Very difficult</b>	.6%	.0%	5.9%	.4%	5.6%	4.3%	3.9%	3.0%
<b>Fairly difficult</b>	8.3%	5.0%	15.3%	1.4%	9.5%	10.6%	12.0%	8.6%
<b>Fairly easy</b>	26.8%	34.0%	38.3%	13.7%	41.3%	33.9%	38.2%	29.8%
<b>Very easy</b>	54.1%	56.8%	31.8%	81.8%	32.5%	46.9%	41.6%	53.0%
<b>Don't know</b>	10.2%	4.3%	8.7%	2.7%	11.1%	4.3%	4.3%	5.6%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

### **Unable to buy**

There were similarly great variations between users in the different countries who indicated that they had cash but were now and then unable to buy cannabis in the past 12 months. The lowest proportion was found in the Netherlands (18%) and the highest in Italy (78%).

Significant differences between user groups were found in Italy, the Netherlands and Sweden. In Italy the proportion of users who had now and then problems in obtaining cannabis ranged from 55% among chippers to 75% among intensive users. This finding probably relates to the lower frequency of buying cannabis among chippers. In the Netherlands this proportion varied from 5% among chippers and 9% among occasional users to 28% among regular and 29% among intensive users. In Sweden a less clear pattern was found: 42% among chippers, 60% among occasional users, 66% among regular users and 56% among intensive users.

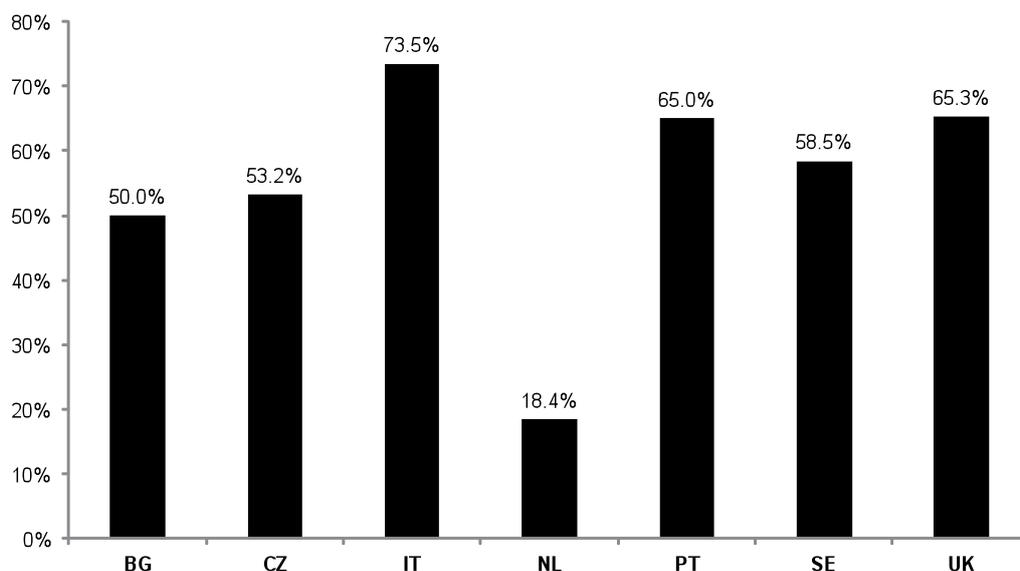
**Figure 4.4: Proportion cannabis users who indicated that there were times they had cash but were not able to purchase cannabis in the past 12 months**

Table 4.11 shows the main reasons for not being able to buy cannabis while having money available. Only a select group of users have answered this question, i.e. only those who usually buy their cannabis and who had times they were unable to acquire the drug. The most commonly cited reasons were that no sellers were available or that sellers did not have any cannabis. Quality played a role for 10% to 14% of the users in all countries, with lower proportions reported in Bulgaria and the Netherlands. Police activities and too high prices were relatively infrequently mentioned reasons.

In the Netherlands, the largest category comprised 'other reasons', including items like 'shops closed', 'no transportation' or 'personal (health) problems'.

**Table 4.11: Reasons for not being able to buy cannabis**

	BG	CZ	IT	NL	PT	SE	E&W	Total
<b>No sellers were available</b>	60.0%	41.5%	29.9%	30.3%	17.9%	40.9%	33.3%	34.6%
<b>Sellers did not have any</b>	14.3%	39.0%	39.6%	6.8%	43.6%	36.1%	45.8%	34.4%
<b>Sellers did not have the quality I wanted</b>	8.6%	12.2%	13.8%	4.5%	12.8%	10.4%	10.4%	11.1%
<b>Sellers were charging too much</b>	8.6%	2.4%	3.3%	.8%	7.7%	2.2%	2.1%	2.9%
<b>Police activity kept me from the sellers</b>	2.9%	2.4%	4.1%	2.3%	.0%	.7%	2.1%	2.5%
<b>Don't know</b>	2.9%	1.2%	4.1%	9.1%	7.7%	1.9%	1.0%	3.7%
<b>Other</b>	2.9%	1.2%	5.1%	46.2%	10.3%	7.8%	5.2%	10.8%
<b>Number</b>	35	82	391	132	39	269	96	1,044
	100%	100%	100%	100%	100%	100%	100%	100%

#### ***i. Comparing methods of estimating consumption in the past month***

In chapter 3.4.f we have estimated the amount of cannabis consumed in the past 12 months by multiplying the number of units usually consumed with the amount of cannabis usually put in a unit and the average number of use days. We can also do this for the consumption of cannabis in the past 30 days or month.

Another method of estimating the amount of cannabis consumed is by dividing the total amount of money spent in the past 30 days by the estimated usual cost per gram of cannabis. As not all cannabis bought in the past month is consumed by the buyer himself, we have to take the proportion of cannabis usually sold or given away into account.

Note that this comparison can only be done for those who have bought cannabis at least once in the past month and have used cannabis in the past month. This is therefore a fairly selective group of users, especially as it concerns the less frequent user groups (chippers and occasional users). Therefore a differentiation into user groups is not useful and in fact not necessary as the main focus is on investigating the degree of concordance between measures.

Table 4.12 shows the mean and median values using both estimation methods. Averages and medians are fairly similar. However, there were some more extreme values under the second method; 0.7% of the cases estimated under the second method concerned amounts higher than 140 gram in the past month, and 90% fell below 25 gram. Under the first method 0.4% concerned cases above 90 grams, and 90% of the values fell below 32 gram.

However, both measures were only weakly correlated in the entire sample ( $r=.28$ ,  $P=.000$  for all units;  $r=.29$ ,  $P=.000$  for joints only). There are many uncertainties and possible sources of error, e.g. when estimating amounts from photo cards, or estimating prices of usual amounts bought and from there estimating prices per gram, and when estimating usual proportions of cannabis sold or given away (with fairly broad answer categories). This is probably the reason why correlations are better when only the amount of money spent in the past 30 days is correlated with the amount consumed based on the number of use days and grams per day ( $r=.52$ ,  $P=.000$ ).

There are, however, differences between countries in the consistency between estimation methods (see annex 1, table A16). Correlations between both consumption measures varied from .23 in Sweden to .51 in Portugal and .55 in the Netherlands. In the Czech Republic correlations increased from .31 to .43 when only joints were taken into account. Means and medians do not show a consistent pattern in that one or other method systematically overestimates or underestimates the amount consumed.

As indicated before, correlations were higher for the amount of cannabis consumed (gram/use days and the amount of money spent in the past 30 days, with Pearson's  $r$  ranging from between .47 in Bulgaria to .55 in England & Wales and Sweden, to .59 in Portugal and .69 in the Netherlands. Moreover, if only joints were taken into account correlations increased in the Czech Republic from .43 to .71 (all significant at .002 or higher).

**Table 4.12: Estimates of the amount of cannabis consumed (gram) in the past 30 days using different methods and for all units together and joints separately**

	All units		Joints	
	Amount of cannabis (gram) based on number of use days and daily amount*	Amount of cannabis (gram) based on money spent and price per gram**	Amount of cannabis (gram) based on number of use days and daily amount*	Amount of cannabis (gram) based on money spent and price per gram**
Mean	11.99	12.45	11.80	12.77
Median	4.80	5.00	4.80	5.25
Std. Deviation	16.99	29.42	16.43	29.89
Minimum	.03	.00	.03	.00
Maximum	129.69	560.00	129.69	560.00
N	1,307	1,307	1,127	1,127

\* Grams per typical use day (amount per unit x number of units) \* number of use days in past 30 days.

\*\*Grams bought in past 30 days\*(100-percent usually sold or given away)/100.

## 4.1 Conclusions

Similar to the findings on user characteristics and consumption patterns, differences between user groups were found with regard to availability indicators. However, differences between countries feature more prominently than differences between user groups.

In general, the proportion of users who buy their cannabis instead of employing other modes to acquire the drug was highest among regular and intensive users and was lowest among chippers, who most often get cannabis from others (including sharing). Growing cannabis was mentioned between 15% to over 21% of the intensive users in five countries, but hardly

played a role as primary way to obtain cannabis among less frequent users.

Of those users who usually buy their cannabis, the amount of cannabis bought per purchase increased from chippers to intensive users, as did the frequency of buying and amount of money spent on cannabis purchases in the past month. Intensive users also more commonly bought cannabis for others, and more often indicated that it was very easy to obtain the drug, compared to less frequent users.

In addition to these common trends across user groups, there were many more remarkable differences between countries on availability indicators.

- Growing cannabis as the dominant way of obtaining cannabis among intensive users was lowest in the Netherlands (5%) and England & Wales (9%) and highest in the Czech Republic (21%), Italy (19%) and Sweden (18%). Yet, only in the Czech Republic growing seems to play a role in all user groups (10%), suggesting that it is more widespread than elsewhere.
- Locations of purchase: Coffee shops were mentioned as the main location of buying cannabis for the vast majority of users in the Netherlands (87%), while buying on the street or in a park was mentioned by over half of the users in Bulgaria (58%), and by between 20% to 34% in Italy, Sweden, Portugal and England & Wales. Buying at a seller's home was a relevant source especially in the Czech Republic (45%) and for between 21% and 36% in the other countries, except for Bulgaria (10%) and the Netherlands (3%).
- Reasons to buy at a specific location: Personal contacts played a role in all countries (32% up to 63% of the users), except for the Netherlands (6%), where local availability and habits were mentioned relatively often. Risk of police detection as the main reason to buy at a certain location was most often mentioned in Bulgaria and Sweden (16%)
- Availability of other drugs: Excluding the Netherlands, between 26% (the Czech Republic) and 52% (Sweden%) of the cannabis users indicated that other drugs were available at the location where they usually bought cannabis. The relatively low proportion in the Netherlands (14% overall, 9% for those who buy in coffee shops), is likely to reflect the policy of separation of the cannabis and hard drugs markets, but figures in other countries also suggest that cannabis markets at retail level seem to be specialized, albeit to different degrees.
- Amounts bought and prices: Among intensive users, the amount of cannabis bought per purchase was lowest in Bulgaria and highest in Italy, Portugal, Sweden and England & Wales, and prices paid for it were lowest in Bulgaria and highest in Sweden.
- Money spent on cannabis: In the past 30 days, Swedish cannabis users spent by far the greatest amount of money on buying cannabis (on average €185 by intensive users), while cannabis users in Bulgaria, Czech Republic and Portugal spent the lowest amount (e.g. on average €72, €73 and €81, respectively, for intensive users).
- Time and ease to obtain cannabis: The proportion of cannabis users estimating that they would be able to buy their usual amount of cannabis within half an hour was highest in the Netherlands (71%) and varied between 22% (Sweden) and 44% (the Czech Republic) in the other countries. In all countries, the majority of the users indicated that it is easy or very easy to obtain cannabis, but in the Netherlands the qualification "very easy" peaked among users (82%), against about 32% (Italy and Portugal) up to 57% (the Czech Republic) in other countries. Ratings of the 'ease' of obtaining cannabis were correlated with the times needed to obtain it. Note that these findings may be associated with the size of a country and population density, and differences in urbanicity between sample respondents.
- Unable to buy: The proportion of users who was now and then unable to buy cannabis in the past 12 months varied from 18% in the Netherlands up to 78% in Italy. The lack of available sellers or sellers who had no cannabis available were the most frequently cited explanations.

## 5 Estimating annual cannabis consumption

### 5.1 Methodology

In chapter 3 we have presented estimates on the amount of cannabis (gram) consumed annually per user group and country. These data have to be multiplied with the number of users per user group to arrive at a final estimate of the amount of cannabis consumed annually in a country.

In order to estimate the number of users per user group we have to match prevalence data from population surveys with the classification of user types in the current study. This is not as straightforward as it looks.

From most population surveys we can quantify the following categories:

- a. the total number of last year users
- b. the number of last year users who did not use in the last month
- c. the total number of last month users
- d. the number of last month users per frequency category

Using data from Eurostat on the size of the population (2011) and prevalence data from population surveys (see tables 5.1 and 5.2), we can calculate the numbers of last year (category a) and last month (category c) cannabis users. The differences in numbers between both tables belong to category c. Moreover, the Czech Republic, Portugal, Netherlands and England & Wales have applied the frequency categories from the EMCDDA (1-3, 4-9, 10-19, 20+ days), which can be used to estimate category d. For Bulgaria, slightly different ranges have been used, while for Italy estimates of users groups are based on an indirect estimation method (see later). For Sweden frequency data are not available but data from Norway and Finland will be used as a proxy measures. Note that data collection years for the population surveys range from 2007 (Portugal) to 2010/2011 (England & Wales).

Table 5.1: Population size by country and age group (2011)

Country	15-24 years	15-34 years	15-64 years
Bulgaria	891,814	1,985,033	5,141,057
Czech Republic	1,274,659	2,917,541	7,378,802
Italy	6,069,233	13,602,678	39,811,683
Netherlands	2,041,473	4,047,775	11,153,778
Portugal	1,162,855	2,696,370	7,097,788
Sweden <sup>I</sup>	1,250,621	2,414,413	6,113,365
England & Wales	8,207,481	16,443,133	41,177,537

I. 16-24 years (1,140,549), 16-34 years (2,304,341), 16-64 years (6,003,293).

Source: Eurostat (2011)

Table 5.2: Number of last year cannabis users by country and age

Country	Year of survey	Age <sup>I</sup>		
		15-24	15-34	15-64
Bulgaria	2008	77,588	119,102	138,809
Czech Republic	2008	475,448	828,582	1,128,957
Italy <sup>II</sup>	2008	1,353,439	2,761,344	5,693,071
Netherlands	2009	328,677	554,545	780,764
Portugal	2007	76,748	180,657	255,520
Sweden <sup>I</sup>	2010	91,295	149,694	171,174
England & Wales	2010/2011	1,403,479	2,055,392	2,800,073

I. Age limits in England & Wales 16 – 59 and in Sweden 16-64. II. Low response rate (32%); figures should be interpreted with caution.

Indirect estimates on the number of cannabis users are applied in calculations on annual consumption.

Sources: EMCDDA, Statistical Bulletin 2012; National Reports of Focal Points; contact persons of the sample countries; Eurostat.

