European Monitoring Centre
for Drugs and Drug Addiction

TECHNICAL REPORT

Estimating the size of the main illicit retail drug markets in Europe: an update

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Executive summary

The first market size estimates for cannabis, cocaine, MDMA, amphetamines and heroin were published in the EMCDDA-Europol 2016 European Drug Markets Report, covering 2013. The challenges in obtaining such estimates were recognised at that time, though the need to assist policymakers in prioritising interventions by providing information on the scale, relative importance and changes in the markets for different drugs outweighed these concerns. The project was seen as a process, where the estimates would be improved in subsequent rounds by addressing data issues and developing the methodology. Since 2016 additional and different data sources have become available and where appropriate the methodology has been changed, though the basic underlying method remains as it was.

Developments for the estimates published in this report include:

- data on the amounts of drugs used by various types of user have been extended and updated, using information from the European Web Survey on Drugs (EWSD);
- routinely monitored data from the Member States have been updated, improving estimates of the number of users and drug prices. For example, 24 of the EU countries have reported a more recent general population survey than that available when the initial estimates were made;
- crack use by high-risk opioid users has been included in the cocaine market size estimates;
- data on patterns of use for cannabis herb and resin, separately obtained from the EWSD, have been used to estimate the contribution of these different forms of cannabis to the overall cannabis market. In the previous estimates, numbers of seizures were used in the absence of suitable information about use of these products.

The hidden nature of the topic, the limitations inherent in some of the available data and the need for simplifying assumptions contribute to uncertainty around the estimates. Alternative methods of estimation were considered and are mentioned in the report, though each has its own data issues and weaknesses. The demand-side approach remains the favoured method, though it is recognised that the estimates are the outcome of the approach adopted, and alternative approaches will generate different values.

Some key principles underpinning the approach taken are:

- wherever possible, the data used came from routine data collections held by the EMCDDA to facilitate the planned process of improving and updating over time;
- European estimates were obtained by summing individual country estimates;
- where imputation of missing data was necessary, as far as possible, this was based on other related data;
- every effort has been made to note all imputations and assumptions made within the estimation process, so that the limitations are clear.

As with the initial estimates, the 2017 figures are likely to underestimate the market; given the available data from which they were constructed, and despite their substantial size, these estimates should be considered as minimum values. Country estimates have not been produced, given issues of comparability in the data, the focus remaining on obtaining EU estimates of the quantity and value of the market for cannabis, cocaine, MDMA, amphetamines and opioids. A consequence of this process is that the 2013 and 2017 estimates are not directly comparable and should not be interpreted as a trend.

The basic model used in the estimation process can be expressed in simple form:

Total annual consumption (quantity) = Number of last year users * Amount used per year
Market value (per year) = Total annual consumption * Price

The basic model is developed for each of the drugs to account for factors influencing consumption. For cannabis, cocaine, MDMA and amphetamines, the number of users was generated on the basis of prevalence data from general population surveys and categorised according to frequency of use. Additional estimates were generated to account for use of these drugs among high-risk drug users where possible. Estimates were generated separately for resin and herb cannabis and for opioid users in and out of treatment.

The overall estimates from this process are as follows.

Estimates of the size of the European illicit drug market, 2017						
	European Union			European Union, Norway and Turkey		
	Quantity			Quantity		
	Mid	Low	High	Mid	Low	High
Cannabis (tonnes)	1 550.97	1 405.73	1 710.33	1 597.30	1 450.25	1 758.47
Cocaine (tonnes)	118.56	99.65	137.46	120.40	101.32	139.47
Amphetamines (tonnes)	61.99	50.99	81.18	63.55	52.28	83.29
MDMA (million tablets)	59.73	49.70	69.76	63.09	52.85	73.33
Heroin (tonnes)	148.86	126.81	181.17	153.09	130.83	185.60
	Value (EUR million)			Value (EUR million)		
	Mid	Low	High	Mid	Low	High
Cannabis	11 635.04	10 533.99	12 823.34	12 070.56	10 949.11	13 279.25
Cocaine	9 068.96	7 635.30	10 502.60	9 237.40	7 788.91	10 685.87
Amphetamines	1 007.69	830.88	1 283.50	1 054.41	869.73	1 346.11
MDMA	528.63	437.33	619.94	582.48	487.83	677.14
Heroin	7 440.86	6 394.04	9 119.55	7 694.40	6 635.18	9 385.49
Total	29 681.19	25 831.54	34 348.93	30 639.25	26 730.76	35 373.86

Certain limitations of the method must be considered when interpreting the results.

- **Under-reporting of use**. With the number of users and frequency of use relying primarily on self-reported data from general population surveys, there is potential for under-reporting and so under-estimation, though the extent and nature of the under-reporting is difficult to quantify and is likely to vary according to a range of factors including drug and country.
- **Under-coverage**. General population surveys have formed the basis for most of the estimates of numbers of users, but it is known that these may under-represent some sub-groups in the population who may have significant levels of drug use, particularly some marginalised groups. Despite, where possible, using estimates of high-risk drug users to identify and include use by some of these groups, gaps in coverage are likely to remain. It should also be noted that the numbers of high-risk users are estimated using a variety of indirect statistical methods, such as capture-recapture or treatment multiplier studies, and come with a high degree of uncertainty.
- **Knowledge gaps**. Though improvements have been made in the availability of data, many data gaps remain, necessitating assumptions to justify imputing data.

1 Introduction

Understanding the size and nature of the illicit drug markets and how they operate is important for planning and prioritising activities to tackle the problems associated with these major global markets and, over time, having the potential to identify changes in the market structure. The hidden nature of the illicit drug business, however, makes it difficult to estimate the amount of money it generates, and published estimates are variable, covering different parts of the market and different geographical areas and involving many assumptions and associated uncertainties. Estimates of the size of the retail markets for a range of illicit drugs are one important element of the overall picture and the one most frequently considered. In the European Union, in line with international standards, there is a requirement that estimates of the value of the illicit drug market, along with other illicit activities that take the form of 'market transactions', are incorporated in national accounts and it has been estimated that illicit drug production and trafficking in the 10 Member States for which data are available ranged between 0.02 % (Luxembourg) and 0.6 % (Italy and Sweden) of the national gross domestic product (GDP) in the period 2004-15, and was 0.4 % or above in half of the countries (Eurostat, 2018) ([1]). These figures are broadly comparable with available global figures, showing retail drug sales in the United States in 2010 being equivalent to 0.7 % of GDP and across 21 EU countries in 2015 being equivalent to 0.32 % of the GDP (UNODC, 2017).

At the time of the production of the 2016 EU Drug Markets Report, the European Commission requested that the EMCDDA produce initial estimates of the size of the market in illicit drugs and initial estimates for cannabis, heroin, cocaine, amphetamines and MDMA were constructed in 2016, relating to 2013 (EMCDDA, 2016). This exercise highlighted the many gaps in the basic data necessary to construct these estimates and the limitations of such estimates. Nevertheless, although the estimates were recognised as likely to be considerable underestimates of the size of the market due to these limitations, the estimates clearly illustrated the large amounts of money generated for criminal groups and gave some insight into the relative importance of different drug markets. In addition to this, the process proved valuable in identifying key gaps in our knowledge and areas for quality improvement work and new data collections.

This report describes the output from a second round of estimates of the EU retail market size conducted for the 2019 EU Drug Markets Report. These estimates make use of additional data sources and methodological improvements that have been obtained following the exercise in 2016 and relate to 2017, being based on data from that year or latest data available. The methodology used, the rationale for the approach, and the assumptions made in the process are described in this report, while differences to the first round of estimates provided are highlighted.

A section on the basic model and common concerns will be followed by a description of the estimation process for each of the substances: cannabis, cocaine, amphetamines, MDMA and heroin. The results obtained for each substance are presented at the end of each drug section in Tables 2a and 2b for cannabis, Table 6 for cocaine, MDMA and amphetamines and Table 8 for heroin. Finally, the limitations and validity of the estimates and key areas for improving them over time will be discussed.

([1]) Czechia, Denmark, France, Germany, Italy, Luxembourg, Netherlands, Spain, Sweden, United Kingdom. All EU countries produce data on the contribution of illicit activities to GDP as part of their national accounts, but often they are not disaggregated to allow identification of drug-related figures and so could not be included here. Furthermore, it should be noted that, where available, published studies vary widely in the period covered — from 2004 (Denmark) to 2013 (Luxembourg).

2 Overview of the methodology

2.1 The basic model

The size of the market estimated here refers to the overall value of the retail market, i.e. the total amount spent on drugs by the people who use them in the European Union, and the quantity that they purchase, rather than the number of consumers. There are two main approaches to assessing the market size for illicit drugs. The first takes a supply-side or top-down approach, combining data on production, amounts seized and prices to obtain an estimate of the overall market size (UNODC, 2005). The second and more common approach is demand-side or bottom-up, in which prevalence data are combined with either assumptions on the quantity used and price data to give expenditure estimates (e.g. Casey et al., 2009; Kilmer and Pacula, 2009; Pudney et al., 2006; van Laar et al., 2013) or with data on amount spent on drugs from surveys of users to obtain expenditure estimates directly (e.g. Legleye et al., 2008) and then using price data to work backwards to estimate the quantity used.