**Table 5.3: Number of last month cannabis users by country and age**

Country	Year of survey	Age <sup>I</sup>		
		15-24	15-34	15-64
Bulgaria	2008	43,699	61,536	71,975
Czech Republic	2008	285,524	487,229	634,577
Italy <sup>II</sup>	2008	667,616	1,346,665	2,747,006
Netherlands	2009	167,401	311,679	468,459
Portugal	2007	47,677	121,337	170,347
Sweden <sup>I</sup>	2010	27,514	50,703	61,134
England & Wales	2010/2011	738,673	1,118,133	1,564,746

*I. Age limits in England & Wales 16 – 59 and in Sweden 16-64. II. Low response rate (32%); figures should be interpreted with caution. Indirect estimates on the number of cannabis users are applied in calculations on annual consumption.*

**Sources:** EMCDDA, Statistical Bulletin 2012; National Reports of Focal Points; contact persons of the sample countries; Eurostat.

For Italy, the population surveys in the past years have been considered unreliable due to very low response rates (see chapter 2). Using a combination of an indirect method and population survey data, the total number of last year cannabis users in 2011 was estimated at 8.1 million (Santoro et al. 2011); personal communication prof. dr. C. Rossi).

### **Matching users with user groups**

In the prior drugs market study a classification was made between heavy users (past month users, cat. c) and light users (category b). In the present study we will refine this classification in two ways: by differentiating according to the frequency of use of last month users and by taking into account that past month users do not use each month in the past 12 month, especially the less frequent users.

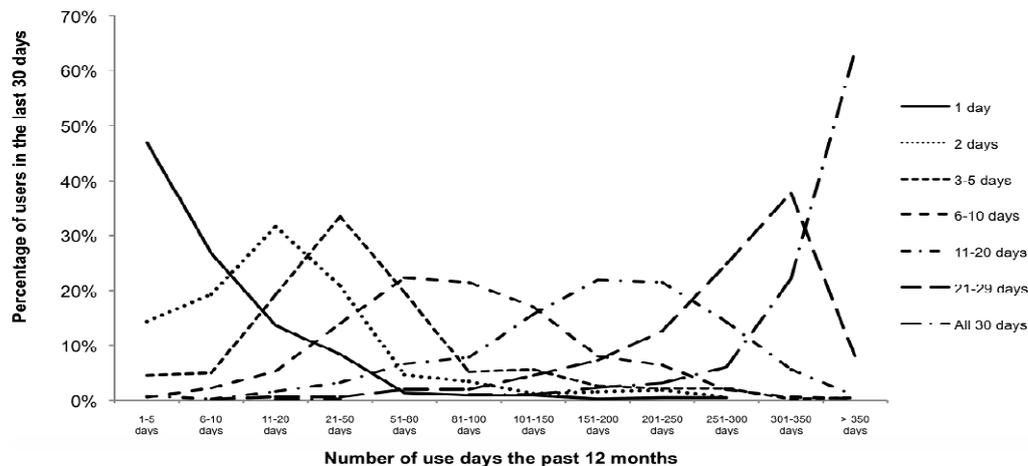
This last finding seems to deviate from prior studies that assumed that past month use could be extrapolated by multiplying frequencies by 12, although it was also acknowledged – but not empirically demonstrated - in a Finnish cannabis market study that past month users may consume cannabis irregularly, even those who consumed nearly every day in the past month (Hakkarainen et al. 2008).

Findings from the current study suggest that this can result in an overestimation of the annual number of use days. Figure 5.1 shows for the past month users in the total sample on how many days they had used in the past month and in the past 12 months. For this analysis we have only selected respondents who had used only hash or marihuana in the past year, to avoid possible misclassification among those who had consumed both and were asked separate questions on hash and marihuana. About half of the users who consumed cannabis on one day in the past month did so on only 1-5 days in the past 12 months. Thus, they apparently did not consume once every month. Similarly, over half of the daily users (63%) actually consumed all days in the past year, but this also means that quite a number consumed less.

Table 5.4 gives the match between last month users by frequency category and the user group, which is based on the number of use days in the past 12 months. As data from population surveys only provide frequencies for last month use and do not allow an estimation of the distribution of last month users over these user categories, the data from this web survey may guide us in this exercise.

Because sample sizes do not seem to be sufficiently large in all countries, we will use data for the total sample to investigate how last month users (and last year but not last month users) are distributed over the different user categories.

Figure 5.1: Percentage of users in the past 30 days by number of use days in the past 12 months



\* For users of only marijuana or only hash in the entire sample (N=1,631)

Table 5.4 shows that indeed the majority of those who had used in the past year but not in the past month (88%) could be classified as chipper. Moreover, two-thirds of those who had used cannabis on one or two days in the past month also belonged to the group of chippers. On the other extreme, the majority of those who used on 20 days or more could be classified as intensive users (84%). Almost three-quarters of those who used on 11-20 days fell within the group of regular users. Those who used cannabis in the past month (almost) weekly up to a couple of times a week were almost equally distributed over the group of occasional and regular users.

Table 5.4: Distribution of last year users over user groups on the basis of their number of use days in the past month (all countries)\*

	0	1 - 2	3 - 10	11 - 20	>20
Chipper	87.5%	68.4%	10.5%	3.0%	0.4%
Occasional user	7.4%	27.4%	42.2%	6.7%	1.7%
Regular user	4.3%	3.9%	45.7%	76.3%	14.5%
Intensive user	0.8%	0.2%	1.6%	14.1%	83.5%

\* Users of only marijuana and only hash (N=1,631)

As noted in the introduction, the frequency categories for last month use in the web survey did not exactly match those indicated in the model questionnaire of the EMCDDA. Therefore, the numbers of users as obtained for the different user groups will be recalculated under the assumption of an equal distribution of users per use day within frequency categories, which might be questionable but still seems the most appropriate way in the absence of more detailed data. Moreover, insofar samples sizes were large enough to allow analyses per country, the results showed roughly the same distributions.

Thereafter the proportions listed in table 5.4 will be matched with the numbers of users estimated on the basis of population surveys in the Czech Republic, Netherlands, Portugal and England & Wales. For Sweden, data on the frequency of use in the past month are not available. As a proxy measure, we will use data from population surveys in Norway and Finland, which may be a better reflecting of the situation in Sweden compared to an overall measure based on European averages. For Bulgaria, a similar method will be applied but with different frequency categories, adapted to those applied in the 2008 population survey. For Italy, indirect estimates of the numbers of users per user category will be used (see later).

### Assumptions and methodological considerations

Once we have obtained the number of users per user group (chippers, occasional users, regular users and intensive users) in each country, we may estimate the amount of cannabis consumed annually by multiplying these figures with estimates of the mean annual consumption per individual per user group. However, there are several methodological issues to consider first.

#### Extrapolation of annual consumption from web survey sample to general population

We have seen in chapter 3.4 that the amount of cannabis consumed annually may depend on the type of unit, being male or female or being a younger or older user, although such differences are not apparent and/or significant in each country. Whether these differences should be taken into account depends on whether we can expect that the characteristic in question

is highly differently distributed in the general population compared to our web survey sample. For example, if in this survey younger people have been found to consume more cannabis annually compared to older users, while they seem to be overrepresented compared to the general population, this will result in an overestimate of the amount of cannabis consumed annually in a country. In this case it would be necessary to make different estimates per age group. Age differences were significant in the Czech Republic and the Netherlands. Hence, consumption estimates in these countries were made separately for age groups 15-24 and 25-64 years.

It was not possible to differentiate between male and female users, since in most countries the number of female users was too low (especially among intensive users) to allow separate consumption estimates. Nonetheless, in most countries this would probably not make a big difference, since gender distributions in the web survey and in the general population surveys seemed to match fairly well. Moreover, in the overall analyses, neither the main gender effect nor the interactions with user groups and/or countries was significant.

Moreover, estimates will be based for user of all types of units included in Bulgaria, the Netherlands, Italy, Portugal, and Sweden. In these countries, the distribution of the main types of units consumed seemed to correspond with the 'normal' situation and/or no major differences were found in annual consumption for these types of units. In the Czech Republic and England & Wales, estimates will be presented both for all types of units as well as joints only, since differences might be expected in these countries. In the Czech Republic taking all units together is expected to give a more reliable estimate compared to an estimate based on joints only, but the reverse is true in England & Wales (see chapter 3.4.b).

#### *Uncertainty of estimates and sources of error*

Estimates will be based on the 5% trimmed means of the annual consumption estimates per user group as the best estimate. A low and high estimate based on the 95% confidence intervals around these means will be presented as well. It should be noted, however, that there are many sources of error that may affect the precision of the estimates. We will show for some of these potential sources, what their impact could be, while making a priori assumptions on the margins of error. Examples are the amounts per unit as estimated by the photo card method, or the maximum allowed amount of cannabis per unit, which was truncated at 0.4 gram. There are, however, many more possible sources of error, like underreporting and underestimation of the number of users (see 'undercoverage'). Due to data limitations it was not possible to give a full account of these factors. In future studies their potential impact might be investigated in statistically more sophisticated approaches, like Monte Carlo like simulation models (see for example Pudney et al. 2006).

#### *Undercoverage*

As population surveys generally do not capture marginalized populations of problem drug users, or do so to a very low extent, we will use data on cannabis use from the face-to-face interviews among these users together with existing estimates of the size of these populations, to correct for such undercoverage. We then have to accept that part of the cannabis using population may still be missing, e.g. those institutionalized or homeless and other marginalized populations not using other illicit drugs except for cannabis. Moreover, the face-to-face interviews provided (limited) data on the last month prevalence and number of use days among problem users. However, the amounts consumed per day could not be reliably assessed and there are also surprisingly little data on this topic in the literature. The number of problem drug users will be distributed over the groups of occasional, regular and intensive users, so that the average number of use days in the past month will match the average reported in the face-to-face interviews. It should be kept in mind that it is not known whether consumption patterns are indeed the same for this population of users compared to those recruited in the web survey.

It is further assumed that the population younger than 15 years or older than 64 years has zero cannabis consumption, which is of course not tenable given figures on cannabis use from school population surveys. Nonetheless, it seems to be a fair assumption that in these age groups the number of regular users and intensive users, who are responsible for the largest share of the amount of cannabis consumed, is negligible.

#### *Time frame*

The most recent data on the size of the population in each country are from 2011 (Eurostat). Data on consumption patterns were collected in the web surveys in Spring 2012, while data on the prevalence of cannabis use were sampled between 2007 (Portugal) up to 2010/2011 (England & Wales). We have calculated estimates under the assumption that rates of cannabis use remained stable since the last survey, which may be questionable especially in countries with less recent surveys, like Bulgaria (2008), the Czech Republic (2008), Portugal (2007) and the Netherlands (2009). Therefore, estimates do not precisely reflect the 2011/2011 situation, but may be higher or lower depending on recent developments in cannabis use.

We will now first make the final estimates separately for each country and discuss which estimate would seem most appropriate given the specific consumption habits and population characteristics in that country. Thereafter we will integrate findings, show the findings from some sensitivity analyses and make a comparison with prior estimates for four of the sample countries.

## 5.2 Country estimates

### 5.2.1 Bulgaria

There were no significant age group differences and also no differences between types of units with regard to the amount of cannabis consumed in the past 12 months. Therefore data for all units will be included in the estimate and there will be no distinction between age groups. As noted before, the proportion of females in the web survey sample was relatively high in Bulgaria, even higher compared to the proportion of females in the general population surveys, which was already high compared to other countries. However, as there was no gender difference in the amount of cannabis consumed per year, this was expected to have no impact on the overall consumption estimate at population level.

Table 5.5 shows the number of users within user categories on the basis of the classifications in the general population survey in 2008, which were adapted to match the frequency categories of the web survey<sup>3</sup>.

**Table 5.5: Numbers of cannabis users in Bulgaria (15-64 years)\***

	Number of users
Last year	138,809
Last year – not last month	66,834
Last month	113,103
• 1 - 2 days	41,560
• 3 - 10 days	14,990
• 11-20 days	4,930
• > 20 days	10,494

\* Prevalence data from 2008 GPS; population size data from EUROSTAT 2011. Last month frequency categories have been recalculated to match those of the web survey.

Table 5.6 shows the number of cannabis users for each of the user categories as defined in the web survey (chippers, occasional, regular and intensive users) by applying the proportions given in table 5.4 to the number of users listed table 5.5. Of all last year cannabis users, half (50%) belonged to the group of chippers, 22% to the group of occasional users and 16% were regular users. Intensive users formed with 11% the smallest group.

**Table 5.6: Numbers of last year cannabis users per user group in Bulgaria (15-64 years)**

	Total	% of all users
<b>Chipper</b>	88,712	64%
<b>Occasional user</b>	23,150	17%
<b>Regular user</b>	16,648	12%
<b>Intensive user</b>	10,299	7%
<b>Total</b>	138,809	100%

Table 5.7 shows the trimmed averages and upper and lower bound amounts of the 95% confidence intervals consumed per individual user in each user group. Multiplying these values with the number of users within each user group, yields a total amount of cannabis consumed in Bulgaria varying from 2.6 to 5.2 tons, with a (trimmed) mean of 3.8 tons. More than three quarters (77%) can be attributed to the group of intensive users, 18% to the regular users, 3% to the occasional users and 2% to the chippers.

<sup>3</sup> Recalculations were done under the assumption of an equal distribution of cases within each frequency %category.

**Table 5.7: Amount of cannabis consumed per user type and total amount consumed per year in Bulgaria (all units)\***

		Amount (gram) per user per year	Amount (ton) consumed at population level
<b>Chipper</b>	95% CI - lower bound	0.56	0.05
	95% CI - upper bound	0.84	0.07
	<b>5% trimmed mean</b>	<b>0.66</b>	<b>0.06</b>
<b>Occasional user</b>	95% CI - lower bound	3.80	0.09
	95% CI - upper bound	7.86	0.18
	<b>5% trimmed mean</b>	<b>5.40</b>	<b>0.13</b>
<b>Regular user</b>	95% CI - lower bound	31.67	0.53
	95% CI - upper bound	60.87	1.01
	<b>5% trimmed mean</b>	<b>39.82</b>	<b>0.66</b>
<b>Intensive user</b>	95% CI - lower bound	186.44	1.92
	95% CI - upper bound	384.32	3.96
	<b>5% trimmed mean</b>	<b>282.55</b>	<b>2.91</b>
<b>Total</b>	95% CI - lower bound		2.59
	95% CI - upper bound		5.23
	<b>5% trimmed mean</b>		<b>3.76</b>

\* 5% trimmed means, excluding the 2.5% lowest and 2.5% highest values. CI=confidence interval.

### ***Underreporting and undercoverage***

There are no sources providing information on a possible underreporting of cannabis use in the general population survey. However, it is important to note that the past month prevalence of cannabis use in the GPS of 2008 has been set at 1.4%, but that a different phrasing of the questions yielded a last month prevalence of 2.2% (see chapter 2)<sup>4</sup>. If this last figure would be more reliable, this would have great impact on the final estimate. In this case, the numbers of last month users would increase and the distribution of users across user groups would be different: 50% chippers, 22% occasional users, 16% regular users and 11% intensive users. The corresponding amounts of cannabis consumed by these users would be 0.50 tons, 0.16 tons, 0.90 tons and 4.40 tons, with a total of 5.52 tons. This is an increase of 47% compared to the 3.76 tons reported before.