In the guidance provided to national statistical offices about estimating the value of illicit economic activities by Eurostat (2018) they state that: 'Usually, supply approach data from producers and importers are more reliable than demand approach data from consumers, investors and exporters, as the number of producers and importers is relatively small compared with the number of consumers and investors. However, supply approach data are not always more reliable in the case of IEAs [illicit economic activities], where producers and importers make every effort to hide their transactions. For the production and trafficking of drugs, for example, where supply approach data (based on quantities seized) are potentially too unstable, the GNI Committee recommends starting with the demand approach (based on an estimate of the quantity of drugs consumed).'

The estimates described in this paper use a demand-side approach, for the reasons highlighted by Eurostat above. Although there are a number of issues with consumption data that are discussed in more detail in the section below on *Challenges and limitations to estimates of retail market size for illicit drugs*, they are nevertheless more reliable and less volatile than seizures data currently available. The basic model used in such an approach can be expressed in simple form as:

Total annual consumption (quantity) = No. of last year users * Amount used per year

Market value (per year) = Total annual consumption * Price

In other words, an estimate of the number of people who have used drugs in the past year is multiplied by an estimate of the average number of days of use per year and an average quantity used per day to obtain the estimated total annual consumption. This estimate can then be multiplied by price data to obtain the market value.

However, such a simple model ignores many things that we know about the variety in patterns of use among the population, and the limitations of the data sources being used. Thus even the basic model needs refinement. One obvious issue concerns the heterogeneity of users and the impact on amounts used. People who have used drugs in the past year will range from those who experiment only once or twice and are likely to consume comparatively small amounts on these occasions to daily users who may use large quantities of the drug each time. To deal with this issue we have tried, as far as possible for each type of drug, to identify different groups of user, based on their intensity of use, which changes the simple formula for calculating quantity used to:

$$\textbf{Total annual consumption (quantity)} = \Sigma \{(\text{No. of last year users})_U * (\text{Amount used per year})_U\}$$

where u denotes different types of users. However, the extent to which it is possible to identify different types of users varies between drugs and between countries, along with a range of other data issues; how these have been addressed and the rationale and assumptions made in doing this are highlighted below.

In order to obtain an estimate of the size of the illicit drug market in the European Union and in the European Union, Norway and Turkey, we first calculate the size of the market in each country and then sum these to provide European figures. The reason for this is due to the patterns of use varying considerably between countries, in a range of ways. For example, the survey data reported to the EMCDDA show variation in the drugs used and the prevalence of use but also that frequency of use is not necessarily related to last year prevalence rates; for instance, in some countries with low prevalence rates the proportion of frequent users can be comparatively high. Similarly, we know that although in general the amount used per session of use by frequent users tends to be higher than for occasional users, there appears to be differences between countries in the amounts used (Trautmann et al., 2013).

2.2 Main data sources

In developing these estimates of market size, wherever possible, country-level data regularly monitored and updated by the EMCDDA have been used to facilitate the planned process of improving and updating over time. Where imputation of missing data was necessary, we sought as far as possible to base this on other related data that, similarly, come from routinely collected data sources. Further information on these data sources, including definitions and data collection protocols can be found on the EMCDDA website (www.emcdda.europa.eu).

For the estimates of cannabis and stimulant drugs, the main source of data on number of users of these drugs in each country is the general population surveys (GPS) in these countries. The most recent GPS data available to the EMCDDA covers different years, as some countries are only able to conduct a GPS every four years or so. Where countries have not been able to provide data relating to 2017, survey data relating to the nearest year available were used. The GPS data provide prevalence rates for the different types of use and these were converted into the total number of users by multiplying the prevalence rates by 2017 Eurostat population data for 15- to 64-year-olds.

To take account of under-coverage of some sub-populations of drug users within these surveys and as the main source of number of people using heroin, estimates of use by people who use drugs in a more problematic way were based on the data provided within the EMCDDA problem drug use (PDU) indicator. This indicator includes estimates of high-risk use of a number of different types of drug, for example opioids, heroin, cocaine and amphetamine. High-risk drug use is defined as recurrent drug use that is causing actual harms (negative consequences, including dependence, but also other health, psychological or social problems) to the person, or is placing the person at a high probability/risk of suffering such harms; this pattern of drug use is associated with more frequent and intensive use. Although most countries have reported some estimate, the data provided are very variable, based on studies from different years, using different estimation methods, while some estimates of high-risk drug users are substance-specific, some cover more than one substance, some are measuring specific patterns of use independently of the substance (e.g. injecting). More imputation is therefore required to obtain comparable numbers of specific sub-groups for inclusion in the estimate. Generally, these imputations have made use of data reported to the EMCDDA within the treatment demand indicator (TDI) or on people receiving opioid substitution treatment (OST).

Additional data outside of the routine monitoring were used to fill information gaps. This was the case for the amounts of drugs used by different groups of drug users, where data from the European Web Surveys on Drugs (EWSD, Matias et al., 2019) were used. Existing work on estimating the market size for drugs, in particular that undertaken with financial support from the European Commission by the Rand Drug Policy Research Center, Trimbos Institute and Institute of Criminal Policy Research (Kilmer and Pacula, 2009;

Trautmann et al., 2013), was also drawn on within the estimation process, although in a lesser extent to the previous round of market size estimates.

The EMCDDA is continuously trying to improve its data collection, either by extending coverage to as many countries as possible or by adjusting instruments. The estimation exercise in 2016 had highlighted areas of EMCDDA data collection that needed to be augmented and improved. In response to that, the EMCDDA ran the EWSD in 15 European countries, collecting information on amounts used, frequency of use, type of drugs used and prices (among others). This is useful, not only for the market size estimates, but also more generally in ensuring that the monitoring of the drug situation remains appropriate.

There have also been general improvements in the quality of the data being submitted to the EMCDDA that will have had a positive impact on the estimates. Monitored data from the Member States have been updated, improving estimates of the number of users and drug prices. For example, 24 of the EU countries have reported a more recent general population survey than that available when the initial estimates were made.

Information on the amounts of drugs used by different groups of users is an area in which the data available are extremely limited. For the market size estimates published in 2016, we based our estimates of amounts used for all drugs on the data from an EU-funded project, described in the report 'Further insights into aspects of the EU illicit drugs market, Part I: Drugs market: an assessment from the demand side', edited by Trautmann et al. (2013), which attempted to obtain this information through an online survey in seven EU Member States (Bulgaria, Czechia, Italy, Netherlands, Portugal, Sweden, United Kingdom (England and Wales)), with varying degrees of success. Following the first round of market size estimates, to fill in this gap and provide more up-to-date information, the EMCDDA initiated the EWSD (Matias et al., 2019), where information on the amounts used daily by drug was asked (apart for heroin). This has provided more up-to-date (2016 to 2018) information from larger survey samples for 15 EU countries (Austria, Belgium, Croatia, Cyprus, Czechia, Estonia, Finland, France, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, United Kingdom). For heroin, the same approach as for the 2016 estimates was used due to lack of availability of more recent data.

It has also been noted that there appears to have been a resurgence of cocaine use and some diffusion of crack use within the European Union recently (EMCDDA, 2018). Using recent GPS data for the estimates has led to an increase in the estimated numbers of cocaine users in the general population within this round of market size estimates compared with 2016. In addition, in this round of estimates we have included an estimate of crack use by high-risk opioid users.

The data on price used to transform the amounts of the different drugs used into values were drawn from the EMCDDA's annual data collection. The way in which the average prices for drugs reported to the EMCDDA are collected is very variable and can reflect different levels of the market. In addition, the format of the estimate varies between countries, with some providing one or more of mode, mean or median, and a few only providing a range, further adding to the complexity. For the market size estimates only retail price data are used and, following the approach taken in a recent publication analysing EMCDDA price data, it was decided to use mode instead of mean value as the statistic of preference for this iteration since '… measures (e.g. ranges, means) take in anomalies at either end of the scale, which may skew the representativeness of the data, while the mode establishes the price most commonly encountered …' (Groshkova et al., 2018, p. 188). Where mode is not available and more than one measure of price is available the order of preference is mean, median, average of minimum and maximum (min-max average), in sequence of availability.

2.3 Challenges and limitations to estimates of retail market size for illicit drugs

There are a number of issues common to the estimation of the market size for each of the drugs, which need to be considered in producing and interpreting such estimates. These may be particularly important when trying to produce estimates for a region as diverse as Europe, made up of countries with very different sizes, cultures and histories and patterns of drug use.

The first general issue is that not all the data items necessary for the estimates are available for all countries and the amount of missing data varies between the different types of drugs. In these cases, missing data have to be imputed. In the estimation process described here, where possible other country-specific information has been used to impute data to fill gaps. Where this was not possible because no suitable data were available, averages of the data from other countries where the data were available have been applied. Details of how this has been done in each case are given in the relevant section below. The data gaps and need for imputation and assumptions to fill them are clearly a weakness in the estimation and an area where improvements in data can be made over time. Information on the amounts used by different types of user is particularly scarce for drugs other than cannabis. Even for cannabis, the lack of consistency between countries on sub-groups of users makes applying the available information difficult.

Second, general population surveys (GPS), the main data source for the number of cannabis, cocaine, amphetamines and MDMA users in most estimates of retail market size, are likely to suffer from under-coverage; some groups may not be included in the sampling frame for surveys, for example, or may simply be hard to reach or enumerate. GPS are unlikely to include marginalised drug users, who may account for a substantial amount of use of a range of drugs. Therefore an effort has been made to include high-risk drug users in the overall estimates for cannabis, cocaine and amphetamines. This is another area for future development, both in terms of improving the way in which consumption by high-risk drug users is estimated and by developing methods for including other sub-populations not covered in GPS.

Thirdly, reliance on self-reported drug use raises the issue of reporting bias and, of particular concern with regard to illicit drug use, of under-reporting. Under-reporting in surveys can be due to recall issues but also, in the case of stigmatised behaviours, to social desirability bias. In the alcohol field, where comparison with alcohol sales figures provide an alternative measure of use, it has been shown for example that the accuracy of self-report may vary among different sub-groups of people. A study in four English-speaking countries by Stockwell et al. (2016) found that people who reported being infrequent drinkers substantially underestimated their drinking frequency across all four countries (since more people reported drinking the previous day in a separate question than would have occurred if they all did drink less than monthly as reported), while the group who reported daily or almost daily drinking appeared to overestimate drinking frequency.

In an illicit market, survey questions about purchases and use are likely to be particularly sensitive and hence people may be even more likely to under-report use. Despite the challenges in undertaking this type of study, a number of studies comparing self-reported drug use with the results of biological testing have been carried out, which indicate the potential for considerable under-reporting. Harrison (1997), reviewed a number of studies in the United States comparing information from biological testing with self-reported drug use and, with colleagues, undertook a study using a sample from the National Household Survey on Drug Abuse that compared information from biological testing with self-reported drug use among youths and young adults (Harrison et al., 2007). The findings from these studies highlight a number of important issues for market size estimates, such as the ones reported here. It suggests that people may be more willing to report lifetime or last year use of drugs than more recent use, such as use in the past month or past three days, and that the extent of under-reporting may differ for different drugs, which would be expected since use of drugs such as heroin or cocaine is generally much more stigmatised than the use of cannabis. In addition, they show that under-reporting may vary among population sub-groups and by setting. They also note that different biological tests (hair, urine, saliva) have their own limitations and these may also be different for different drugs. The review also highlights the fact that while significant numbers of individuals who say they have not used drugs recently will test positive for drugs, there are also people who report use but test negative. A community survey in Chicago (Fendrich et al., 2004) also illustrated these issues and the analysis suggested that social desirability factors were important in under-reporting and discordant reporting, while memory difficulties played a role in over-reporting (Johnson and Fendrich, 2005).

A number of studies have focused on validation of self-reports of drug use among young people in festival and nightlife settings, a sub-group of the population likely to be similar to the population included in the EWSD. These generally looked at a recent time periods of use (past 48 hours) validated against oral fluid tests and found the highest levels of under-reporting for cocaine use and the lowest for cannabis, while also finding a number of individuals who self-reported use but tested negative (Gjerde et al., 2019; Gjersing et al., 2019; Johnson et al., 2009; Miller et al., 2015). The recent study of over a thousand music festival attendees in Norway (Gjerde et al., 2019; Gjersing et al., 2019) found that 53.8 % of those that tested positive for cannabis reported use in the past 48 hours as did 1.3 % of the much larger number of people who tested negative. In the case of cocaine, only 16.7 % of those who tested positive said they had used the drug in the past 48 hours, as did 0.3 % of those who tested negative, the equivalent figures for MDMA were 31.3 % and 0.3 %. Only a very small number of individuals tested positive for amphetamines and of those, 55.6 % reported use in the past 48 hours. Analysis showed that among those who tested positive, the factors most strongly associated with self-reporting use were weekly illicit substance use and having used illicit substances before they were 18 years of age.

Kilmer and Pacula (2009), drawing on the work of Harrison et al. (2007) calculate a correction factor for each of the drugs for their estimates of the global retail market size, while Caulkins and Kilmer (2013) suggest an ex-post judgement on the size of any correction rather than incorporation into the calculations. However, correction factors have not been applied to the estimates here data on under-reporting in European countries are extremely limited, and it is very likely that there are considerable inter-country differences due to cultural factors and the extent to which drug use is normalised. Correction factors may need to vary not only by drug but also based on patterns of use, and consideration may also need to be given to potential biases in frequency of use and daily amounts used in addition to prevalence rates. This is clearly an essential area for further research and data collection for future estimates.

For all the reasons above, it is important to recognise that, although large, the current estimates most likely underestimate the size of the market and should be considered minimum estimates. However, we feel that the conservative approach we have taken within the estimation process is important since as Savona and Riccardi (2015) indicate '… any quantification of illicit markets risks producing only guess-estimations or mythical numbers not backed by any empirical support or proof … more useful for lobbying purposes than for research or policy-making.'

3 Estimating the size of the cannabis market

Cannabis is the most frequently used drug and hence the data available relating to its use are relatively comprehensive and robust. General population surveys were used as the primary source of data on the number of cannabis users in the year, who were categorised into four different user groups, according to frequency of use. In addition, a correction was made for under-coverage of high-risk opioid users, who may also frequently use cannabis, within these surveys.

Improvements in the estimation process in this second round of estimations were made in three main areas.

- Information on amounts used were available for 15 EU countries from the European Web Survey on Drugs (EWSD) (Matias et al., 2019), partially addressing a data gap identified in the previous estimation by more than doubling the number of countries with available data. In the previous round of estimates we only had data from five countries.
- Information on the type of cannabis used was also available from the EWSD, allowing a distinction to be made between amounts used for herb and resin and a partition of the market into these two groups on the basis of demand data. The previous estimation relied on seizure data to partition the market.
- Improvements to the routine data collections at the EMCDDA have reduced slightly the need for imputation and also provide more up-to-date information for the estimation process.

The decisions made about the data to be used within the estimates, imputation processes and assumptions made are described for each component of the basic model below. The data used in the estimation process are shown in Tables 1a and 1b.

3.1 Number of cannabis users

Number of cannabis users in the general population

Cannabis users are mainly well integrated in society and likely to be quite well represented in GPS. Within Europe, most countries have a fairly recent GPS that includes questions on use in the last year and the last month, and on frequency of use (most often relating to use in the last month but sometimes in the last year). These data are reported to the EMCDDA routinely, and the number of cannabis users included in the surveys is generally sufficiently large to enable estimates of the prevalence of different types of users to be constructed for most countries. Therefore, for the estimate of numbers of people who use cannabis, GPS data have been used as the main source of data for the market size estimates using the same approach as used in the previous estimates published in 2016 (EMCDDA, 2016).

As was the case for the previous market size estimates, to take account of the considerable variations in amounts of cannabis people use per year depending on their frequency of use, the numbers of people who use cannabis need to be divided into sub-groups on the basis of their frequency of use. For each country, those who had used cannabis in the last year were sub-divided into four groups based on their responses to the GPS questions on their use of cannabis in the last year and last month, and frequency of use. However, the way in which frequency of use is ascertained varies between countries, with some asking about number of days in which drugs were used and others are presenting frequency groups, such as ‘less than once a week’. The estimates of quantities of cannabis are not available in the GPS and are obtained from the EWSD, which asks slightly different questions on frequency of use. So it was necessary to identify groupings that approximated, as nearly as possible, those that had been used in the previous study, which had been originally developed in the study by van Laar et al. (2013).

The groupings used were as follows:

- used in the last year but not in the last month (infrequent);
- used less than once a week or 1-3 days in last month (occasional);
- used once up to several times a week or 4-19 days in last month (regular);
- used daily or almost daily or 20+ days in last month (intensive).

However, the frequencies of use questions are quite variable from country to country, so further minor variations in the categories used were necessary. The prevalence of infrequent use was obtained by subtracting last month prevalence from last year prevalence. The prevalence of use for the occasional, regular and intensive user groups was obtained by multiplying the last month prevalence by the proportion of last month users in the appropriate categories of the frequency of use question.

Imputation procedures: The amount of GPS data available to the EMCDDA for this round of estimates was an improvement from that available for the estimates published in 2016. A general population survey with data on last month prevalence (LMP) and last year prevalence (LYP) was available for all 30 countries; all were from 2012 or later, with the exception of Estonia in 2008, 10 were from 2017 and 5 from 2016. Nevertheless, frequency of use data were missing in 6 countries. In order to obtain EU totals, it was therefore necessary to impute values in these cases. As before, because of the enormous inter-country variation in drug use in Europe, in conducting the imputation we sought as far as possible to use any country-specific data available and only use European averages as a last resort.