As far as undercoverage is concerned, it is quite likely that the population of problem opiate and stimulant users have not been included in the estimates on the number of users in the basis of the GPS. In 2009, the size of this population in Bulgaria has been estimated at between 23,050 and 42,920, with a midpoint estimate of 31,316 (EMCDDA 2012b). According to the face-to-face interviews, 11 out of 48 users had used cannabis in the past month, and they did so on 6 days on average. If we take it as representative for the Bulgarian problem drug users, about one-fourth (23%) would be a past month user<sup>5</sup>. If 75% would belong to the group of occasional users, 15% to the group of regular users and 10% to the group of intensive users, this would yield an average number of use days of slightly over 6. Then the overall cannabis consumption estimate would increase with 0.20 to 0.38 tons (midpoint 0.28 tons), which is 5% to 10% (midpoint 7%).

### **5.2.2 Czech Republic**

In the Czech Republic, annual consumption differed between types of units: higher amounts are found for pipe smokers compared to those who smoke joints. There are no data on the prevalence of joint smokers against pipe smokers in the general population. Based on expert opinions, pipe smoking seems to be relatively popular in the Czech Republic and including these users would give a better picture than excluding them. Nonetheless, we will also show what happens when including only smokers of joints.

<sup>4</sup> According to the Bulgarian contact person (M. Vassilev), the first measure was obtained through two questions: "Have you ever used during the last 30 days marijuana..." and "... hashish?". The total for cannabis is a combination between the positive answers of the two questions. The second measure is through question: "In the case you have smoked marijuana or other form of cannabis during the last 30 days in how many days you have done it?"

<sup>5</sup> This seems to be an acceptable assumption. In a study among 901 PHUs carried out by the Bulgarian Focal Point, 16% had used cannabis in the past month. Probably, cannabis consumption is slightly higher among problem stimulant users.

Since overall annual consumption turned out to be significantly different between the two age groups (15-24 and 25-64 years;  $F=6.7$ ,  $P=.01$ ; age by user group  $F=5.4$ ,  $P=.001$ ) and young people were clearly overrepresented among respondents in the web survey, it was deemed important to distinguish between age groups.

Table 5.8 shows the number of users within user categories on the basis of the classifications in the general population survey in 2008, which were adapted to match the frequency categories of the web survey<sup>6</sup>. The frequency of last month use was available for age group 15-64 and 15-34 years, which were roughly similar, and secondary analyses showed that this also applied to the frequency of last month use for age group 15-24 years.

Table 5.9 shows the number of cannabis users for each of the user categories as defined in the web survey (chippers, occasional, regular and intensive users) by applying the proportions given in table 5.4 to the number of users listed table 5.8. Of all last year cannabis users, almost half (52%) belonged to the group of chippers, 20% to the group of occasional users and 22% were regular users. With 6% intensive users were clearly the minority.

**Table 5.8: Numbers of cannabis users in the Czech Republic\***

	15-24**	25-64	Total
<b>Last year users (total)</b>	475,448	653,509	1,128,957
<b>Last year – not last month</b>	189,924	304,456	494,38
<b>Last month</b>	285,524	349,053	634,577
• 1 - 2 days	81,5783	100,432	182,011
• 3 - 10 days	133,924	166,639	300,563
• 11-20 days	45,301	53,039	98,339
• > 20 days	24,721	28,943	53,664

\* Prevalence data from 2008 GPS; population size data from EUROSTAT 2011. Last month frequency categories have been recalculated to match those of the web survey.

\*\*Frequency distribution in the past month for age group 15-24 years is not available. Proportions for age group 15-34 years have been applied to last month prevalence rates for age group 15-24.

**Table 5.9: Numbers of last year cannabis users per user group in the Czech Republic**

	15-24	25-64	Total	% of all users
<b>Chipper</b>	237,630	354,473	592,103	52%
<b>Occasional user</b>	96,284	124,282	220,566	20%
<b>Regular user</b>	110,750	137,922	248,672	22%
<b>Intensive user</b>	30,784	36,832	67,616	6%
<b>Total</b>	475,448	653,509	1,128,957	100%

Now we have estimated the number of users per user group we can calculate the amount of cannabis consumed annually by the different user groups in the Czech Republic by multiplying the average amount of cannabis consumed per user group and numbers of users. This will be done for the two age groups separately, and by adding those data we will obtain national estimates for the population of 15-64 years. We will also show what happens if we would not have differentiated by age group.

<sup>6</sup> Recalculations were done under the assumption of an equal distribution of cases within each frequency category.

**Table 5.10: Amounts of cannabis consumed annually per user type in the Czech Republic (all units)\***

		15-24	25-64	Total**
<b>Chipper</b>	95% CI - lower bound	0.90	0.75	0.99
	95% CI - upper bound	1.72	1.94	1.65
	<b>5% trimmed mean</b>	<b>1.11</b>	<b>1.15</b>	<b>1.12</b>
<b>Occasional user</b>	95% CI - lower bound	7.84	6.22	8.16
	95% CI - upper bound	13.72	12.88	12.61
	<b>5% trimmed mean</b>	<b>9.58</b>	<b>8.94</b>	<b>9.38</b>
<b>Regular user</b>	95% CI - lower bound	54.58	25.65	52.92
	95% CI - upper bound	100.89	89.94	90.23
	<b>5% trimmed mean</b>	<b>60.73</b>	<b>41.42</b>	<b>54.28</b>
<b>Intensive user</b>	95% CI - lower bound	314.28	160.40	283.41
	95% CI - upper bound	444.33	273.30	384.92
	<b>5% trimmed mean</b>	<b>350.70</b>	<b>204.30</b>	<b>303.76</b>

\* 5% trimmed means, excluding the 2.5% lowest and 2.5% highest values. CI=confidence interval.

\*\* Based on overall average for total sample.

**Table 5.11: Total amount of cannabis (ton) consumed in the Czech Republic (all units)\***

		15-24	25-64	15-24 & 25-64	Total**
<b>Chipper</b>	95% CI - lower bound	0.21	0.27	0.48	0.59
	95% CI - upper bound	0.41	0.69	1.10	0.98
	<b>5% trimmed mean</b>	<b>0.26</b>	<b>0.41</b>	<b>0.67</b>	<b>0.66</b>
<b>Occasional</b>	95% CI - lower bound	0.75	0.77	1.53	1.80
	95% CI - upper bound	1.32	1.60	2.92	2.78
	<b>5% trimmed mean</b>	<b>0.92</b>	<b>1.11</b>	<b>2.03</b>	<b>2.07</b>
<b>Regular</b>	95% CI - lower bound	6.04	3.54	9.58	13.16
	95% CI - upper bound	11.17	12.40	23.58	22.44
	<b>5% trimmed mean</b>	<b>6.73</b>	<b>5.71</b>	<b>12.44</b>	<b>13.50</b>
<b>Intensive</b>	95% CI - lower bound	9.67	5.91	15.58	19.16
	95% CI - upper bound	13.68	10.07	23.74	26.03
	<b>5% trimmed mean</b>	<b>10.80</b>	<b>7.52</b>	<b>18.32</b>	<b>20.54</b>
<b>Total</b>	95% CI - lower bound	16.69	10.48	27.17	34.71
	95% CI - upper bound	26.58	24.76	51.34	52.22
	<b>5% trimmed mean</b>	<b>18.71</b>	<b>14.76</b>	<b>33.46</b>	<b>36.77</b>

\* 5% trimmed means, excluding the 2.5% lowest and 2.5% highest values. CI=confidence interval.

\*\* Based on overall average for total sample, not taking differences between age groups into account.

Table 5.11 shows that the overall amount of cannabis consumed per annum is 33.5 tons, which can be attributed for 55% to the group of intensive users, 37% to the group of regular users, 6% to the group of occasional users and 2% to the group of chippers. Note that this distribution is almost the inverse of the frequency distribution of the number of users.

If we would not have considered differences in consumption by age groups, there would be a slight overestimation of the annual consumption. The total amount consumed would then be estimated at 36.8 tons, with an almost similar distribution among users groups as described before.

In these analyses we have included all types of units, which seem to be the most representative situation for the Czech Republic. If we, on the other hand, include only those who smoked cannabis mainly in a joint, the estimates would have been lower (see table 5.12). The total amount consumed would then be 31.5 tons instead of 33.5 tons.

**Table 5.12: Total amount of cannabis (=ton) consumed in the Czech Republic (only joints)\***

	15-24	25-64	Total 15-24 &25-64	Total**
Chipper	0.24	0.40	0.64	0.61
Occasional user	0.83	1.05	1.88	1.88
Regular user	5.04	5.97	11.00	11.09
Intensive user	9.08	8.90	17.98	18.58
<b>Total</b>	<b>15.18</b>	<b>16.32</b>	<b>31.50</b>	<b>32.16</b>

\* Population prevalence data for 2008; consumption patterns for 2012.

\*\* Based on average amount consumed per year according to age distribution in web sample.

### **Underreporting and undercoverage**

There are no sources providing information on a possible underreporting in the Czech Republic. As in other countries the majority of the problem opioids and stimulant drug users may have been missed in general population surveys. In the Czech Republic the population of problem methamphetamine and opioid (mainly buprenorphine) users has been estimated at between 32,000 and 46,300 in 2010, with a midpoint of 39,150 (EMCDDA 2012b). According to the face-face-interviews in the framework of the current project, 12 out of 45 methamphetamine/buprenorphine problem users had consumed cannabis in the past month (27%), with an average of 17 use days. The prevalence seems to be low, but might be related, among others, to the relatively low availability of cannabis to methamphetamine users, given the home made production of methamphetamine and related market.

Using these figures, there would be an additional 10,400 last month cannabis users (27% of the summed midpoint estimate). Further assumed that 10% would be an occasional user, 45% and regular and 45% an intensive user (which would give an average of 17 use days in the past month), they would together consume an additional 1.7 tons of cannabis. This is an additional 5% higher compared to the estimate based on population surveys only.

### **5.2.3 Italy**

For Italy, the number of users per user group has been estimated in three ways (see table 5.13). As in other countries, the first estimate was based on prevalence data from the 2008 population survey, with the addition of 2005 data on the frequency of use among past month users. As the response rate for the 2008 GPS was low (32%), the reliability of the outcomes has been questioned (Rossi 2011). Therefore, the University of Rome applied an indirect estimate using registration data on cannabis dealers, which was used in for a capture-recapture analysis (Zelterman's estimate) to estimate the number of (active) cannabis dealers. These data were combined with data on a customer to seller ratio, informed by the scientific literature to estimate the total population of cannabis users (Bouchard and Tremblay 2005); 32 for cannabis. Moreover, in order to estimate different user groups, data from past month frequency of use from school population surveys were extrapolated. Using this indirect method, the number of last year cannabis users was estimated at 5.9 million (Fabi et al. 2011). Note that this estimate is fairly close to the 5.7 million last year cannabis users estimated by the general population survey in 2008. Occasional users formed the largest group with 51%, followed by chippers (19%), regular users (17%) and intensive users (14%). This distribution across user groups in Italy is different from the pattern seen in most other countries, where chippers form by far the majority of the last year users. However, data on last year users who did not consume cannabis in the past month has not been included in this approach, which may contribute to the underestimation of especially the group of chippers.

Another research group from the Catholic University of Milan has reported yet another estimate of the total number of cannabis users i.e. 7,300,000 (only occasional, regular and intensive users). The method applied by these investigators is very simple, but based on assumptions that cannot be verified easily. They used prevalence data from the GPS 2008, assuming that the number of occasional users was underestimated with 20%. For regular users and intensive users underestimation was assumed to be 30% and 50%, respectively. For chippers no underestimation was assumed. In fact, the assumptions seem to be better suitable for a scenario analysis than for an accurate estimate. In order to better estimate chippers that are not accurately estimated by the former indirect estimation method, the best choice might be to use a hybrid method estimating chippers directly from the GPS and the other groups from indirect method. The corresponding estimates are reported in the last column of table 5.14.

**Table 5.13: Numbers of cannabis users per user group in Italy (15-64 years) according to different estimation methods**

	Estimation based on population survey data*		Indirect estimation method**		Adjusted indirect estimation method***	
	Numbers	%	Numbers	%		%
<b>Chipper</b>	3,305,720	58%	1,100,000	19%	3,305,720	41%
<b>Occasional user</b>	963,027	17%	3,000,000	51%	3,000,000	37%
<b>Regular user</b>	972,868	17%	1,000,000	17%	1,000,000	12%
<b>Intensive user</b>	451,456	8%	800,000	14%	800,000	10%
<b>Total</b>	5,693,071	100%	5,900,000	100%	8,105,720	100%

\* Estimate using population survey data (2008/2005).

\*\* Indirect estimation method using data from registered dealers, a dealer to customer ratio and user group distribution from school surveys (Fabi et al. 2012).

\*\*\* Estimate based the indirect estimation method for occasional, regular and intensive users, corrected for underestimation of the group of chippers on the basis of the GPS data for 2008/2005.

Using the numbers of users per user groups reported in the third column of table 5.13 and the corresponding data on amounts of cannabis consumed per user group individual, table 5.14 lists the amount of cannabis consumed annually per user group in Italy at population level. The total amount is estimated at 384 tons, which can be attributed for 1% to the chippers, 5% to the occasional users, 23% to the regular users and 71% to the intensive users.

**Table 5.14: Amount of cannabis consumed per user type and total amount consumed per year in Italy (all units)\***

		Amount (gram) consumed per user per year	Amount (ton) consumed at population level
<b>Chipper</b>	95% CI - lower bound	0.81	2.68
	95% CI - upper bound	1.37	4.53
	<b>5% trimmed mean</b>	0.84	2.78
<b>Occasional user</b>	95% CI - lower bound	6.25	18.75
	95% CI - upper bound	9.30	27.90
	<b>5% trimmed mean</b>	6.74	20.22
<b>Regular user</b>	95% CI - lower bound	92.85	92.85
	95% CI - upper bound	120.99	120.99
	<b>5% trimmed mean</b>	89.39	89.39
<b>Intensive user</b>	95% CI - lower bound	336.19	268.95
	95% CI - upper bound	408.40	326.72
	<b>5% trimmed mean</b>	339.89	271.91
<b>Total</b>	95% CI - lower bound		383.23
	95% CI - upper bound		480.14
	<b>5% trimmed mean</b>		384.30

\* 5% trimmed means, excluding the 2.5% lowest and 2.5% highest values. CI=confidence interval.

### **Underreporting and undercoverage**

Due to the indirect estimation method applied it is hard to say whether groups of users have been missed. We may assume that the indirect and hybrid estimation methods on the number of cannabis users yields a more comprehensive and reliable estimate compared to the one that would be obtained on the basis of the general population survey only. For illustration, in the latter case (using the figures in the first column of table 5.13), this would result in a total amount of 250 tons of cannabis consumed, instead of 384 tons. This would be almost exclusively caused by the lower number of intensive users and therefore lower consumption (153 against 272 tons), which illustrates the great impact of the reliability of estimates on the number of users within this user group.

## 5.2.4 The Netherlands

Similar to the Czech Republic, it is necessary to make a distinction in consumption between age groups in order to estimate cannabis consumption in the Netherlands, as younger cannabis users have been found to consume more cannabis per annum compared to older users (within user groups). Moreover, younger cannabis users were overrepresented in the web survey compared to the general population survey. Table 5.15 shows the numbers of last year users and last month users in the Netherlands by age group. It has been assumed that the frequency distribution among past month users for age group 15-24 years is similar to that reported for age group 15-34 years. For the Czech Republic this assumption could be roughly confirmed, but we have no data for the Netherlands to verify it.

**Table 5.15: Numbers of last year cannabis users in the Netherlands\***

	15-24**	25-64	Total
<b>Last year users (total)</b>	328,677	452,087	780,764
<b>Last year – not last month</b>	161,276	151,029	312,305
<b>Last month***</b>	167,401	301,058	468,459
• 1 - 2 days	32,253	42,076	74,329
• 3 - 10 days	59,650	87,508	147,158
• 11-20 days	38,365	79,184	117,549
• > 20 days	37,133	92,758	129,891

\* Prevalence data from 2009 GPS; population size data from EUROSTAT 2011. Last month frequency categories have been recalculated to match those of the web survey, under the assumption of an equal distribution of cases within frequency categories.

\*\*Frequency distribution in the past month for age group 15-24 years is not available. Proportions for age group 15-34 years have been applied to last month prevalence rates for age group 15-24.

\*\*\*Numbers from subcategories may not precisely sum to the total due to rounding differences.

**Table 5.16: Numbers of last year cannabis users per user group in the Netherlands**

	15-24	25-64	Total	% of all users
<b>Chipper</b>	170,810	172,941	343,751	44%
<b>Occasional user</b>	49,063	66,391	115,455	15%
<b>Regular user</b>	70,159	122,010	192,169	25%
<b>Intensive user</b>	38,645	91,213	129,858	17%
<b>Total</b>	328,677	452,555	781,233	100%

**Table 5.17: Amounts (gram) of cannabis consumed annually per user type in the Netherlands (all units)\***

		15-24	25-64	Total**
<b>Chipper</b>	95% CI - lower bound	0.9	0.6	0.8
	95% CI - upper bound	1.2	1.4	1.2
	5% trimmed mean	0.9	0.7	0.8
<b>Occasional user</b>	95% CI - lower bound	6.9	3.5	6.4
	95% CI - upper bound	10.0	8.1	8.9
	5% trimmed mean	7.3	4.5	6.5
<b>Regular user</b>	95% CI - lower bound	70.6	33.6	63.1
	95% CI - upper bound	99.1	74.7	86.7
	5% trimmed mean	74.5	40.3	63.2
<b>Intensive user</b>	95% CI - lower bound	338.1	232.1	306.1
	95% CI - upper bound	495.9	358.4	408.0
	5% trimmed mean	367.5	254.6	310.5

\* 5% trimmed means, excluding the 2.5% lowest and 2.5% highest values. CI=confidence interval.

\*\* Based on overall average for total sample.

**Table 5.18: Total amount of cannabis (ton) consumed in the Netherlands (all units)\***

		15-24	25-64	15-24 & 25-64	Total**
<b>Chipper</b>	95% CI - lower bound	0.1	0.1	0.2	0.3
	95% CI - upper bound	0.2	0.2	0.4	0.4
	<b>5% trimmed mean</b>	<b>0.2</b>	<b>0.1</b>	<b>0.3</b>	<b>0.3</b>
<b>Occasional</b>	95% CI - lower bound	0.3	0.2	0.6	0.7
	95% CI - upper bound	0.5	0.5	1.0	1.0
	<b>5% trimmed mean</b>	<b>0.4</b>	<b>0.3</b>	<b>0.7</b>	<b>0.7</b>
<b>Regular</b>	95% CI - lower bound	5.0	4.1	9.0	12.1
	95% CI - upper bound	7.0	9.1	16.1	16.7
	<b>5% trimmed mean</b>	<b>5.2</b>	<b>4.9</b>	<b>10.1</b>	<b>12.2</b>
<b>Intensive</b>	95% CI - lower bound	13.1	21.2	34.2	39.7
	95% CI - upper bound	19.2	32.7	51.9	53.0
	<b>5% trimmed mean</b>	<b>14.2</b>	<b>23.2</b>	<b>37.4</b>	<b>40.3</b>
<b>Total</b>	95% CI - lower bound	18.5	25.6	44.1	52.9
	95% CI - upper bound	26.8	42.6	69.4	71.1
	<b>5% trimmed mean</b>	<b>19.9</b>	<b>28.6</b>	<b>48.5</b>	<b>53.5</b>

\* 5% trimmed means, excluding the 2.5% lowest and 2.5% highest values. CI=confidence interval.

\*\* Based on overall average for total sample, not taking differences between age groups into account.

The total amount of cannabis consumed per year varies between and 44 and 69 tons, with a (trimmed) mean of 49 tons. The large majority comes on account of the intensive users (77%), followed at distance by the regular users (21%). Both the occasional users and chippers make up less than 2% of the annual cannabis consumption (1.4% and 0.6%, respectively).

There is no difference in the total amount of cannabis consumed when only smokers of joints are taken into account (48.4 tons, which is not surprising given the large share of joint smokers versus users of other types of units and the lack of differences in amounts consumed between unit types).

### ***Underreporting and undercoverage***

It has been generally assumed that there is a lower risk of underreporting of cannabis use in countries where consumption or possession for personal use is not criminalized and/or less stigmatized, compared to countries with more repressive policies where fear of negative (social) consequences may withhold users to admit their drug consumption. Nonetheless, underreporting may also play a role in the Netherlands, where cannabis consumption has been decriminalized since the mid seventies (Spijkerman et al. 2009). Moreover, a change of survey mode in 2009, whereby questions on drug use in a face-to-face interview were self-completed by the respondents compared to 2005 (questions asked and entered by interviewer in face-to-face interview), may have contributed to the higher prevalence rates of drug use in 2009. More specifically, last year prevalence was 30% higher (7.0% against 5.4%) and last month prevalence was 27% higher (4.2% against 3.3%). While it cannot be excluded that there has been an increase in cannabis consumption (although there are no clear indications for such an increase), it is likely that at least part of the difference can be attributed to mode differences. Stated otherwise, the risk of underreporting may be low(er) in the 2009 survey.

The estimates do not include consumption by drug tourists, problem hard drug users and the homeless who do not consume heroin and/or crack. Drug tourism, especially in the border towns and Amsterdam, may account for a significant amount of cannabis bought in the Netherlands, part of which may be consumed at location or be transported across the border for personal use or dealing. In 2003 this amount has been estimated between 6.6 and 13.3 tons (Korf 2003). This amount has probably dropped severely since the introduction of the new measures aiming to curb drug tourism (residence and closed club criterion) in the Southern part of the country as of 1 May 2012.

According to the treatment multiplier method, there were some 18,000 PHUs in the Netherlands in 2008. A large part of this population also consumes crack cocaine. According to the face-to-face interviews conducted in spring 2012 among 45 heroin users, 58% had used cannabis in the past month with an average of 15 days. This fits well with data from a sample of heroin users taking part in a medical heroin prescription programme, revealing a last month prevalence of cannabis use 54% and an average of 18 days in the past month (P. Blanken, personal communication). An older study in 2000 reports a past month

prevalence of cannabis use among problem hard drug users of 64%, with an average of 14 use days in the past month (De Graaf et al. 2000). We can assume on the basis of these data that some sixty percent of the PHUs in the Netherlands are past month cannabis users, including one-third occasional users, one-third regular users and one-third intensive users. This user group distribution would give an average of about 14 use days, but note that the real distribution is not known. Under these assumptions, the total consumption of cannabis in the Netherlands would increase with 1.37 tons.

Finally, a recent study among 500 homeless people in the four big cities showed that less than 10% used hard drugs like cocaine and heroin, but 43% consumed (almost) daily cannabis (Van Straaten et al. 2012). Given the low rate of hard drug use, the majority (90%) of this population does apparently not overlap with that of the problem hard drug users. An estimate by Statistics Netherlands arrived at a number of 18,000 homeless people in 2009 (CBS 2010)<sup>7</sup>. If we combine these data, we have to add an additional 7,000 intensive cannabis users, who account for the consumption of 2.16 tons.

Adding the consumption of the populations of problem drug users and homeless population (roughly 3.5 tons), we arrive at an overall estimate of 52 tons, an increase with 7.3% compared to the 48.5 tons in table 5.18.

### 5.2.5 Portugal

There were no significant age group differences and also no differences between types of units with regard to the amount of cannabis consumed in the past 12 months. Therefore data for all units will be included in the estimate and there will be no distinction between age groups.

Table 5.19 show the numbers of last year and last month users based on the 2007 population survey and table 5.20 shows the numbers of users by user group. Note that the proportion of intensive users (25%) is higher compared to all other sample countries.

**Table 5.19: Numbers of cannabis users in Portugal (15-64 years)\***

	Number of users
Last year	255,520
Last year – not last month	85,173
Last month	170,347
• 1 - 2 days	21,009
• 3 - 10 days	38,339
• 11-20 days	42,704
• > 20 days	68,294

\* Prevalence data from 2007; population size data from Eurostat 2011. Last month frequency categories have been recalculated to match those of the web survey.

**Table 5.20: Numbers of last year cannabis users per user group in Portugal (15-64 years)\***

	Total	% of all users
Chipper	94,516	37%
Occasional user	32,186	13%
Regular user	64,494	25%
Intensive user	64,323	25%
Total	255,520	100%

<sup>7</sup> Note that there may differences in definitions of 'homeless', that cannabis use in the big cities may differ from that elsewhere and that this number may have changed between 2009 and 2012.

Table 5.21 shows that the total amount of cannabis consumed in Portugal varies from 13 to 26 tons, with a (5% trimmed) mean of 17 tons. Two thirds (68%) comes on account of the intensive users, followed by regular users (30%), occasional users (2%) and chippers (<1%).

**Table 5.21: Amount of cannabis consumed per user type and total amount consumed per year in Portugal (15-64 years)\***

		Amount (gram) per user per year	Amount (ton) consumed at population level
<b>Chipper</b>	95% CI - lower bound	0.61	0.06
	95% CI - upper bound	1.36	0.13
	<b>5% trimmed mean</b>	<b>0.80</b>	<b>0.08</b>
<b>Occasional user</b>	95% CI - lower bound	6.19	0.20
	95% CI - upper bound	15.64	0.50
	<b>5% trimmed mean</b>	<b>10.27</b>	<b>0.33</b>
<b>Regular user</b>	95% CI - lower bound	48.73	3.14
	95% CI - upper bound	140.28	9.05
	<b>5% trimmed mean</b>	<b>79.46</b>	<b>5.12</b>
<b>Intensive user</b>	95% CI - lower bound	144.38	9.29
	95% CI - upper bound	258.79	16.65
	<b>5% trimmed mean</b>	<b>183.91</b>	<b>11.83</b>
<b>Total</b>	95% CI - lower bound		12.69
	95% CI - upper bound		26.33
	<b>5% trimmed mean</b>		<b>17.36</b>

\* 5% trimmed means, excluding the 2.5% lowest and 2.5% highest values. CI=confidence interval. Population 15-64 years.

### ***Underreporting and undercoverage***

There are no studies known on underreporting in Portugal. There is also no recent estimate on the number of problem drug users in Portugal. For 2005 a number of 44,653 problem drug users was reported, as estimated by the treatment multiplier method (Santos et al. 2011). In the face- to-face interviews, only 2 out of 53 heroin/cocaine users (4%) consumed cannabis. It is not known whether this finding is representative for the Portuguese problem drug users, but it might suggest that this population would not add much to the total amount of cannabis consumed. Confirmation from other studies is needed before this conclusion can be drawn.

### **5.2.6 Sweden**

In the Swedish sample, males seemed to be overrepresented compared to the general population survey, although it is not known whether this would also apply to the population of intensive users, who generally make up the largest share of the total amount of cannabis consumed. Although statistical analyses revealed no significant gender differences in annual consumption within user groups, the number of females among intensive users was too low to allow a gender comparison of cannabis consumption. Hence, no distinction will be made between males and females, but the reader should be aware that this could result in a (probably slight) overestimation of use, if female intensive cannabis users would in fact consume less than males.

Age group differences were not significant. Moreover, the proportion of users who consumed cannabis in other units than joints was too small to have a significant effect on annual cannabis consumption per individual user (see chapter 3.4). It was not necessary to differentiate estimates by these variables.

A bottleneck is the lack of information on frequency of use in the past month, as this variable is not included in the Swedish general population surveys. We will therefore use frequency data from the Norwegian and Finnish population surveys as a proxy for the frequency distribution in Sweden. While this approach is questionable, it seems to be a more appropriate option than applying a kind of European average. We will take the average percentage of both countries per frequency category, but also show what happens when the two frequency distributions are considered as upper and lower limit. Note that the absolute numbers of cases on which these frequencies are based are very low in both Finland and Norway (see subscript table 5.22). This may limit the precision of the estimates.

Table 5.22: Frequency (number of use days) of last month use in Norway and Finland \*

	1-3 days / less than once a week	4-9 days / at least once a week	10-19 days / several times a week	20 days or more / daily or almost daily
Norway (2009)	61.1	11.1	11.1	16.7
Finland (2010)	39.1	39.1	8.7	13.0
Average	50.1	25.1	9.9	14.9

\*Distribution based on N= 25 (Finland) and N=18 (Norway) last month users. Source: EMCDDA. Statistical Bulletin.

Table 5.23: Numbers of cannabis users in Sweden (16-64 years)\*

	Number of users
Last year	171,174
Last year – not last month	110,040
• 1 - 2 days	61,134
• 3 - 10 days	20,419
• 11-20 days	26,159
• > 20 days	6,303

\* Prevalence data from 2010 GPS; population size data from EUROSTAT 2011. Last month frequency categories are based on the averages of the frequency categories in Finland and Norway, and have been recalculated to match those of the web survey.

\*\*Frequency distribution in the past month for age group 15-24 years is not available. Proportions for age group 15-34 years have been applied to last month prevalence rates for age group 15-24.

Table 5.24: Numbers of last year cannabis users per user group in Sweden (16-64 years)\*

	Total	% of all users
Chipper	113,266	66%
Occasional user	25,301	15%
Regular user	23,531	14%
Intensive user	9,076	5%
Total	171,174	100%

Table 5.25: Amount of cannabis consumed per user type and the total amount consumed per year in Sweden (all units)\*

		Amount (gram) consumed per user per year	Amount (ton) consumed at population level
Chipper	95% CI - lower bound	1.04	0.12
	95% CI - upper bound	1.60	0.18
	<b>5% trimmed mean</b>	<b>1.04</b>	<b>0.12</b>
Occasional user	95% CI - lower bound	10.24	0.26
	95% CI - upper bound	16.98	0.43
	<b>5% trimmed mean</b>	<b>9.87</b>	<b>0.25</b>
Regular user	95% CI - lower bound	91.61	2.16
	95% CI - upper bound	128.03	3.01
	<b>5% trimmed mean</b>	<b>90.70</b>	<b>2.13</b>
Intensive user	95% CI - lower bound	325.42	2.95
	95% CI - upper bound	499.32	4.53
	<b>5% trimmed mean</b>	<b>362.79</b>	<b>3.29</b>
Total	95% CI - lower bound		5.49
	95% CI - upper bound		8.16
	<b>5% trimmed mean</b>		<b>5.79</b>

\* 5% trimmed means, excluding the 2.5% lowest and 2.5% highest values. CI=confidence interval.

The total amount of cannabis consumed in Sweden per year is 5.8 tons, which can be attributed for 57% to the intensive users, 37% to the regular users, 4% to the occasional users and 2% to the chippers.