Estonia, Ireland, Luxembourg, Malta, Sweden and Turkey did not have data on frequency of use in the last month. As was the case for the previous market size estimates, a regression equation to predict the likely prevalence of occasional, regular and intensive users based on lifetime prevalence and the ratio of last month to last year prevalence in those countries that did have frequency of use data was obtained. Then to obtain the prevalence of use for each of the user groups for the countries with missing data, the estimated proportion of the total number of last month users in each of the user groups obtained using the regression equation was multiplied by the prevalence of use in the last month.

In the case of Estonia, lifetime prevalence, one of the variables used in the regression equation, was not available. The simple average of the ratio of last year to lifetime prevalence was calculated for all the available surveys and then the last year prevalence reported by Estonia was multiplied by the inverse of this to obtain an estimate of lifetime prevalence.

The regression method was adopted in order, where possible, to make use of any available data to generate the estimates. The selected model parameters are shown in Table A1 (appendix). It can be seen that, although a number of different models were considered, the results obtained from the selected model are not ideal. The estimate for intensive users in Estonia fell out of bounds (predicted value of the proportion of daily users among last month users = −0.07), and was replaced with 0 as a minimum value. We considered using the averages of the existing prevalence rates and rescaling to ensure the sum of the group prevalence matched the last month prevalence for the country being estimated. This shifted values towards the intensive users, and provided values within scale, but did not utilise the available information on lifetime and last year prevalence available in those countries. Tables A2 and A3 in the appendix present the data on numbers and proportions of last month users by user group drawn from GPS and the prevalence rates and population used that were taken forward into the market size estimation process.

Table 1a: Number of cannabis users used in the market size estimation process by country

Country	GPS year	Infrequent	Occasional	Regular	Intensive	PDU year	High-risk opioid users that also use cannabis
Austria	2015	229 461	75 588	42 901	28 601	2017	9 725
Belgium	2013	146 573	77 742	73 169	39 633	n.a.	6 173
Bulgaria	2016	78 688	77 145	31 155	7 418	2016	1 778
Croatia	2015	79 359	70 383	45 045	21 397	2015	5 553
Cyprus	2016	5 825	3 828	1 498	1 664	2017	353
Czechia	2017	479 041	51 850	80 851	6 152	2017	2 466
Denmark	2017	129 221	54 346	30 012	22 712	2009	4 052
Estonia	2008	38 987	8 302	4 387	0	2015	2 221
Finland	2014	148 743	40 537	35 132	10 810	2012	3 697
France	2017	1 917 049	914 348	893 084	883 971	2017	80 425
Germany	2015	1 618 901	805 122	505 438	362 305	2016	32 864
Greece	2015	103 407	42 451	28 301	18 867	2017	5 003
Hungary	2015	52 372	30 550	10 183	5 092	2010-11	726
Ireland	2015	103 271	58 163	43 800	35 731	2014	4 053
Italy	2017	1 827 281	910 013	806 908	421 385	2017	42 902
Latvia	2015	32 724	12 645	5 152	2 342	2017	1 588
Lithuania	2016	30 009	11 413	8 779	439	2016	1 678
Luxembourg	2014	11 087	4 501	2 778	1 754	2015	749
Malta	2013	1 543	776	354	105	2017	581
Netherlands	2017	378 763	310 009	192 532	143 583	2012	1 530
Norway	2017	96 482	45 822	36 657	3 666	2013	2 017
Poland	2014	648 925	454 247	45 425	45 425	2014	4 640
Portugal	2016	53 524	30 026	58 656	199 010	2015	16 018
Romania	2016	235 651	128 903	52 367	2 014	2017	1 243
Slovakia	2015	83 170	37 048	31 756	10 585	2008	752
Slovenia	2012	28 704	15 904	9 247	6 288	2017	1 132
Spain	2017	583 304	114 698	1 111 480	1 567 542	2016	16 309
Sweden	2017	187 719	64 370	33 408	2 339	2007	2 709
Turkey	2017	192 543	192 811	95 300	121 383	2011	962
United Kingdom	2017	1 645 081	1 033 668	215 441	142 883	2014-15	42 567

Note: Yellow highlights denote values estimated on the basis of the regression equations; red highlights denote values out of range (i.e. negative values), which were replaced by 0.

Table 1b: Amounts of cannabis used per year by user group and prices for herbal cannabis and resin used in the market size estimation

	Herbal – price per gram (EUR)			Grams of herbal cannabis used per year				Resin – price per gram (EUR)			Grams of cannabis resin used per year			
Country	Year	Price	Measure used	Infrequent	Occasional	Regular	Intensive	Year	Price	Measure used	Infrequent	Occasional	Regular	Intensive
Austria	2017	8	Mode	1.06	8.80	93.95	299.52	2017	8	Mode	0.06	0.29	3.14	21.01
Belgium	2017	10	Mode	0.97	6.80	65.10	255.12	2017	10	Mode	0.10	0.67	3.58	13.80
Bulgaria	2015	5	Mode	0.82	7.57	65.11	230.52	2017	10	Mode	0.05	0.63	6.89	39.86
Croatia	2017	12.2	Mode	0.47	6.62	53.06	165.88	2017	12.9	Mode	0.28	2.43	11.77	53.68
Cyprus	2017	20	Mode	0.82	7.57	65.11	230.52	2017	12	Mode	0.05	0.63	6.89	39.86
Czechia	2017	6.5	Mode	0.82	7.57	65.11	230.52	2017	11.1	Mean	0.05	0.63	8.77	11.77
Denmark	2017	11.0	EU average	0.82	7.57	65.11	230.52	2017	7	Mode	0.05	0.63	6.89	39.86
Estonia	2017	20	Mode	0.62	6.13	56.29	206.59	2017	20	Mean	0.00	0.01	0.31	0.50
Finland	2017	17	Mode	1.10	9.67	78.61	277.43	2017	15	Mode	0.06	0.53	2.59	15.34
France	2017	10.2	Mode	0.42	5.63	45.12	161.07	2017	5.4	Mode	0.19	2.42	33.52	125.75
Germany	2017	10	Mean	0.82	7.57	65.11	230.52	2017	9.4	Mean	0.05	0.63	6.89	39.86
Greece	2017	19	Mean	0.82	7.57	65.11	230.52	2017	25	Mean	0.05	0.63	6.89	39.86
Hungary	2017	8.1	Mode	0.82	7.57	65.11	230.52	2017	8.1	Mode	0.05	0.63	6.89	39.86
Ireland	2017	20	Mean	0.82	7.57	65.11	230.52	2017	6	Mean	0.05	0.63	6.89	39.86
Italy	2017	9.9	Mean	0.92	6.67	58.29	196.93	2017	11.08	Mean	0.15	1.77	18.90	59.68
Latvia	2017	12	Mode	0.82	8.25	66.05	228.45	2017	13	Mode	0.00	0.02	0.24	3.28
Lithuania	2017	13	Mean	0.68	7.28	43.15	210.07	2017	13	Mean	0.00	0.13	1.23	1.23
Luxembourg	2017	10	Mode	0.85	6.97	62.54	252.63	2017	12.5	Mode	0.08	1.37	12.71	60.75
Malta	2017	19.8	Mean	0.82	7.57	65.11	230.52	2017	20.75	Mean	0.05	0.63	6.89	39.86
Netherlands	2017	4.0	Mean	0.41	4.50	47.48	179.77	2017	9.43	Mean	0.12	1.87	21.10	29.65
Norway	2017	16.2	Mean	0.82	7.57	65.11	230.52	2017	13.49	Mean	0.05	0.63	6.89	39.86
Poland	2017	7	Mode	0.90	8.29	68.04	242.27	2017	6.	Mode	0.01	0.15	0.43	3.88
Portugal	2017	4.8	Mode	0.82	7.57	65.11	230.52	2017	1.67	Mode	0.05	0.63	6.89	39.86
Romania	2017	13.1	Min-max average	0.82	7.57	65.11	230.52	2017	15.32	Min-max average	0.05	0.63	6.89	39.86
Slovakia	2017	10	Mean	0.82	7.57	65.11	230.52	2017	15	Mean	0.05	0.63	6.89	39.86
Slovenia	2017	5	Mode	0.82	7.57	65.11	230.52	2017	10	Mode	0.05	0.63	6.89	39.86
Spain	2017	5.2	Mean	0.82	7.57	65.11	230.52	2017	6.04	Mean	0.05	0.63	6.89	39.86
Sweden	2017	10	Mode	0.82	7.57	65.11	230.52	2017	10	Mode	0.05	0.63	6.89	39.86
Turkey	2016	7.0	Min-max average	0.82	7.57	65.11	230.52	2016	19.62	Min-max average	0.05	0.63	6.89	39.86
United Kingdom	2017	5.5	Mode	0.93	10.88	92.56	272.45	2017	5.5	mode	0.00	0.03	13.01	52.31

Note: Yellow highlights denote imputed values

Cannabis use among high-risk opioid users

It is acknowledged that general population surveys are unlikely to cover people whose drug use is more problematic, such as high-risk opioid users, who are known to often use other drugs alongside their primary problem drug (e.g. Rehm et al., 2005). To correct for this type of under-coverage, an estimate of the cannabis consumption among high-risk opioid users has been made to complement the estimates derived using GPS. The simple approach remains the same, the number of users is multiplied by the amount used to obtain a quantity consumed and this is then multiplied by the price of the drug to obtain expenditure estimates. In considering the amount used, this group are assumed to be in the intensive use group.