If we apply the frequency distributions for either Norway or Finland (instead of the average), the estimates hardly change (overall 5.9 and 5.7 tons, respectively).

### ***Underreporting and undercoverage***

There are no data on the extent of underreporting of cannabis use in Swedish population surveys. In an older study on cannabis use among conscripts it has been reported that fewer subjects in the cohort interviewed face-to-face claimed to have used cannabis and other illicit drugs compared with similar cohorts that used anonymous questionnaires (Zammit et al. 2002). The Swedish population survey in 2010 was carried out by mail, which might be less sensitive to underreporting than face-to-face interviews.

The population of problem drug users in Sweden was estimated at 29,513 in 2007. In this estimate no distinction is made by type of drug. Given the distribution of drugs among drug users in treatment, amphetamine is more common than heroin, with proportions reported for clients outside prison of 29% for amphetamine and 17% for heroin. The sample of problem drug users in the face-to-face interviews consisted of 18 heroin users and 27 amphetamine users, which might more or less reflect the distribution in the overall population of problem drug users. The last month prevalence of cannabis use in this sample was 60%, with an average of 12 use days in the past month. Assume that 40% of these problem drug users (17,708) not only consumed heroin or amphetamines but are occasional cannabis users, 40% regular users and 20% intensive users, this would give an average of 12 use days in the past month. Taking the estimated annual consumption per user group individual into account, this would increase the total consumption with 1.99 tons (or 34% of the estimate based on the general population survey only). Note that there are many uncertainties in making these estimates, and these findings should therefore be interpreted with caution.

### ***5.2.7 England & Wales***

For England & Wales, estimates will be made for the population of 16-59 years in England & Wales only, since this is the population covered by the British Crime Survey. These regions cover about 87% of the total population in England & Wales (Davies et al. 2011). The different age range will probably have little effect on the comparability of consumption estimates between countries, since the large majority of the population of cannabis users will be aged between 16 and 59 years. Estimates will be made for all units and for users of joints only, since the proportion of users of respondents consuming cannabis in other ways than smoking joints seems to be higher than what would be expected among cannabis users in England & Wales. Since the proportions of users by frequency category in the past month do not sum to 100% but to 91% (due to a weighing procedure, personal communication EMCDDA; see table 5.26), the remaining 9% have been weighed and distributed over all frequencies categories (e.g. 4.5% has been added to the largest category of 1-3 days, and 1.5% to the three other categories).

**Table 5.26: Numbers of cannabis users in England & Wales (16-59 years)\***

	Number of users
Last year	2,800,073
Last year – not last month	1,235,326
Last month	1,564,746
• 1 - 2 days	547,661
• 3 - 10 days	540,620
• 11-20 days	241,753
• > 20 days	234,712

\* Prevalence data from 2010/2011 GPS for England and Wales; population size data from EUROSTAT 2011. Last month frequency categories have been recalculated to match those of the web survey.

Table 5.27: Numbers of last year cannabis users per user group in England &amp; Wales (16-59 years)\*

	Total	% of all users
Chipper	1,521,189	54%
Occasional user	489,271	17%
Regular user	540,365	19%
Intensive user	249,247	9%
<b>Total</b>	<b>2,800,073</b>	<b>100%</b>

Table 5.28: Amount of cannabis consumed per user type and total amount consumed per year in England &amp; Wales (all units)\*

		Amount (gram) per user per year	Amount (ton) consumed at population level
Chipper	95% CI - lower bound	0.6	1.0
	95% CI - upper bound	1.5	2.3
	<b>5% trimmed mean</b>	<b>0.8</b>	<b>1.3</b>
Occasional user	95% CI - lower bound	5.3	2.6
	95% CI - upper bound	11.5	5.6
	<b>5% trimmed mean</b>	<b>6.8</b>	<b>3.3</b>
Regular user	95% CI - lower bound	45.5	24.6
	95% CI - upper bound	88.5	47.8
	<b>5% trimmed mean</b>	<b>55.6</b>	<b>30.1</b>
Intensive user	95% CI - lower bound	307.9	76.7
	95% CI - upper bound	575.6	143.5
	<b>5% trimmed mean</b>	<b>373.8</b>	<b>93.2</b>
<b>Total</b>	95% CI - lower bound		104.9
	95% CI - upper bound		199.2
	<b>5% trimmed mean</b>		<b>127.8</b>

\* 5% trimmed means, excluding the 2.5% lowest and 2.5% highest values. CI=confidence interval. Population of 16-59 years.

If the annual consumption would be based on the consumption patterns of users of all units combined, the total amount consumed in England & Wales ranges from 105 to 199 tons, with a midpoint of 128 tons. Intensive users account for three quarters of this amount (73%), followed at distance by the regular users (24%), occasional users (3%) and chippers (1%).

If the consumption patterns of users of other units than joints would be excluded, this would result in a six tons higher estimate (134 ton, ranging from 96 to 221). As the relatively high proportion of users (especially the more frequent ones) who consumed their cannabis in water pipes and dry pipes, seems to be atypical in England & Wales, the estimate based on joints only seems to be the most representative one (table 5.29).

Table 5.29: Total amount of cannabis (ton) consumed in England &amp; Wales (only joints)\*

	Total	% of all users
Chipper	1.2	54%
Occasional user	3.3	17%
Regular user	26.4	19%
Intensive user	102.8	9%
<b>Total</b>	<b>133.8</b>	<b>100%</b>

\* Population prevalence data for 20010/2011 for England & Wales in age group 16-59 years; consumption patterns for 2012. Estimates based on 5% trimmed means of annual consumption per user.

### ***Underreporting and undercoverage***

There are no data on underreporting of drug use in the British Crime Survey. In a very thorough discussion of estimates of the UK drugs markets, Pudney et al. (2006) reported experimental data on underreporting of drug use on the basis of self-reported drug use and urine or saliva drug tests among arrestees (Pudney et al. 2006). These data suggest that underreporting was much lower for cannabis (5.5%) compared to heroin (18%), but no data are available on the non arrestee population.

According to the UK National Focal point the estimated number of problem opiate/crack users in 2009/2010 was 306,150 in England and 16,389 in Wales (UK, National Report 2011). According to the face-to-face interviews with 45 opiate/crack users, 42% had used cannabis in the past month with an average of 12 use days. However, the median was only 4 days, which suggests a highly skewed distribution. We will show estimates for three different scenarios: if the distribution of users would be 40% occasional, 40% regular and 20% intensive users, if it would be 35%, 50%, 15%, respectively and 25%, 75% and 5%, respectively, which would all give an average of about 12 use days in the past month. The amount of cannabis consumed for these scenarios would be 33.8, 28.6 and 18.2 tons, respectively. Thus, if the consumption of this population of problem drug users is taken into account, the total amount of cannabis consumed in England & Wales increases with 13% to 24% compared to the estimate based on the population survey only.

### ***5.2.8 Overview of the estimates of user groups and cannabis consumption***

Table 5.30 shows the number of last year cannabis users by user group. In all countries, chippers formed the largest group of last year users, with percentages varying from 41% in Italy and 44% in the Netherlands to over 60% in Bulgaria and Sweden. The proportion of occasional users was three times that of regular users in Italy, but in most countries differences between these user groups were fairly small. The proportion of intensive users was lowest in all countries, except for Portugal, where intensive and regular users each made up one-fourth of all users. In five countries, one or less in ten users was an intensive user. Nonetheless, table 5.31 shows that this user group accounted for the largest part of the total amount of cannabis consumed in all countries, with proportions varying from 55% in the Czech Republic up to 77% in Bulgaria, the Netherlands and England & Wales.

**Table 5.30: Number of last year cannabis users by country and distribution over user groups**

	BG	CZ	IT	NL	PT	SE	E&W
<b>Number of users</b>	138,809	1.128,957	8,105,720	781,233	255,520	171,174	2,800,073
<b>% Chippers</b>	64%	52%	41%	44%	37%	66%	54%
<b>% Occasional</b>	17%	20%	37%	15%	13%	15%	17%
<b>% Regular</b>	12%	22%	12%	25%	25%	14%	19%
<b>% Intensive</b>	7%	6%	10%	17%	25%	5%	9%

**Table 5.31: Amount of cannabis (ton) consumed annually per country and user group (%)\***

	BG	CZ	IT	NL	PT	SE	E&W
<b>Amount (ton) - lower</b>	2.6	27.2	383.2	44.1	12.7	5.5	96.1
<b>Amount (ton) - upper</b>	5.2	51.3	480.1	69.4	26.3	8.2	221.0
<b>Amount (ton) - average</b>	<b>3.8</b>	<b>33.4</b>	<b>384.3</b>	<b>48.5</b>	<b>17.4</b>	<b>5.8</b>	<b>133.8</b>
<b>% Chippers</b>	2%	2%	1%	<1%	1%	2%	1%
<b>% Occasional</b>	3%	6%	5%	1%	2%	4%	2%
<b>% Regular</b>	18%	37%	23%	21%	30%	37%	20%
<b>% Intensive</b>	77%	55%	71%	77%	68%	57%	77%
<b>Additional amount used by problem drug users</b>	0.2-0.4	1.7	n.a.	1.4	?	2.0	18-34

*Upper and lower values are based on the upper and lower values of the 95% confidence interval for the annual cannabis consumption on the basis of the web survey, multiplied by the number of users according to population surveys (or adapted estimate in Italy). The average is based on the 5% trimmed mean of the 12 months cannabis consumption.*

In these estimates we have not taken possible underreporting of cannabis in general population surveys into account<sup>8</sup>. As described in the previous chapters, there are little data available to allow rationally based adjustments for underreporting. Ideally, such data should be country specific and take the characteristics of the survey into account. Data from the Dutch population surveys in 2005 and 2009 suggest that the degree of underreporting in more privacy respecting survey modes may be up to 30%, although there might be other explanations for the difference. However, it remains to be determined whether this figure can be generalized to other countries, and whether it applies to the same extent to all user groups. If we compare the population survey based estimate for Italy with the indirect/hybrid estimation method, the total number of last year users was 42% higher under the last method, but for intensive users the increase was 77%. Note, however, that the Italian indirect estimate might also compensate for undercoverage of populations that would be missed in population surveys. As far as data were available in other countries, the addition of (rough) estimates of cannabis consumed by (marginalised) populations of problem drug users increased the estimates from a low 3% in the Netherlands and 5% in the Czech Republic, up to 25% in England & Wales, and 35% in Sweden, which is a huge variation.

Given the possible impact of different survey modes (as well as contextual effects) and country specific (cultural and policy-related) factors, it seems unlikely that a simple single correction factor for underreporting yields accurate estimates in all countries.

However, there are more possible sources of estimation error that may afflict figures on cannabis consumption. Imagine the true amount of cannabis put in a unit is 1.5 times the amount assessed with the photo card method, or the highest amount per unit was not set at 0.4 gram but 0.5 gram. Table 5.32 shows that the first situation would logically have a great impact. Table 5.33 shows that increasing the highest dose per unit to 0.5 gram has only small effects on the estimates (between 3% and 9% increase), thus excluding misclassification as a relevant factor.

**Table 5.32: Annual amount of cannabis consumed per country if the true amount of cannabis per unit would be 50% higher**

	BG	CZ	IT	NL	PT	SE	E&W
Amount (ton) - lower	3.9	40.8	574.8	66.2	19.1	8.3	144.2
Amount (ton) - upper	7.8	77.0	720.2	104.1	39.5	12.3	331.5
Amount (ton) - average	5.7	50.1	576.5	72.8	26.1	8.7	200.7

*Amounts excluding consumption of cannabis by problem users of heroin, amphetamine or cocaine.*

**Table 5.33: Annual amount of cannabis consumed per country if the maximum amount of cannabis would be increased from 0.4 to 0.5 gram per unit**

	BG	CZ	IT	NL	PT	SE	E&W
Amount (tons) - lower	2.7	28.6	413.3	46.7	13.0	5.9	100.6
Amount (tons) - upper	5.6	56.8	525.8	75.5	27.3	9.1	252.5
Amount (tons) - average	3.9	35.7	410.1	51.6	17.9	6.3	145.2
% Increase <sup>1</sup>	2.6%	6.9%	6.7%	6.4%	2.9%	8.6%	8.5%

*Amounts excluding consumption of cannabis by problem users of heroin, amphetamine or cocaine.*

*1. Increase relative to the average amount if the maximum is 0.4 gram.*

## 5.2.9 Comparison with previous estimates

For four countries included in this study, estimates of cannabis consumption from other studies are available (see table 5.34). Note that the high, average/best and low ranges have been established in different ways. In the current study, the high and low ranges reflect the 95% confidence intervals around the mean of the annual consumption per user group, and the 5% trimmed average for the average estimate. Moreover, the (average/midpoint) estimated consumption for the population of problem drug of heroin, cocaine and/or amphetamine has been added to the average and highest estimate. The year refers to the year of the general population survey as this may be an important determinant of the estimates.

<sup>8</sup> This does not play a role in the indirect estimates for Italy.

In the Dutch study by the National Police Agency, the ranges are based on the variation regarding the annual cannabis consumption per current (last month user), i.e. assumed to be between 76 and 160 gram per year (Landelijke Recherche 2012). If we would select only last month users in the present study we would find an average of 99 grams, ranging from 90 gram to 142 gram. This seems to fit fairly well.

The much higher estimates for England & Wales in prior studies is probably partly related to the strong decrease in the prevalence of cannabis use regardless of methodological differences<sup>9</sup>. Last year prevalence of cannabis use decreased from 10.8% in 2003/2004 to 6.8% in 2010/2011. This is a decrease of 37%. If this decrease is extrapolated to the average amount reported by Pudney et al. (2006), this gives an average amount of 227 tons, which is closer to (albeit still higher) compared to the 168 tons in the current study (Pudney et al. 2006).

In the first drug markets study, Kilmer and Pacula (2009) based their estimates and ranges on several assumptions regarding the number of use days, the number of joints used per day, grams per joint and grams per use day, which were given for two user groups: past month users and past year but not past month users. A direct comparison with the findings in the current study is hampered by differences in user classifications, but apparently some assumptions do not seem to match between studies. For example, Kilmer and Pacula (2009) estimated the amount of cannabis per joint between 0.3 gram (low) and 0.5 gram (high), with 0.4 gram as best estimate (Kilmer and Pacula 2009). In the current study, the highest average doses were reported for intensive users in Sweden and Italy (.27-.28 gram), with an overall average of .25 gram. Lower amounts were reported for the other user groups. For other indicators (e.g. amounts consumed per typical day; see chapter 3), the assumptions for last month users in the former study seem to fit the consumption patterns for regular and intensive users, but not that of chippers and occasional users. The relatively high proportion of last month users who belong to these latter groups (see chapter 5) can also explain why the former estimates tend to be in the higher range. Another factor contributing to different estimates is that the current study allowed the calculation of annual amounts consumed per user on the basis on individual data for the relevant parameters, i.e. multiplying number of use days with number of units and amount of cannabis per unit, after which averages at group level were made. This is different from multiplying overall averages on daily consumption and use days, which may yield higher estimates (see also part I, report 4).

Moreover, Kilmer and Pecula (2009) assumed 20% underreporting of the number of past year users for the best estimate and 39% underreporting for the high estimate (Kilmer and Pacula 2009). This may definitely increase the estimates, and explain part of the higher ranges. Note that in this regard underreporting has been conceived dichotomous (use or no use in the past year) regardless of frequency or amount. As the issue of underreporting has never been addressed well, while it may greatly affect market estimates, it would be recommended as research priority for future research.

Finally, in the former report, backed by other data sources (from Australia, New Zealand and UK), an overall consumption per past year user was reported of 96 gram (Kilmer and Pacula 2009). This is - as expected - higher compared to the overall consumption found in the current study suggesting an annual average consumption between 27 grams in Bulgaria and 68 gram in Portugal (table 5.34). It should be kept in mind, however, that averages per past year users are very rough given the heterogeneity of the population of past year users. For example, figures are fairly high in Portugal because of the relatively high proportion of intensive users, in spite of low overall past year prevalence of cannabis use.

---

<sup>9</sup> According to Pudney et al. (2006), England and Wales probably account for 87% of the total cannabis consumed in the United Kingdom, which seems to be a plausible finding given the fact that 87% of the population in the UK resides in England and Wales.

**Table 5.34: Comparison of demand-based estimates of cannabis consumption (tons per year) in this study and other studies**

Country	Estimate in this study <sup>I</sup>		Other estimates		Sources
	Amount (tons)	Year <sup>II</sup>	Amount (tons)	Year	
Bulgaria	2.6 (low) 4.0 (average) 5.5 (high)	2008	15 – 20	2007	Bulgarian National Focal Point
			5.5 (low) 6.3 (average) 7.1 (high)	2007	
Czech Republic	27.2 (low) 35.9 (average) 53.7 (high)	2008	30 (low) 68 (average) 141 (high)	2004	Kilmer and Pacula (2009)
			49 (low) 56 (average) 63 (high)	2005	
The Netherlands	44.1 (low) 49.9 (average) 70.8 (high)	2009	35 (low) 75 <sup>III</sup> (high)	2009	Landelijke Recherche (2012)
			33 (low) 73 (best) 152 (high)	2005	
England & Wales	96.1 (low) 168.4 (average) 249.6 (high)	2010/2011	224 (low) 360 (average) 496 (high)	2003/2004	Pudney et al. 2006
			201 (low) (UK) 450 (best) (UK) 937 (high) (UK)	2005	
			255 (low) (UK) 290 (average) (UK) 325 (high) (UK)	2007/2008	Carpentier et al. (2012)

I. Lowest estimate (as in GPS).

II. Year refers to the year of the general population survey. The average and highest estimate also include the midpoint estimate of cannabis consumption by problem users of heroin, amphetamine, cocaine).

III. Excluding possible undercoverage.

Sources: Carpentier et al. (2012); Kilmer and Pacula (2009); Landelijke Recherche (2012)

**Table 5.35: Amounts (gram) of cannabis consumed annually per last year user\***

	BG	CZ	IT	NL	PT	SE	E&W
Lower	19	24	47	56	50	32	34
Upper	38	45	59	89	103	48	79
Middle/average	27	30	47	62	68	34	48

\*Averages per past year user are very rough given the heterogeneity of the population of past year users.

## 5.3 Conclusions and recommendations

This is the first study that addresses in detail cannabis consumption patterns, availability and estimates of the amounts of cannabis consumed among different types of cannabis users across different European Member States. The core data have been collected by a web survey, which has allowed the recruitment of a large number of cannabis users (almost 4,000) and detailed assessments of use patterns and availability in a relatively short period of time, which would not have been easily possible otherwise. With increasing internet penetration rates of the internet in many European countries, this method may be promising and which is increasingly employed in drug research (e.g. (Bauermeister et al. 2012; Carhart-Harris et al. 2009; Miller and Sonderlund 2010; Stein et al. 2012; Walden and Earleywine 2008). Nonetheless, we should be aware of its drawbacks, notably the lack of a sampling frame and non-probability sampling strategy, which may affect the representativeness of the sample. Web surveys may generally attract younger and more highly educated public compared to those captured in general population surveys. Moreover, respondents were recruited in different ways in different countries. These limitations should be kept in mind when generalizing the data. While crucial variables were analyzed per subgroup (frequency, age and gender), acknowledging that the sample would not be representative on these variables, we could not take into account all relevant (demographic) variables. For example, it might be that higher educated users, even if they consume cannabis daily, might have different consumption patterns compared to (daily) users who are less educated. Moreover, as in many population surveys, ethnic minorities might be underrepresented. Also, differences in urbanicity may affect assessments of use and availability. Nonetheless, the reported 'universal' (consumption) patterns across countries with varied economic, social, and cultural norms, suggest that the findings may have a high degree of validity.

### *Some key findings and insights*

- This study clearly showed that in all countries, the amount of cannabis consumed per day increases with increasing frequency (use days), although there is wide variability between users.
- The profiling of users showed that the largest group of the past year users comes on account of the infrequent using population (chippers), who take cannabis less than monthly. Even among past month cannabis users, who are usually considered to be regular users, infrequent use is common.
- The smallest group of intensive users is responsible for the largest part of the total amount of cannabis consumed in all countries.
- Some prior estimates on cannabis consumption tended to be too high, probably because the assumed share of 'high consumption users' was too high, and the assumed amounts of cannabis per unit were higher compared to those assessed in the current study.
- In spite of the overall patterns across user groups, there is appreciable variability between countries in consumption patterns, which seem to argue for country-specific assumptions and estimates.

### *Recommendations for further research*

- Generally, past month use is considered as reflecting more regular use as compared to those who used in the past year but not in the past month. One of the insights of this study, however, is that people who have consumed cannabis in the past month represent a heterogeneous group of users, including a majority of incidental or 'occasion' user. Multiplying past month frequencies by twelve inherently overestimates annual frequencies. To obtain better insight into the dynamics of cannabis use it would be useful in population surveys not only to ask for frequency in the past month or 30 days but also in the past year or 12 months.
- The amount of cannabis consumed per unit has been investigated for the first time in a comparable way in different EU Member States. While the employed picture card method seemed to provide a consistent pattern across user groups and countries, we have insufficient information on the validity of this method. As the amount per unit is a crucial variable for making reliable market estimates, it is highly recommended to carry out a cross-country validation study, in which different types of cannabis and units are manipulated. Ideally, such a study should result in an improved and feasible method for estimating amounts to be implemented in (population) surveys.
- Further to this, it would be recommended to include questions in population surveys not only on the frequency of cannabis use but also the number of units per typical use day, the type of cannabis and, whenever a feasible method has been established (see later), the amounts per unit.
- In the current study respondents could indicate the number of units only in whole numbers, while in fact people may take less than one joint, especially the less frequent users who predominantly get their cannabis from others. More precise estimates could be obtained by allowing numbers of units with one decimal or at least halve units.
- The issue of sharing and how it affects market estimates has not yet been resolved. It was an unexpected finding that such a high proportion of users indicated to have shared their cannabis unit during the last occasion. For chippers and

occasional users, this is consistent with the fact that they much more often get their cannabis from others instead of buying it themselves. Even if we would attempt to correct for sharing by these user groups, this would probably not make much of a difference, because of the low share in the market. However, it may make a difference especially for the intensive users, although sensitivity analyses did not yield strong differences in consumption patterns between those who shared and those who did not. Nonetheless, it would be recommended in future research to ask respondents explicitly how much units on a typical day they consume themselves, excluding numbers of parts of units that are shared.

- There is still insufficient knowledge of the degree of underreporting of cannabis use in population surveys, how it might be associated with the survey methodology and/or differ between countries and across different user groups. This issue is an important target for further research, as underreporting may be a relevant source of estimation uncertainty.

## 6 References

- Bauermeister, J.A., Zimmerman, M.A., Johns, M.M., Glowacki, P., Stoddard, S., and Volz, E. (2012). Innovative recruitment using online networks: lessons learned from an online study of alcohol and other drug use utilizing a web-based, Respondent-Driven Sampling (webRDS) strategy. *J Stud Alcohol Drugs* **73** (5) 834-838.
- Běláčková, V., Nechanská, B., Chomynová, P., & Horáková, M. (2012). *Celopopulační studie užívání návykových látek a postojů k němu v České republice v roce 2008* [General Population Survey on Substance Use and attitudes towards it in the Czech Republic in 2008]. Praha: Úřad vlády České republiky.
- Benschop, A., Nabben, T., and Korf, D. (2009). *Antenne 2008: trends in alcohol, tabak en drugs bij jonge Amsterdammers*. Rozenberg Publishers, Amsterdam.
- Benschop, A., Nabben, T., and Korf, D.J. (2011). *Antenne 2010: trends in alcohol, tabak en drugs bij jonge Amsterdammers*. Rozenberg Publishers, Amsterdam.
- Bessö, A., Bild, M., Jansson, M., Källmén, H., Löfgren, H., Nordvik, M.K. et al. (2009). *Sweden drug situation 2009: report to the EMCDDA by the Reitox National Focal Point*. Swedish National Institute of Public Health, Stockholm.
- Bouchard, M. and Tremblay, P. (2005). Risks of arrest across drug markets: A capture-recapture analysis of 'hidden' dealer and user populations. *Journal of Drug Issues* **35** (4) 733-754.
- Bulgarian National Focal Point on Drugs and Drug Addictions (2009). *National Report 2009: Bulgaria: report to the EMCDDA*. Bulgarian National Focal Point, Sofia.
- Carhart-Harris, R.L., Nutt, D.J., Munafo, M., and Wilson, S.J. (2009). Current and former ecstasy users report different sleep to matched controls: a web-based questionnaire study. *J Psychopharmacol* **23** (3) 249-257.
- Carpentier, C., Mulligan, K., Laniel, L., Potter, D., Hughes, B., Vandam, L. et al. (2012). *Cannabis production and markets in Europe*. EMCDDA, Lisbon.
- Cipolla, C. and Martoni, M. (2008). *Droghe nella notte: Una ricerca empirica sulla costa romagnola*. FrancoAngeli, Milano.
- Cuenca-Royo, A.M., Sanchez-Niubo, A., Forero, C.G., Torrens, M., Suelves, J.M., and Domingo-Salvany, A. (2012). Psychometric properties of the CAST and SDS scales in young adult cannabis users. *Addict Behav* **37** (6) 709-715.
- Davies, C., English, L., Lodwick, A., and McVeigh, J. (2009). *United Kingdom drug situation: annual report to the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) 2009*. UK Focal Point, London.
- Davies, C., English, L., Stewart, C., Lodwick, A., and McVeigh, J. (2011). *United Kingdom drug situation: annual report to the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) 2011*. UK Focal Point, London.
- De Graaf, I., Wildschut, J., and Van de Mheen, H. (2000). *Utrechtse druggebruikers: een jachtig bestaan*. IVO, Rotterdam.
- Direzione Centrale per i Servizi Antidroga (DCSA) (2012). *Annual Report 2012*. DCSA, Roma
- EMCDDA (2012). *European Legal Database on Drugs [online]*. Available: <http://www.emcdda.europa.eu/eldd> [accessed december 2012].
- EMCDDA (European Monitoring Centre for Drugs and Drug Addiction) (2011). *Annual report 2011: the state of the drugs problem in Europe*. Publications Office of the European Union, Luxembourg.
- EMCDDA (European Monitoring Centre for Drugs and Drug Addiction) (2012a). *Annual report 2012: the state of the drugs problem in Europe*. Publications Office of the European Union, Luxembourg.
- EMCDDA (European Monitoring Centre for Drugs and Drug Addiction) (2012b). *Statistical bulletin 2012*. EMCDDA, Lisbon.
- Fabi, F., Mammone, A., Ricci, R., and Rossi, C. (2011). *Monitoring and assessing drug policies: indicators of drug use in the teenage population as a tool for cross country comparisons*. Illicit Drug Market Institute, Rome.
- Fischer, B., Rehm, J., Irving, H., Ialomiteanu, A., Fallu, J.S., and Patra, J. (2010). Typologies of cannabis users and associated characteristics relevant for public health: a latent class analysis of data from a nationally representative Canadian adult survey. *Int J Methods Psychiatr Res* **19** (2) 110-124.

- Hakkarainen, P., Kainulainen, H., and Perälä, J. (2008). Measuring the cannabis market in Finland: A consumption-based estimate. *Contemporary Drug Problems: An Interdisciplinary Quarterly* **35** (2-3) 321-345.
- Hall, W. and Degenhardt, L. (2009). Adverse health effects of non-medical cannabis use. *Lancet* **374** (9698) 1383-1391.
- Hammersley, R. and Leon, V. (2006). Patterns of cannabis use and positive and negative experiences of use amongst university students. *Addiction Research & Theory* **14** (2) 189-205.
- Hibell, B., Guttormsson, U., Ahlström, S., Balakireva, O., Bjarnason, T., Kokkevi, A. et al. (2012). *The 2011 ESPAD report: substance use among students in 36 European countries*. CAN, Stockholm.
- Hoare, J. and Moon, D. (2010). *Drug Misuse Declared: Findings from the 2009/10 British Crime Survey: England and Wales*. Home Office, London.
- Horwood, L.J., Fergusson, D.M., Hayatbakhsh, M.R., Najman, J.M., Coffey, C., Patton, G.C. et al. (2010). Cannabis use and educational achievement: findings from three Australasian cohort studies. *Drug Alcohol Depend* **110** (3) 247-253.
- Kandel, D.B. and Chen, K. (2000). Types of marijuana users by longitudinal course. *J Stud Alcohol* **61** (3) 367-378.
- Kilmer, B. and Pacula, R. (2009). Estimating the size of the global drug market: a demand-side approach, In *A Report on Global Illicit Drug Markets 1998-2007: full report*. P. Reuter and F Trautmann, (eds.), pp. 99-156. European Commission, Brussels.
- Korf, D.J. (2003). De economie van de wietkwekerij: een verkenning, In *Hennepteelt in Nederland: het probleem van de criminaliteit en haar bestrijding*. F. Bovenkerk and W I M Hogewind, (eds.), pp. 251-263. Willem Pompe Instituut voor Strafwetenschappen, Utrecht.
- Korf, D.J., Benschop, A., and Wouters, M. (2007). Differential responses to cannabis potency: a typology of users based on self-reported consumption behaviour. *International Journal of Drug Policy* **18** (3) 168-176.
- Korf, D.J., Nabben, T., and Benschop, A. (2002). *Antenne 2001: trends in alcohol, tabak, drugs en gokken bij jonge Amsterdammers*. Rozenberg Publishers, Amsterdam.
- Lynskey, M.T., Agrawal, A., Henders, A., Nelson, E.C., Madden, P.A., and Martin, N.G. (2012). An Australian twin study of cannabis and other illicit drug use and misuse, and other psychopathology. *Twin Res Hum Genet.* **15** (5) 631-641.
- Meier, M.H., Caspi, A., Ambler, A., Harrington, H., Houts, R., Keefe, R.S. et al. (2012). Persistent cannabis users show neuropsychological decline from childhood to midlife. *Proc Natl Acad Sci U.S.A* **109** (40) E2657-E2664.
- Miller, P. and Plant, M. (2002). Heavy cannabis use among UK teenagers: an exploration. *Drug Alcohol Depend* **65** (3) 235-242.
- Miller, P.G. and Sonderlund, A.L. (2010). Using the internet to research hidden populations of illicit drug users: a review. *Addiction* **105** (9) 1557-1567.
- Miovsky, M. (2007). Changing patterns of drug use in the Czech Republic during the post-Communist era: A qualitative study. *Journal of Drug Issues* **37** (1) 73-102.
- Mravcik, V., Pesek, R., Horakova, M., Necas, V., Chomynova, P., St'astna, L. et al. (2011). *Annual Report: The Czech Republic: 2010 Drug Situation*. Office of the Government of the Czech Republic, Prague.
- Mravcik, V., Pesek, R., Skarupova, K., Orlikova, B., Skrdlantova, E., St'astna, L. et al. (2009). *Annual Report: The Czech Republic: 2008 Drug Situation*. Urad vlady Ceske republiky, Praha.
- Nabben, T., Benschop, A., and Korf, D.J. (2010). *Antenne 2009: trends in alcohol, tabak en drugs bij jonge Amsterdammers*. Rozenberg Publishers, Amsterdam.
- Niesink, R. and Rigter, S. (2012). *THC-concentraties in wiet, nederwiet en hasj in Nederlandse coffeeshops (2011-2012)*. Trimbo-instituut, Utrecht.
- Observatoire Français des Drogues et des Toxicomanies (OFDT) (2002). *Drugs and drug addictions - indicators and trends 2002: Cannabis*. OFDT, Paris.
- Pudney, S., Badillo, C., Bryan, M., Burton, J., Conti, G., and Iacovou, M. (2006). Estimating the size of the UK illicit drug market, In *Measuring different aspects of problem drug use: methodological developments*. N. Singleton, R Murray, and L Tinsley, (eds.), pp. 46-88. Home Office, London.
- Reuter, P. and Trautmann, F. (2009). *A report on global illicit drug markets 1998-2007: full report*. European Commission, Brussels.
- Rossi, C. (2011). *The segmentation of the population of drug users and estimates of "frequent" or "intensive" users [presentation at the EMCDDA PDU Expert Meeting on 27-28 October 2011 in Lisbon]*. University of Rome, Rome.
- Santoro, M., Triolo, L., and Rossi, C. (2011). *Drug users dynamics: a compartmental model of drug users to make scenario analyses*. University of Rome, Rome.
- Santos, A.S., Duarte, O., and Maia, E. (2011). *Portugal drug situation 2011: report to the EMCDDA by the Reitox National Focal Point*. IDT, Lisbon.
- Senate Special Committee on Illegal Drugs (Senate) (2002). *Cannabis: our position for a public policy*. Senate of Canada, Ottawa.