Once again, standard EMCDDA data collections were used as far as possible to obtain an estimate of the numbers of high-risk opioid users who use cannabis. Estimates of the number of high-risk opioid users for each country collected as part of the problem drug use (PDU) indicator is the starting point. Then to estimate the proportion who also use cannabis, data on secondary drug use among those entering treatment primarily for opioid use in each country are used as a proxy for cannabis use among high-risk opioid users more generally. Therefore the number of high-risk opioid users using cannabis in each country is obtained by multiplying the estimated number of high-risk opioid users in the country by the proportion of all treatment entrants for opioids who reported using cannabis as a secondary drug.

Imputation procedures: In a number of instances the necessary data were missing and had to be imputed in order to obtain EU estimates.

1. The data on the number of high-risk opioid users had to be imputed for five countries: Belgium, Bulgaria, Denmark, Estonia and Sweden. Different approaches were used depending on the available data. For Bulgaria, Denmark and Sweden, more general estimates were submitted for the problem drug use indicator, defined by the EMCDDA as a broader group than high-risk opioid users and including people who inject drugs and long-term cocaine and amphetamine users, were available. Upper and lower confidence intervals were available for these estimates, except in the case of Sweden. As was the case in the previous round of market size estimates, these were adjusted using the proportion of entrants into treatment for problems associated with use of opioids and stimulant drugs who were opioid users. The upper and lower bounds were calculated in the same way using the confidence intervals of the estimates. This assumes that the treatment population reflects the overall high-risk drug use population (i.e. that high-risk users of different drugs have an equal propensity to seek treatment). This might overestimate the share of opioid/heroin users since drug treatment is better tailored for these substances, but in the absence of any better data source it seemed the best approach. For Estonia, estimates of the number of people who inject drugs were available. This was combined with information from the national report on the proportion of all injectors who were opioid users and the proportion of opioid users whose route of administration was injecting to obtain the number of opioid users. For Belgium information on the number of individuals in opioid substitution treatment (OST) was the only data available that provide some insight into the numbers of problem opioid users. An estimate of the average OST coverage in the European Union was calculated from those countries with available data, and this was then applied to the number in OST for Belgium to get an estimate of number of problem opioid users. Central values were used as upper and lower bounds for Belgium and Sweden.
2. The proportion of treatment entrants for opioids who reported cannabis as a secondary drug was not available for seven countries: Estonia, Germany, Hungary, Latvia, Lithuania, Norway and Sweden. In these cases, the average proportion of opioid users reporting cannabis as a secondary drug in the European Union and Turkey, weighted by the number of opioid users, (0.2237) was applied.

The data taken forward into the estimation, including the outcome of the imputation procedures are shown in Table A4. Aside from the obvious limitations resulting from estimating missing data, the high-risk opioid use estimates are for a broad range of years, with just under half referencing 2012 or later. The methods adopted

to estimate the numbers of high-risk drug users differ across the reporting countries, weakening inter-country comparability. Regular estimates using comparable methods from established data sources for more countries are required to improve these estimates. This continues to be the long-term goal of the EMCDDA and the Reitox network.

3.2 Amounts used by different user types

The lack of data on amounts used by the different types of user, e.g. occasional, intensive, etc., for most countries was identified as a fundamental problem for the retail market size estimates published in 2016. As discussed above, to address this data gap, the EMCDDA developed the European Web Survey on Drugs (Matias et al., 2019) and supported a number of countries in implementing it. As a result, for the current estimates, data on amounts and frequency of use of both herbal and resin cannabis were available from the web survey in 15 EU countries, more than double the number available for the estimates published in 2016. The sample sizes obtained in the participant countries were also generally larger.

The questions included in the web survey allowed the calculation of an estimated annual amount of herbal and/or resin (in grams) used for each participant. This was obtained by multiplying the amount of herbal and/or resin (in grams) participants reported that they used on a typical day by the number of days that they indicated that they used the substance in a year. Average amounts used per year were then calculated for each of the frequency of use groups based on the number of days cannabis was used during last year (infrequent, occasional, regular and intensive). The 5 % trimmed mean and its 95 % CI were used for this purpose, as was the case for the previous estimates using this approach (EMCDDA, 2016; van Laar et al., 2013) because it reduces the influence of very extreme values that tend to be found in this type of data.

In the EWSD, respondents to the cannabis questions were asked about use of herbal cannabis and cannabis resin separately, which also meant that it could be used to subdivide the estimate of the size of the cannabis market into markets for resin and herb, marking a further improvement on the estimates published in 2016. In the earlier study, in the absence of comparable data on use of different types of cannabis from most EU countries, estimates of use and expenditure on any type of cannabis were calculated and this was then split between cannabis herb and resin based on the proportion of cannabis seizures (number of seizures) in each country that were herb or resin.

Having EWSD data from half of the EU countries allowed a completely different approach to be taken. The annual amounts used for herb and resin could be calculated separately for each respondent. Then for those respondents who reported using only resin or only herbal cannabis, the estimated annual quantity used was calculated as described above and allocated to either herb or resin use as appropriate, with the annual amount for the other form being set to zero. For those respondents who said they used both forms of cannabis and hence answered both modules, a weight variable based on the ratio of the number of days of herbal cannabis use and the number of days of resin use was calculated. This was necessary because in some cases the numbers of days of use reported added up to more than 365 days. This weight variable was then used to assign the number of days per year of herbal and of resin use and an annual amount of herbal cannabis and of resin use calculated. Average amounts of herbal cannabis use and of resin use were then calculated for different frequency of use groups in each participating country.

In order to impute amounts for the countries with no data, data from all 15 countries that participated in the EWSD were analysed together and the trimmed mean of the whole sample and its confidence intervals were used (see Tables A5 and A6). The same approach was used to impute the amounts used when the sample size in the web survey was too small (<30) to provide reliable estimates for some frequency of use groups (that is, herbal users in Cyprus and Czechia; resin users in Cyprus; infrequent and occasional resin users in Czechia). When negative lower limits were obtained, they were replaced with zero (infrequent and intensive resin users in Latvia; regular resin users in Lithuania; infrequent and occasional resin users in the United Kingdom).

The estimated numbers of people in each frequency of use group obtained from GPS were then multiplied by the average annual amount of herbal cannabis and resin use in that frequency of use group, to get separate market size estimates for herbal cannabis and resin. The assumption that problem opioid users who also use cannabis were likely to be intensive users and that the split between cannabis herb and resin use would be the same as in the EWSD was also made.

3.3 Calculating the value of the market

The data on price were drawn from the EMCDDA's annual data collection and the rules described earlier were followed to select a price when more than one was provided. Prices were reported for resin and herbal cannabis separately. In most cases data from 2017 were used, but there were some missing data. Denmark had no price data for herbal cannabis so a simple average of the values for the other countries was imputed. In the case of Turkey and Estonia, data for 2016 were used. The prices used are shown in Table 1b and Table A7.

Table 2a: Estimates of the retail market size for cannabis in Europe, 2017 – quantities

EU28	Herb (tonnes)			Resin (tonnes)			Total (tonnes)		
Users identified through GPS	Mid	Low	High	Mid	Low	High	Mid	Low	High
Infrequent	8.10	7.33	9.67	0.95	0.70	1.25	9.05	8.02	10.92
Occasional	41.02	34.60	48.22	5.73	4.13	7.36	46.74	38.73	55.57
Regular	261.40	238.36	294.98	67.27	52.89	80.75	328.68	291.26	375.72
Intensive	844.15	788.57	902.57	240.21	207.72	272.70	1 084.36	996.30	1 175.27
High-risk opioid users	62.95	55.91	70.00	19.18	15.52	22.85	82.13	71.43	92.85
Total	1 217.63	1 124.77	1 325.43	333.34	280.96	384.91	**1 550.97**	**1 405.73**	**1 710.33**
EU, Norway and Turkey	Herb (tonnes)			Resin (tonnes)			Total (tonnes)		
Users identified through GPS	Mid	Low	High	Mid	Low	High	Mid	Low	High
Infrequent	8.34	7.56	9.91	0.96	0.68	1.27	9.30	8.26	11.18
Occasional	42.82	36.33	50.10	5.88	4.29	7.52	48.70	40.60	57.62
Regular	270.00	246.64	303.88	68.18	53.72	81.75	338.18	300.35	385.63
Intensive	872.98	816.54	932.26	245.19	212.31	278.10	1 118.17	1 028.83	1 210.35
High-risk opioid users	63.64	56.58	70.70	19.30	15.63	22.98	82.94	72.20	93.68
Total	1 257.78	1 163.65	1 366.85	339.52	286.60	391.62	**1 597.30**	**1 450.25**	**1 758.47**