- Serpelloni, G., Genetti, B., Simeoni, E., Mollica, R., and Saccone, L. (2011). Italy drug situation 2011: report to the EMCDDA by the Reitox National Focal Point. Ministero dell'Interno/Ministero della Salute, Roma.
- Smith, K. and Flatley, J. (2011). Drug Misuse Declared: Findings from the 2010/11 British Crime Survey: England and Wales. Home Office, London.
- Spijkerman, R., Knibbe, R., Knoop, K., Van de Mheen, D., and Van den Eijnden, R. (2009). The utility of online panel surveys versus computer-assisted interviews in obtaining substance-use prevalence estimates in the Netherlands. Addiction **104** (10) 1641-1645.
- Stein, L.A., Lebeau, R., Clair, M., Martin, R., Bryant, M., and Storti, S. (2012). Preliminary web-based measures development for GHB: expectancies, functions, and withdrawal. Am J Drug Alcohol Abuse **38** (2) 121-129.
- Temple, E.C., Brown, R.F., and Hine, D.W. (2011). The 'grass ceiling': limitations in the literature hinder our understanding of cannabis use and its consequences. Addiction **106** (2) 238-244.
- Thomas, G., Flight, J., Richard, K., and Racine, S. (2006). Toward a Policy-Relevant Typology of Cannabis Use for Canada: Analysis drawn from the 2004 Canadian Addiction Survey. Ottawa.
- UNODC (United Nations Office On Drugs and Crime) (2009). World Drug Report: 2009. UNODC, Vienna.
- Van der Pol, P., Liebrechts, N., De Graaf, R., Korf, D., Van den Brink, W., and Van Laar, M. (2013). Validation of self-reported cannabis dose and potency: an ecological study. Addiction [Submitted].
- Van der Pol, P., Liebrechts, N., De Graaf, R., Korf, D.J., Van den Brink, W., and Van Laar, M. (2011). The Dutch Cannabis Dependence (CanDep) study on the course of frequent cannabis use and dependence: objectives, methods and sample characteristics. Int J Methods Psychiatr Res **20** (3) 169-181.
- Van Laar, M. and Van Ooyen-Houben, M. (2009). Evaluatie van het Nederlandse drugsbeleid. Trimbos-instituut/WODC, Utrecht-Den Haag.
- Van Laar, M. and Van Ooyen-Houben, M. (2009b). Evaluatie van het Nederlandse drugsbeleid. Trimbos-instituut/WODC, Utrecht.
- Van Laar, M.W., Cruts, A.A.N., Van Ooyen-Houben, M.M.J., Van Gageldonk, A., Croes, E.A., Meijer, R.F. et al. (2012). The Netherlands drug situation 2011: report to the EMCDDA by the Reitox National Focal Point. Trimbos-instituut/WODC, Utrecht/Den Haag.
- Van Straaten, B., Van der Laan, J., Schrijvers, C., Boersma, S., Maas, M., Wolf, J. et al. (2012). Profiel van daklozen in de vier grote steden: resultaten uit de eerste meting van de Cohortstudie naar daklozen in de vier grote steden (Coda-G4). IVO/UMC St Radboud, Rotterdam-Nijmegen.
- Walden, N. and Earleywine, M. (2008). How high: quantity as a predictor of cannabis-related problems. Harm Reduct J **5**, 20.
- Wittchen, H.U., Behrendt, S., Hofler, M., Perkonig, A., Rehm, J., Lieb, R. et al. (2009). A typology of cannabis-related problems among individuals with repeated illegal drug use in the first three decades of life: Evidence for heterogeneity and different treatment needs. Drug Alcohol Depend **102** (1-3) 151-157.
- Zammit, S., Allebeck, P., Andreasson, S., Lundberg, I., and Lewis, G. (2002). Self reported cannabis use as a risk factor for schizophrenia in Swedish conscripts of 1969: historical cohort study. BMJ **325** (7374) 1199.
- Zeisser, C., Thompson, K., Stockwell, T., Duff, C., Chow, C., Vallance, K. et al. (2012). A 'standard joint'? The role of quantity in predicting cannabis-related problems. Addiction Research & Theory **20** (1) 82-92.

## Annex 1: Additional tables

Table A.1: Type of marihuana usually consumed\*

	Domestically produced marihuana/skunk		Imported marihuana/skunk		No preference		I don't know	
	N	%	N	%	N	%	N	%
<b>Bulgaria</b>	62	31.2%	13	6.5%	48	24.1%	76	38.2%
<b>Czech Republic</b>	310	62.1%	24	4.8%	106	21.2%	59	11.8%
<b>Italy</b>	325	33.1%	149	15.2%	277	28.2%	230	23.4%
<b>Netherlands</b>	482	49.4%	26	2.7%	228	23.4%	240	24.6%
<b>Portugal</b>	47	36.2%	11	8.5%	16	12.3%	56	43.1%
<b>Sweden</b>	277	38.8%	115	16.1%	130	18.2%	192	26.9%
<b>England &amp; Wales</b>	110	41.5%	25	9.4%	35	13.2%	95	35.8%
<b>Total</b>	1,613	42.9%	363	9.6%	840	22.3%	948	25.2%

\* Row percentages sum to 100

Table A.2: Type of hash usually consumed\*

	Domestically produced hash		Imported hash		No preference		I don't know	
	N	%	N	%	N	%	N	%
<b>Bulgaria</b>	4	12.5%	8	25.0%	10	31.3%	10	31.3%
<b>Czech Republic</b>	106	43.4%	61	25.0%	35	14.3%	42	17.2%
<b>Italy</b>	72	9.0%	285	35.7%	214	26.8%	228	28.5%
<b>Netherlands</b>	164	22.4%	184	25.1%	155	21.1%	230	31.4%
<b>Portugal</b>	3	2.7%	46	41.1%	12	10.7%	51	45.5%
<b>Sweden</b>	29	5.1%	233	40.9%	134	23.5%	174	30.5%
<b>England &amp; Wales</b>	18	18.0%	39	39.0%	10	10.0%	33	33.0%
<b>Total</b>	396	15.3%	856	33.1%	570	22.0%	768	29.7%

\* Row percentages sum to 100.

Table A.3: Mean and median number of joints smoked on a typical use day by 6-level user group and country

		Chipper	Occasional user	Regular user1	Regular user2	Almost daily user	Daily user
Bulgaria	Mean	1.24	1.48	1.74	2.43	4.35	3.33
	Median	1.00	1.00	1.97	2.00	3.00	3.50
	N	81	23	37	20	14	6
Czech Republic	Mean	1.61	1.51	1.68	2.47	3.42	3.88
	Median	1.00	1.00	1.96	2.00	2.99	3.00
	N	96	60	55	28	45	18
Italy	Mean	1.38	1.69	2.48	2.98	3.22	4.88
	Median	1.00	1.00	2.00	2.77	2.67	4.24
	N	178	138	160	152	182	108
Netherlands	Mean	1.19	1.57	2.28	2.73	3.32	4.76
	Median	1.00	1.00	2.00	2.04	2.95	4.00
	N	336	190	140	88	125	100
Portugal	Mean	1.48	2.52	2.27	3.28	3.51	4.16
	Median	1.00	2.00	2.03	3.00	2.47	4.00
	N	44	18	16	16	29	11
Sweden	Mean	1.50	2.28	3.07	3.67	4.13	4.68
	Median	1.00	2.00	3.00	3.00	3.00	4.96
	N	163	127	111	68	58	20
United Kingdom	Mean	1.46	1.57	2.53	2.51	4.54	6.68
	Median	1.00	1.00	2.00	2.00	3.11	5.00
	N	64	41	35	16	28	15
All countries	Mean	1.36	1.77	2.42	2.98	3.50	4.79
	Median	1.00	1.50	2.00	2.77	3.00	4.00
	N	962	597	554	388	481	278

Table A.4: Mean and median amount of cannabis usually consumed per joint by 6-level user group and country

		Chipper	Occasional user	Regular user1	Regular user2	Almost daily user	Daily user
Bulgaria	Mean	.125	.191	.138	.180	.152	.333
	Median	.100	.200	.148	.150	.175	.349
	N	74	21	36	20	14	6
Czech Republic	Mean	.151	.200	.184	.213	.238	.277
	Median	.150	.200	.195	.199	.245	.271
	N	93	58	53	26	45	18
Italy	Mean	.132	.165	.220	.242	.249	.276
	Median	.100	.150	.215	.250	.250	.292
	N	168	135	157	149	176	107
Netherlands	Mean	.162	.180	.190	.226	.240	.256
	Median	.150	.150	.200	.242	.250	.251
	N	316	185	133	84	121	95
Portugal	Mean	.111	.174	.133	.222	.188	.165
	Median	.100	.200	.147	.248	.195	.159
	N	43	17	16	16	27	10
Sweden	Mean	.166	.189	.217	.231	.280	.314
	Median	.150	.191	.228	.246	.300	.399
	N	159	124	109	65	58	18
United Kingdom	Mean	.135	.169	.174	.150	.177	.278
	Median	.113	.150	.150	.150	.150	.300
	N	59	39	34	16	25	15
All countries	Mean	.149	.180	.197	.226	.239	.269
	Median	.150	.150	.200	.242	.250	.287
	N	912	579	538	376	466	269

Table A.5: Mean and median amounts of cannabis consumed per joint if the maximum dose is set at 0.4 gram (left) or 0.5 gram (right)

		Maximum dose set at 0.4 gram		Maximum dose set at 0.5 gram	
		Mean	Median	Mean	Median
Bulgaria	Chipper	.125	.100	.128	.100
	Occasional	.191	.200	.196	.200
	Regular	.153	.150	.157	.150
	Intensive	.206	.200	.221	.200
Czech Republic	Chipper	.151	.150	.154	.150
	Occasional	.200	.200	.212	.200
	Regular	.194	.199	.202	.199
	Intensive	.249	.250	.268	.250
Italy	Chipper	.132	.100	.135	.100
	Occasional	.165	.150	.172	.150
	Regular	.231	.244	.247	.244
	Intensive	.259	.262	.278	.262
Netherlands	Chipper	.162	.150	.165	.150
	Occasional	.180	.150	.187	.150
	Regular	.204	.200	.212	.200
	Intensive	.247	.250	.269	.250
Portugal	Chipper	.111	.100	.113	.100
	Occasional	.174	.200	.174	.200
	Regular	.177	.163	.182	.180
	Intensive	.182	.167	.185	.167
Sweden	Chipper	.166	.150	.172	.150
	Occasional	.189	.191	.196	.191
	Regular	.222	.238	.235	.240
	Intensive	.288	.300	.325	.300
England & Wales	Chipper	.135	.113	.135	.113
	Occasional	.169	.150	.176	.150
	Regular	.166	.150	.173	.150
	Intensive	.215	.200	.232	.200
All countries	Chipper	.149	.150	.152	.150
	Occasional	.180	.150	.187	.150
	Regular	.209	.200	.221	.200
	Intensive	.250	.250	.271	.250

Table A.6: Differences in the mean and median annual amount of cannabis consumed for the all types of units and for only joints\*

		Chipper	Occasional	Regular	Intensive
Bulgaria	Mean	0.0	0.7	0.0	12.6
	Median	-0.1	0.0	0.0	36.6
Czech Republic	Mean	0.1	1.2	16.1	47.2
	Median	0.2	0.4	2.2	0.0
Italy	Mean	0.0	-0.1	-0.5	20.0
	Median	0.0	-0.7	0.0	11.6
Netherlands	Mean	0.1	-0.2	-1.2	10.3
	Median	0.0	0.0	-0.5	0.0
Portugal	Mean	0.0	0.0	0.0	-4.6
	Median	0.0	0.0	0.0	0.0
Sweden	Mean	0.0	1.0	-4.5	15.9
	Median	0.0	-0.1	-2.0	-10.0
England & Wales	Mean	0.0	0.5	9.4	-47.6
	Median	-0.1	-0.3	6.0	-1.2
All countries	Mean	0.0	0.6	0.4	15.1
	Median	0.0	-0.2	0.0	4.5

\* Positive values indicate higher amounts for the total units compared to joints.