Table 2b: Estimates of the retail market size for cannabis in Europe, 2017 – value

EU28	Herb (EUR million)			Resin (EUR million)			Total (EUR million)		
Users identified through GPS	Mid	Low	High	Mid	Low	High	Mid	Low	High
Infrequent	71.81	65.22	83.49	8.04	6.06	10.56	79.85	71.28	94.04
Occasional	345.23	298.70	396.83	48.64	35.35	62.10	393.87	334.06	458.93
Regular	2 156.57	1 965.35	2 415.77	507.35	394.85	609.80	2 663.92	2 360.20	3 025.57
Intensive	6 233.36	5 809.62	6 675.40	1 567.55	1 343.92	1 791.25	7 800.91	7 153.53	8 466.65
High-risk opioid users	563.83	507.13	620.52	132.68	107.79	157.63	696.50	614.92	778.15
Total	9 370.79	8 646.02	10 192.01	2 264.25	1 887.97	2 631.33	**11 635.04**	**10 533.99**	**12 823.34**
EU, Norway and Turkey	Herb (EUR million)			Resin (EUR million)			Total (EUR million)		
Users identified through GPS	Mid	Low	High	Mid	Low	High	Mid	Low	High
Infrequent	74.20	67.51	85.97	8.27	6.26	10.83	82.47	73.77	96.80
Occasional	361.00	313.85	413.23	51.40	37.77	65.20	412.40	351.62	478.43
Regular	2 238.40	2 044.22	2 500.56	523.64	409.43	627.81	2 762.05	2 453.65	3 128.37
Intensive	6 441.78	6 011.80	6 890.07	1 664.44	1 432.85	1 896.10	8 106.23	7 444.65	8 786.17
High-risk opioid users	572.90	515.93	629.86	134.51	109.48	159.62	707.41	625.41	789.48
Total	9 688.28	8 953.31	10 519.70	2 382.27	1 995.79	2 759.56	**12 070.56**	**10 949.11**	**13 279.25**

4 Estimating the size of the stimulants market

The main illicit stimulant drugs available in Europe are cocaine and the amphetamine-type stimulants (ATS) amphetamine, methamphetamine and MDMA (often known as ecstasy when in tablet form or MDMA in crystal form). There are regional differences in the relative importance of the different stimulants, with cocaine generally more important in western and southern countries and amphetamines predominant in northern and eastern Europe. Amphetamine is much more commonly used in most countries than methamphetamine. However, in some datasets it is not possible to distinguish between these two substances. Of particular importance for these market size estimates is the fact that most GPS do not distinguish between these two substances, in part because many users are unaware of what form of amphetamine they are using, particularly in countries where use of methamphetamine is still comparatively rare. For this reason, in these estimates we calculate a generic 'amphetamines' estimate. It is assumed that this is generally amphetamine, except in the case of Czechia and Cyprus where other data indicate that methamphetamine is more common.

The same basic approach as that described for cannabis was applied to cocaine, MDMA and amphetamines (namely, establishing the amount consumed by multiplying estimates of the number of users by the amount used, and converting this to a value by multiplying by price). However, less information is available for these drugs than for cannabis, and prevalence of use is much lower, so it is not possible to subdivide users into as many sub-groups.

In this round of estimates, the use of crack cocaine as well as powder cocaine by high-risk opioid users was included in the market size estimates. This has a significant impact in the estimates in some countries, especially in the case of the United Kingdom. It is one factor behind the considerably higher estimate for the size of the cocaine market in these updated estimates.

4.1 Numbers of stimulant users

Stimulant users in the general population

The basic approach

The method of estimating the number of users in the general population remained unchanged for this round of estimates, although as discussed earlier the data have been updated and availability has improved.

As was the case for cannabis, prevalence rates obtained from GPS are multiplied by 2017 Eurostat population data for 15- to 64-year-olds. However, far less information is available in GPS on the frequency of use for stimulants than for cannabis. Because of the lower prevalence rates for the use of these drugs, few countries have a sufficient numbers of last month users to provide robust data on frequency of use in the last month. Hence, it is not possible to distinguish the same range of user types as was possible for cannabis. As was the case for the market size estimates published in 2016, it was only possible to distinguish two broad groups of users based on frequency of use which were mapped onto the data available from the EWSD as follows:

- infrequent users who used less than once a month or less than 11 times a year, approximated in the GPS by those using in the last year but not in the last month (LYP – LMP); and
- frequent users who used on 11 or more days a year or at least once a month approximated by those using in the last month (LMP).

Only last year prevalence and last month prevalence are required to distinguish these groups.

Imputation procedures

Although only data on last year prevalence (LYP) and last month prevalence (LMP) are necessary to estimate the prevalence of both infrequent users (LYP – LMP) and frequent users (LMP) and these are generally

available from GPS, the need for imputation of some data for a number of countries persisted despite improvements in reporting. However, the extent of this varied by drug. The method of imputation followed the principle of making use of as much country-specific data as possible.

Cocaine

In the case of Belgium, France and Norway no recent data for last month prevalence of cocaine were reported, while Malta reported data for lifetime but not last year and last month prevalence. In addition, there were three countries that reported 0 LMP (Austria, Czechia, Poland). It was felt that these values were unlikely and in a departure from the previous estimation process in 2016, it was decided to treat 0 LMP as missing values and apply the same imputation procedure.

Following the principle of making use of as much country-specific data as possible, the population weighted average of the ratios of LYP/LTP and LMP/LYP were calculated for those countries with complete data. Missing values and 0 reported values were estimated as necessary for LYP and LMP by multiplying the values of LTP and LYP available for the country by the appropriate weighted average.

For two countries (Luxembourg, Slovakia), subtracting LMP from LYP to estimate infrequent users resulted in a 0 infrequent use population. Given the small population of the two countries, the impact on the total amounts consumed and the corresponding values was judged to be minimal and no correction applied. However, alternatively, imputation methods as described above could be considered.

The estimated prevalence rates of each user group by country obtained by the above methods that were taken forward into the market size estimation process are shown in Table A8 and the estimated numbers of users, prices and amounts are shown in Table 3.

MDMA

The same approach was taken to imputation as for cocaine. Firstly, there was no recent data for last month prevalence of MDMA reported for Belgium, France and Norway, while Malta reported data for lifetime but not last year and last month prevalence. Four countries reported 0 LMP (Austria, Cyprus, Portugal, Romania) and again, it was decided to treat 0 LMP as missing values and apply the same imputation procedure. For one country (Latvia) subtracting LMP from LYP to estimate infrequent users resulted in a 0 infrequent use population. Given the relatively small population of Latvia, the impact on the total amount consumed and the corresponding values was judged to be minimal and no correction applied.

The estimated prevalence rates of each user group by country used in the estimation procedure are shown in Table A9 and the estimated numbers of users, prices and amounts are shown in Table 4.

Amphetamines

For amphetamines, as for the other stimulants, no recent data for last month prevalence of amphetamines were reported by Belgium, France and Norway, while both Malta and Turkey reported data for lifetime but not last year and last month prevalence. In addition, there were eight countries that reported 0 LMP for amphetamines (Cyprus, Czechia, Estonia, Greece, Italy, Latvia, Portugal, Romania) and it was decided to treat 0 LMP as missing values. The same imputation procedures as for the other stimulant drugs were used to impute these missing values and the estimated prevalence rates of each user group by country used in the estimation procedure for amphetamines are shown in Table A10 and the estimated number of users, prices and amounts are shown in Table 5.

Table 3: Number of users, prices and amounts used in the market size estimates for cocaine

	Number of users						Price per gram (EUR)			Amount of cocaine used	
Country	GPS year	GPS sample size	Infrequent	Frequent	PDU year	High-risk opioid users that also use cocaine	Year	Price	Measure used	Infrequent	Frequent
Austria	2015	3 477	13 826	9 708	2017	12 361	2017	100	Mode	2.06	32.70
Belgium	2013	4 931	21 528	15 116	EU average	9 088	2017	50	Mode	2.90	42.69
Bulgaria	2016	3 996	9 257	4 629	2016	599	2017	61	Mode	3.01	53.81
Croatia	2015	4 959	13 683	8 210	2015	2 510	2017	78	Mode	3.67	89.65
Cyprus	2016	3 500	582	582	2017	215	2017	100	Mode	3.01	53.81
Czechia	2017	1 261	4 079	2 864	2017	51	2017	75.96	Mode	2.50	53.81
Denmark	2017	10 196	33 228	25 844	2009	4 469	2017	67	Mode	3.01	53.81
Estonia	2008	1 401	5 085	848	2015	3 420	2017	120	Mode	2.45	62.07
Finland	2014	3 128	10 377	6 918	2012	76	2017	100	Mode	3.78	54.01
France	2017	20 665	388 529	272 811	2017	65 583	2017	79.4	Mode	3.76	63.13
Germany	2015	9 204	215 854	107 927	2016	50 594	2017	71.6	Mean	3.01	53.81
Greece	2015	1 519	13 788	13 788	2017	1 500	2017	85	Mean	3.01	53.81
Hungary	2015	2 274	6 546	13 093	2010-11	1 117	2017	64.6	Mode	3.01	53.81
Ireland	2015		31 294	15 647	2014	3 518		79.41	EU average	3.01	53.81
Italy	2017	10 502	311 026	155 513	2017	56 753	2017	80.95	Mean	2.44	48.89
Latvia	2015	4 513	2 517	3 776	2017	2 445	2017	90	Mode	2.95	53.81
Lithuania	2016	4 794	0	1 876	2016	2 584	2017	58	Mean	2.68	53.81
Luxembourg	2014	3 344	821	821	2015	1 243	2017	100	Mode	3.78	98.08
Malta	2013		200	151	2017	523	2017	37.75	Mean	3.01	53.81
Netherlands	2017	5 883	167 101	77 981	2012	4 267	2017	49	Mean	3.34	68.95
Norway	2017	1 883	22 268	15 636	2013	3 105	2017	102.52	Mean	3.01	53.81
Poland	2014	1 135	30 499	21 415	2014	1 713	2017	55	Mode	3.21	49.94
Portugal	2016	9 632	6 691	6 691	2015	21 918	2017	100	Mode	3.01	53.81
Romania	2016	7 200	13 092	13 092	2017	211	2017	100	Min-max	3.01	53.81
Slovakia	2015	8 029	0	3 780	2008	103	2017	100	Mean	3.01	53.81
Slovenia	2012	7 514	5 468	1 367	2017	1 201	2017	60	Mode	3.01	53.81
Spain	2017	21 249	337 702	337 702	2016	15 701	2017	59.29	Mean	3.01	53.81
Sweden	2017	7 990	62 573	12 515	2007	4 170	2017	94	Mode	3.01	53.81
Turkey	2017		14 644	12 475	2011	945	2016	75.95	Min-max	3.01	53.81
United Kingdom	2017	21 257	717 086	421 816	2014-15	184 417	2017	88	Mode	2.95	53.81

Note: Yellow highlights denote imputed values.

Table 4: Number of users, prices and amounts used to estimate the market size estimates for MDMA

	Number of users				Price per gram (EUR)			Amount of MDMA used per year (tablets)	
Country	GPS year	GPS sample size	Infrequent	Frequent	Year	Price	Measure used	Infrequent	Frequent
Austria	2015	3 477	14 344	9 191	2017	9	Mode	4.91	69.09
Belgium	2013	4 931	13 400	8 586	2017	5	Mode	5.70	53.50
Bulgaria	2016	3 996	41 659	18 515	2017	5	Mode	5.56	64.38
Croatia	2015	4 959	8 210	8 210	2017	7.4	Mode	5.80	101.34
Cyprus	2016	3 500	355	227	2017	10	Mode	5.56	64.38
Czechia	2017	1 261	41 656	13 885	2017	7.6	Mode	4.84	49.09
Denmark	2017	10 196	14 768	3 692	2017	6.7	Mode	5.56	64.38
Estonia	2008	1 401	8 476	1 695	2017	10	Mode	6.14	58.73
Finland	2014	3 128	27 673	10 377	2017	20	Mode	5.61	65.98
France	2017	20 665	145 412	93 173	2017	10	Mode	6.57	61.20
Germany	2015	9 204	215 854	107 927	2017	7.7	Mean	5.56	64.38
Greece	2015	1 519	6 894	6 894	2017	6	Mean	5.56	64.38
Hungary	2015	2 274	21 603	36 006	2017	6.5	Mode	5.56	64.38
Ireland	2015		34 424	31 294	2017	10	Mean	5.56	64.38
Italy	2017	10 502	116 635	38 878	2017	15.65	Mean	3.98	64.38
Latvia	2015	4 513	0	3 776	2017	4.5	Min-max average	4.54	48.36
Lithuania	2016	4 794	5 627	1 876	2017	6	Mean	5.54	93.08
Luxembourg	2014	3 344	411	411	2017	10	Mode	4.74	64.38
Malta	2013		249	196	2017	8.5	Mean	5.56	64.38
Netherlands	2017	5 883	267 362	100 261	2017	4.1	Mean	7.38	57.94
Norway	2017	1 883	21 001	13 457	2015	30	Min-max average	5.56	64.38
Poland	2014	1 135	51 914	51 914	2017	5	Mode	5.19	57.22
Portugal	2016	9 632	4 078	2 613	2017	10	Mode	5.56	64.38
Romania	2016	7 200	7 979	5 113	2017	13.13	Min-max average	5.56	64.38
Slovakia	2015	8 029	18 902	3 780	2017	7.5	Mean	5.56	64.38
Slovenia	2012	7 514	2 734	1 367	2017	5	Mode	5.56	64.38
Spain	2017	21 249	122 801	61 400	2017	10.56	Mean	5.56	64.38
Sweden	2017	11 514	43 801	12 515	2017	10	Mode	5.56	64.38
Turkey	2017		18 983	35 254	2016	10.255	Min-max average	5.56	64.38
United Kingdom	2017	21 257	506 179	210 908	2017	11	Mode	5.33	48.48

Note: Yellow highlights denote imputed values.

Table 5: Number of users, prices and amounts used to estimate the market size estimates for amphetamines

	Number of users							Price per gram (EUR)			Amount of amphetamine used per year (grams)	
Country	GPS year	GPS sample size	Infrequent	Frequent	PDU year	High-risk opioid users that also use amphetamines	High-risk amphetamine users	Year	Price	Measure used	Infrequent	Frequent
Austria	2015	3 477	17 651	5 884	2017	4 019		2017	40	Mode	2.06	32.70
Belgium	2013	4 931	8 963	5 694	EU average	1 427		2017	10	Mode	2.90	42.69
Bulgaria	2016	3 996	18 515	13 886	2016	1 092		2017	5	Mode	3.01	53.81
Croatia	2015	4 959	13 683	13 683	2015	1 017		2017	16.5	Mode	3.67	89.65
Cyprus	2016	3 500	356	226	2017	94	176	2017	100	Mode	3.01	53.81
Czechia	2017	1 261	12 736	8 092	2017	7 911	34 700	2017	38	Mode	2.5	53.81
Denmark	2017	10 196	14 768	11 076	2009	2 294		2017	20	Mode	3.01	53.81
Estonia	2008	1 401	5 085	4 238	2015	427		2017	20	Mode	2.45	62.07
Finland	2014	3 128	31 132	6 918	2012	6 099		2017	30	Mode	3.78	54.01
France	2017	20 665	76 787	48 784	2017	3 066		2017	13.6	Mode	3.76	63.13
Germany	2015	9 204	269 817	269 817	2016	6 322	101 994	2017	11.9	Mean	3.01	53.81
Greece	2004	4 351	0	0	2017	295		2017	10	Mean	3.01	53.81
Hungary	2015	2 274	9 165	20 294	2010-11	140		2017	9.7	Mode	3.01	53.81
Ireland	2015		5 741	3 647	2014	95		2017	15	Mean	3.01	53.81
Italy	2017	10 502	23 774	15 104	2017	3 972		2015	37.7	Mean	2.44	48.89
Latvia	2015	4 513	2 517	1 259	2017	306	2 234	2017	12	Mode	2.95	53.81
Lithuania	2016	4 794	1 876	3 751	2016	323		2017	25	Mean	2.68	53.81
Luxembourg	2014	3 344	287	123	2015	85		2017	13	Mode	3.78	98.08
Malta	2013		65	81	2017	1		2017	30	Mean	3.01	53.81
Netherlands	2017	5 883	133 681	66 840	2012	178		2017	7.4	Mean	3.34	68.95
Norway	2017	1 883	12 643	8 032	2013	388	11 208	2017	28.87	Mean	3.01	53.81
Poland	2014	1 135	31 746	20 168	2014	3 921		2017	9	Mode	3.21	49.94
Portugal	2016	9 632	0	0	2015	1 308		2017	26.31	Mean	3.01	53.81
Romania	2016	7 200	8 006	5 086	2017	43		2017	26.16	EU average	3.01	53.81
Slovakia	2015	8 029	3 780	11 341	2008	2 181		2017	50	Mean	3.01	53.81
Slovenia	2012	7 514	2 734	1 367	2017	138		2017	20	Mode	3.01	53.81
Spain	2017	21 249	92 101	61 400	2016	369		2017	26.86	Mean	3.01	53.81
Sweden	2017	7 990	31 287	12 515	2007	521		2017	26	Mode	3.01	53.81
Turkey	2017		1 248	1 564	2011	495		2016	40.51	Min-max average	3.01	53.81
United Kingdom	2017	21 257	168 726	42 182	2014-15	8 505		2017	40	Mode	2.95	53.81

Note: Yellow highlights denote imputed values.