Table A.7: Mean and median amount (gram) of cannabis consumed by user group and gender

		Chipper		Occasional		Regular		Intensive	
		Male	Female	Male	Female	Male	Female	Male	Female
Bulgaria	Mean	.6	.8	4.6	5.6	54.5	27.2	304.1	197.7
	Median	.4	.6	3.9	5.4	33.8	18.6	278.9	130.2
	N	38	43	13	10	40	17	14	6
Czech Republic	Mean	1.5	1.0	10.7	6.7	63.2	37.7	304.8	172.8
	Median	.9	.6	7.1	4.5	35.6	26.0	256.5	188.0
	N	40	56	35	25	57	26	54	9
Italy	Mean	1.4	.7	8.6	6.0	110.1	93.7	356.6	321.7
	Median	.8	.3	5.4	3.6	68.5	60.9	268.5	204.2
	N	100	78	101	37	258	54	254	36
Netherlands	Mean	1.0	.8	7.6	8.6	82.9	53.5	369.3	279.7
	Median	.6	.6	5.3	3.9	52.7	29.0	268.2	194.1
	N	203	133	137	53	167	61	164	61
Portugal	Mean	.6	1.4	12.3	8.3	115.5	72.2	166.9	449.6
	Median	.4	.5	9.3	7.8	57.3	34.3	130.2	439.7
	N	23	21	12	6	17	15	33	7
Sweden	Mean	1.4	.8	12.7	12.3	114.6	109.6	400.0	363.6
	Median	.8	.5	7.1	7.4	65.9	86.3	303.1	329.3
	N	125	38	115	12	165	14	71	7
England & Wales	Mean	1.3	.9	9.4	3.6	68.7	32.3	490.5	481.9
	Median	.5	.6	6.2	2.3	34.5	19.3	333.2	194.7
	N	24	40	28	13	36	15	37	6
All countries	Mean	1.2	.9	9.6	7.4	96.6	63.4	356.2	302.9
	Median	.7	.5	6.2	4.4	54.3	35.7	268.5	195.3
	N	553	409	441	156	740	202	627	132

Bulgaria (gender  $P=.025$ ; gender x user group  $P=.083$ ); Czech Republic : gender ( $P=.006$ ); gender x user group  $P=.025$ ); Italy (gender  $P=.441$ ; gender x user group  $P=.903$ ), Netherlands (gender  $P=.030$ ; gender x user group  $P=.065$ ); Portugal (gender  $P=.007$ ; gender x user group  $P=.0001$ ); Sweden (gender  $P=.661$ ; gender x user group  $P=.962$ ); England & Wales (gender  $P=.814$ , gender x user group  $P=.993$ ).

Table A.8: Mean amount (gram) of cannabis consumed per typical use day by user and country

	Chipper	Occasional	Regular	Intensive
Bulgaria	.18	.28	.31	.87
Czech Republic	.28	.36	.47	1.04
Italy	.21	.29	.67	1.11
Netherlands	.21	.29	.52	1.06
Portugal	.19	.42	.54	.64
Sweden	.26	.48	.77	1.28
England & Wales	.22	.29	.52	1.31
Total	.22	.35	.60	1.10

Table A.9: Mean scores for each of the 6 CAST items by user group

	Chipper	Occasional	Regular	Intensive
Using alone	.44	.91	1.60	2.34
Using before midday	.66	1.59	2.30	3.02
Memory problems	.54	.97	1.18	1.26
Told to reduce or stop	.27	.53	.91	1.33
Tried to reduce or stop without success	.12	.22	.42	.59
(Social) problems because of use	.20	.32	.52	.60

\*Differences between groups were significant for all items at  $P=.0001$ .

Table A.10: Proportion of users by CAST scores\*

CAST scores		Chipper	Occasional	Regular	Intensive
<b>Bulgaria</b>	0 to 6	86%	65%	65%	17%
	7 to 11	11%	25%	31%	67%
	≥ 12	3%	10%	4%	17%
<b>Czech Republic</b>	0 to 6	91%	81%	57%	25%
	7 to 11	8%	18%	34%	53%
	≥ 12	1%	1%	9%	21%
<b>Italy</b>	0 to 6	91%	83%	53%	37%
	7 to 11	8%	14%	39%	50%
	≥ 12	1%	3%	8%	13%
<b>Netherlands</b>	0 to 6	92%	78%	45%	16%
	7 to 11	6%	16%	44%	43%
	≥ 12	2%	6%	11%	41%
<b>Portugal</b>	0 to 6	93%	88%	52%	29%
	7 to 11	2%	12%	34%	43%
	≥ 12	4%	0%	14%	29%
<b>Sweden</b>	0 to 6	89%	67%	38%	20%
	7 to 11	9%	30%	52%	52%
	≥ 12	2%	3%	10%	29%
<b>England &amp; Wales</b>	0 to 6	95%	73%	46%	19%
	7 to 11	5%	18%	44%	64%
	≥ 12	0%	8%	10%	17%
<b>All countries</b>	0 to 6	91%	76%	49%	26%
	7 to 11	7%	20%	42%	50%
	≥ 12	2%	4%	9%	24%

\* Differences between groups were significant for all countries at  $P=0.0001$ .

Table A.12: Days of the week on which cannabis is usually consumed by user group\*

	Chipper	Occasional	Regular	Intensive
<b>Bulgaria</b>				
Only on weekends	38%	23%	3%	0%
More often on weekends than on weekdays	25%	42%	49%	14%
Just as often on weekends as on weekdays	30%	31%	46%	73%
More often on weekdays than on weekends	4%	0%	2%	14%
Only on weekdays	4%	4%	0%	0%
<b>Czech Republic</b>				
Only on weekends	40%	22%	9%	1%
More often on weekends than on weekdays	38%	39%	40%	27%
Just as often on weekends as on weekdays	15%	32%	42%	65%
More often on weekdays than on weekends	3%	5%	8%	6%
Only on weekdays	3%	3%	1%	1%
<b>Italy</b>				
Only on weekends	34%	20%	3%	0%
More often on weekends than on weekdays	26%	38%	33%	13%

Just as often on weekends as on weekdays	31%	36%	58%	83%
More often on weekdays than on weekends	5%	5%	5%	4%
Only on weekdays	4%	1%	1%	0%
<b>Netherlands</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>
Only on weekends	70%	47%	11%	2%
More often on weekends than on weekdays	15%	32%	44%	23%
Just as often on weekends as on weekdays	10%	14%	36%	70%
More often on weekdays than on weekends	2%	4%	8%	5%
Only on weekdays	3%	2%	2%	0%
<b>Portugal</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>
Only on weekends	41%	21%	9%	0%
More often on weekends than on weekdays	22%	47%	38%	36%
Just as often on weekends as on weekdays	27%	21%	34%	62%
More often on weekdays than on weekends	4%	11%	19%	2%
Only on weekdays	6%	0%	0%	0%
<b>Sweden</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>
Only on weekends	53%	31%	7%	2%
More often on weekends than on weekdays	31%	44%	44%	15%
Just as often on weekends as on weekdays	13%	22%	44%	79%
More often on weekdays than on weekends	3%	2%	5%	4%
Only on weekdays	0%	1%	0%	0%
<b>England &amp; Wales</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>
Only on weekends	44%	15%	6%	3%
More often on weekends than on weekdays	26%	58%	45%	24%
Just as often on weekends as on weekdays	25%	21%	46%	70%
More often on weekdays than on weekends	3%	6%	0%	3%
Only on weekdays	3%	0%	3%	0%
<b>Total</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>
Only on weekends	52%	31%	7%	1%
More often on weekends than on weekdays	24%	40%	40%	20%
Just as often on weekends as on weekdays	18%	24%	46%	75%
More often on weekdays than on weekends	3%	4%	6%	5%
Only on weekdays	3%	2%	1%	0%

\* Categories sum to 100% within user groups.

Table A.13: Time of the day on which cannabis is usually consumed by user group\*

<b>Bulgaria</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>P= .001</b>
All day	4%	4%	7%	27%	
At night	18%	8%	8%	5%	
In the evening	45%	35%	41%	27%	
In the afternoon	1%	0%	12%	0%	
In the morning	0%	0%	2%	0%	
No specific time	32%	54%	31%	41%	
<b>Czech Republic</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>P= .000</b>
All day	1%	2%	12%	37%	
At night	21%	9%	4%	1%	
In the evening	53%	56%	38%	25%	
In the afternoon	9%	13%	15%	14%	
In the morning	0%	1%	1%	0%	
No specific time	17%	19%	29%	22%	
<b>Italy</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>P= .000</b>
All day	2%	3%	12%	26%	
At night	19%	13%	11%	8%	
In the evening	51%	65%	48%	38%	
In the afternoon	4%	2%	4%	1%	
In the morning	1%	0%	1%	0%	
No specific time	23%	17%	25%	27%	
<b>Netherlands</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>P= .000</b>
All day	1%	0%	4%	26%	
At night	17%	16%	6%	1%	
In the evening	61%	69%	64%	53%	
In the afternoon	3%	2%	4%	3%	
In the morning	0%	0%	0%	0%	
No specific time	18%	13%	23%	18%	
<b>Portugal</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>P= .055</b>
All day	0%	0%	9%	19%	
At night	80%	63%	66%	50%	
In the evening	4%	5%	6%	5%	
In the afternoon	2%	0%	0%	2%	
In the morning	0%	5%	0%	0%	
No specific time	14%	26%	19%	24%	
<b>Sweden</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>P= .000</b>
All day	2%	1%	7%	21%	
At night	15%	8%	4%	1%	
In the evening	60%	60%	59%	45%	
In the afternoon	5%	8%	6%	5%	
In the morning	0%	1%	0%	1%	
No specific time	18%	22%	23%	28%	
<b>England &amp; Wales</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>P= .000</b>
All day	0%	0%	6%	23%	
At night	29%	34%	20%	7%	
In the evening	48%	47%	37%	34%	
In the afternoon	1%	8%	7%	1%	
In the morning	0%	0%	0%	0%	
No specific time	22%	11%	31%	34%	

All countries	Chipper	Occasional	Regular	Intensive	P= .000
All day	1%	1%	8%	26%	
At night	21%	15%	10%	6%	
In the evening	54%	60%	50%	39%	
In the afternoon	4%	5%	6%	4%	
In the morning	0%	1%	1%	0%	
No specific time	20%	19%	25%	25%	

\* Categories sum to 100% within user groups

**Table A.14: Location where cannabis is usually consumed\***

Bulgaria	Chipper	Occasional	Regular	Intensive	P=.434
At my own home	19%	14%	26%	33%	
At someone else's home	15%	33%	16%	19%	
At a private party	14%	10%	2%	0%	
At school, college or university	1%	0%	2%	0%	
On the street or in a park	38%	19%	37%	24%	
At a pub/bar	1%	0%	0%	0%	
At another place of entertainment	1%	5%	2%	5%	
At a music concert or festival	1%	5%	0%	0%	
Other	9%	14%	16%	19%	
Czech Republic	Chipper	Occasional	Regular	Intensive	P=.000
At my own home	15%	18%	29%	40%	
At someone else's home	14%	14%	9%	1%	
At a private party	10%	8%	5%	0%	
At school, college or university	0%	1%	2%	1%	
On the street or in a park	23%	18%	30%	39%	
At a pub/bar	12%	14%	10%	6%	
At another place of entertainment (e.g. disco, night club)	4%	8%	2%	2%	
At a music concert or festival	8%	5%	2%	1%	
Tea house	1%	0%	1%	0%	
Other	1%	12%	9%	11%	
Italy	Chipper	Occasional	Regular	Intensive	P=.000
At my own home	15%	31%	51%	65%	
At someone else's home	27%	28%	18%	8%	
At a private party	16%	4%	0%	0%	
At school, college or university	1%	4%	0%	2%	
On the street or in a park	22%	23%	23%	15%	
At a pub/bar	1%	4%	0%	2%	
At another place of entertainment (e.g. disco, night club)	2%	1%	1%		
At a music concert or festival	1%	1%	0%	0%	
Other	14%	4%	6%	9%	
The Netherlands	Chipper	Occasional	Regular	Intensive	P=.000
At my own home	24%	34%	52%	65%	
At someone else's home	30%	27%	22%	11%	
At a private party	9%	6%	0%	0%	
At school, college or university	0%	0%	1%	1%	
On the street or in a park	12%	16%	14%	12%	
At a pub/bar	1%	3%	1%	0%	

At another place of entertainment (e.g. disco, night club)	4%	4%	1%	0%	
At a music concert or festival	5%	2%	0%	0%	
In a coffee shop	5%	3%	5	6%	
Other	10%	7%	3%	5%	
<b>Portugal</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>P=.000</b>
At my own home	11%	28%	53%	74%	
At someone else's home	35%	6%	3%	11%	
At a private party	11%	0%	0%	0%	
At school, college or university	15%	28%	23%	5%	
On the street or in a park	13%	28%	10%	3%	
At a pub/bar	0%	6%	7%	0%	
At another place of entertainment (e.g. disco, night club)	4%	6%	0%	0%	
At a music concert or festival	11%	0%	0%	5%	
Smartshops and other	0%	0%	3%	3%	
<b>Sweden</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>P=.000</b>
At my own home	33%	62%	67%	82%	
At someone else's home	32%	20%	11%	4%	
At a private party	14%	2%	1%	0%	
At school, college or university	0%	0%	0%	1%	
On the street or in a park	11%	9%	13%	8%	
At a pub/bar	1%	0%	0%	0%	
At another place of entertainment (e.g. disco, night club)	1%	0%	0%	0%	
At a music concert or festival	3%	0%	0%	0%	
Other	6%	7%	9%	4%	
<b>England &amp; Wales</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>P=.000</b>
At my own home	38%	59%	77%	80%	
At someone else's home	27%	16%	13%	9%	
At a private party	20%	6%	0%	0%	
At school, college or university	2%	2%	0%	0%	
On the street or in a park	6%	10%	5%	2%	
At a pub/bar	2%	0%	0%	2%	
At a music concert or festival	6%	2%	2%	0%	
Other	0%	4%	5%	8%	
<b>All countries</b>	<b>Chipper</b>	<b>Occasional</b>	<b>Regular</b>	<b>Intensive</b>	<b>P=.000</b>
At my own home	23%	40%	52%	64%	
At someone else's home	27%	23%	15%	8%	
At a private party	12%	5%	1%	0%	
At school, college or university	1%	2%	1%	1%	
On the street or in a park	16%	16%	19%	15%	
At a pub/bar	2%	3%	2%	2%	
At another place of entertainment (e.g. disco, night club)	3%	3%	1%	0%	
At a music concert or festival	4%	2%	0%	1%	
Other**	10%	7%	8%	9%	

\* Categories sum to 100% within user groups. Two categories (at a seller's home and at the workplace) are excluded as they were virtually not mentioned by the respondents.

\*\* Smart shops and other locations in Portugal; tea house and other locations in the Czech Republic; Coffee shops and other locations in the Netherlands; other locations in Bulgaria, Italy, Sweden and England & Wales.

Table A.15: Mean and median number of cannabis purchases in the past month\*

		Chipper	Occasional	Regular	Intensive	P=.
Bulgaria	Mean	2.9	1.0	4.7	15.6	.000
	Median	2.0	1.0	4.0	18.0	
	N	8	3	26	10	
Czech Republic	Mean	1.3	3.0	5.1	10.7	.000
	Median	1.0	3.0	4.0	8.0	
	N	6	12	46	57	
Italy	Mean	2.2	2.3	4.6	7.7	.000
	Median	1.0	2.0	4.0	4.0	
	N	13	44	186	189	
Netherlands	Mean	1.8	2.4	6.1	11.4	.000
	Median	1.0	2.0	4.0	8.0	
	N	80	95	161	169	
Portugal	Mean	1.0	2.3	3.1	6.0	.186
	Median	1.0	2.0	2.0	4.0	
	N	3	3	16	20	
Sweden	Mean	1.7	1.6	3.7	6.3	.000
	Median	1.0	1.0	2.0	4.0	
	N	34	68	135	63	
England & Wales	Mean	1.3	2.0	3.8	6.1	.004
	Median	1.0	1.0	4.0	4.0	
	N	6	22	34	48	
All countries	Mean	1.8	2.2	4.8	8.9	.000
	Median	1.0	2.0	4.0	4.0	
	N	150	247	604	556	

\* Among those who had bought cannabis at least once in the past month.