Stimulant use within the high-risk drug using population

Use among high-risk opioid users

Basic approach

To complement the estimates derived from GPS, the consumption of stimulants by high-risk opioid users was also estimated. The approach was the same as for estimating consumption of cannabis among this group, that is, the number of high-risk opioid users who used cocaine was calculated by multiplying the estimated number of high-risk opioid users in each country by the proportion of all entrants into treatment for opioids in that country who reported using cocaine (cocaine powder and/or crack) as a secondary or tertiary drug. This same approach was taken for amphetamines. MDMA use generally takes place in nighlife and festival settings and is rarely problematic or mentioned as a problem drug by entrants to drug treatment. Use by high-risk drug users will therefore make a negligible contribution to market size estimates and they are not considered here.

Imputation procedures

Correction for under-coverage of drug use among opioid users has been made for cannabis, cocaine, and amphetamines. In each case the same high-risk opioid use data had to be imputed for five countries: Belgium, Bulgaria, Denmark, Estonia and Sweden. The methods varied according to available data for each country, and this is described above in the imputation section for under-coverage of cannabis use among high-risk opioid users.

The proportion of treatment entrants for opioids who reported using cannabis, cocaine and amphetamines respectively as a secondary drug had to be imputed for seven countries: Estonia, Germany, Hungary, Latvia, Lithuania, Norway and Sweden. Missing values were imputed as the weighted average proportion of treatment entrants for opioids who reported using the drug as a secondary drug, using those countries with available data (weighted according to the size of the high-risk opioid using population in each country), which was approximately 0.34 for cocaine and approximately 0.43 for amphetamines.

Table A11 shows the number of the high-risk opioid users and the proportion of opioid users in treatment who reported using cocaine as a secondary or tertiary drug that were used in the estimation process. Table A12 shows the same information for amphetamines.

Use among high-risk stimulant users

In some countries there are marginalised populations who use stimulants in a problematic way and, like high-risk opioid users, are unlikely to be represented in GPS. Therefore, consideration was given to including estimates of use by these groups.

For a few countries, estimates of high-risk cocaine users were available through the PDU indicator reporting to the EMCDDA. However, these data come from a wide variety of sources and there were concerns about the extent that these users were already covered within the other sources of data on numbers of users. For example, some are based on GPS data, so these users were likely to have been included in the general population survey estimates. In other cases, such as the United Kingdom, there are estimates for high-risk crack users included as part of its problem drug use estimates. However, some of these may also be opioid users and further investigation of overlaps would be needed before they could be included. In addition, information on the amounts of crack used by high-risk users is limited. It was therefore decided not to include them at this stage, but this is an area for further development in future iterations of these estimates.

In some countries problematic use of amphetamines is a significant problem and they have produced estimates of the number of problem amphetamines users. Data of this type were available for Cyprus, Czechia, Denmark, Latvia and Norway. These estimates for high-risk amphetamines use were included in the market size calculations, being treated as frequent stimulant users in the absence of any recent data on amounts used

by this group. This is likely to underestimate the amounts they use and is an area for further development in future iterations of these estimates. The available high-risk amphetamines users' data are shown in Table A13.

4.2 Amounts used by different user types

Limited available data on amounts used by different user types for stimulants was an important limitation for the 2016 market size estimates. Data reported in the 'Further insights' study (Frijns and van Laar, 2013) were used then to obtain the amounts for a very limited number of countries, which were then applied to all countries. As discussed earlier, the European Web Survey on Drugs was implemented in part to address this issue, and so for this round of estimates data were available for 15 EU countries. For each of the three stimulant drugs, estimates of annual amounts used, in grams or, in the case of MDMA in tablets, could be estimated for each survey participant based on their responses to questions on the amount used on a typical day, multiplied by the number of days they said they used the drug in a year. Users were then classified into infrequent (<11 days per year) and frequent (11 days or more) user groups and an average amount used per year then calculated for each of the user groups, by taking the 5 % trimmed mean for those individuals falling within the group. The 95 % CI around the trimmed mean was used to obtain upper and lower limits for market size estimates.

The estimated numbers of people of each user type obtained from GPS were then multiplied by the relevant annual amount used, to obtain the contribution of that user group to the overall amount of the drug consumed per year. As indicated above, for both cocaine and amphetaines it was assumed that those problem opioid users who also used those drugs were most likely to be frequent users. The same was true for problem amphetamine users. Hence, the amounts used by frequent users were applied to the numbers of problem users to provide an estimate of the contribution of these groups to the cocaine and amphetamine markets.

Imputation procedures

In order to impute the annual amounts used by the different user groups for the countries with no data, all 15 countries from the 2 waves of the EWSD were analysed together and the trimmed mean of the whole sample and its confidence intervals were used.

Where the sample size was less than 30 in the EWSD for a user group in a country, the same estimation method was adopted. For cocaine, this was the case for Cyprus, both infrequent and frequent user groups, and for Czechia, Latvia, Lithuania and the United Kingdom ,the frequent user groups. For amphetamines, Cyprus and the United Kingdom, both infrequent and frequent user groups, and for Luxembourg, Lithuania and Italy, the frequent user group. For MDMA, Cyprus, both infrequent and frequent user groups, and Italy and Luxembourg, for the frequent user groups.

See Tables A14 for cocaine, A15 for MDMA and A16 for amphetamines.

4.3 Calculating the value of the market

As for cannabis, the value of market for each of the stimulant drugs was calculated by multiplying the estimated total amount used annually in each country by the average retail price for that drug in that country. The data on price were drawn from the EMCDDA's annual data collection and the rules followed to select a price when more than one was provided are the following: select mode, mean, median, average of minimum and maximum (min-max average), in sequence of availability.

Imputation procedures

For cocaine, no price data were available for Ireland and the simple average of the final selected price of the remaining countries was used. For MDMA, older price data were used for Norway (from 2015). For amphetamines, no data were available for Romania at the time the estimates were made, and the simple average of the final selected price of the remaining countries was used. The price data for methamphetamine

instead of amphetamines were used for Czechia and Cyprus because methamphetamine is the most common type of amphetamine used in those countries.

See Tables A17 for cocaine, A18 for MDMA and A19 for amphetamines.

Table 6: Estimates of the retail market size for cocaine by quantity and value in Europe, 2017

		Users identified from GPS		Users identified from PDU	Total		
		Infrequent	Frequent	Frequent	Total	Lower limit	Upper limit
European Union							
Cocaine	Quantity (tonnes)	7.42	86.60	24.54	118.56	99.65	137.46
	Value (million EUR)	565.27	6 486.69	2 017.01	9 068.96	7 635.30	10 502.60
MDMA	Quantity (million tablets)	9.97	49.76	–	59.73	49.70	69.76
	Value (million EUR)	87.86	440.77	–	528.63	437.33	619.94
Amphetamines	Quantity (tonnes)	3.36	45.29	13.34	61.99	50.99	81.18
	Value (million EUR)	51.27	696. 48	259.94	1 007.69	830.88	1 283.50
European Union, Norway and Turkey							
		Infrequent	Frequent	Frequent	Total	Lower limit	Upper limit
Cocaine	Quantity (tonnes)	7.53	88.11	24.76	120.40	101.32	139.47
	Value (million EUR)	575.48	6 623.92	2 038.00	9 237.40	7 788.91	10 685.87
MDMA	Quantity (million tablets)	10.20	52.89	–	63.09	52.85	73.33
	Value (million EUR)	92.44	490.04	–	582.48	487.83	677.14
Amphetamines	Quantity (tonnes)	3.41	45.96	14.18	63.55	52.28	83.29
	Value (million EUR)	52.71	717.04	284.66	1 054.41	869.73	1 346.11

5 Estimating the size of the heroin market

Heroin is the main opioid used in Europe, although in a few countries other opioids are quite important, for example in Finland and Estonia other opioids dominate the market (EMCDDA, 2019). However, most of the information available on frequency of use and amounts used relates to heroin so that in these market size estimates, as was the case in the previous estimates published in 2016, we focus on estimates for heroin use. Because those dependent on heroin and other opioids tend to consume the drugs frequently, the market for opioids is an important one. However, it is recognised that a large proportion of opioid users lead chaotic lives and are unlikely to be well-represented in GPS and therefore different data sources need to be used to estimate the size of this market.

Although an attempt was made within the EWSD in Switzerland to investigate the potential of using online surveys to gather information on patterns of use from heroin users this was unsuccessful. Therefore the methods used to estimate the retail market size for heroin in this round of estimation remain the same as used in the previous round published in 2016, although the data sources have been updated.

5.1 Number of heroin users

Basic approach

No single source of data for the number of either heroin or other opioid users for all countries is available at the EMCDDA, so a combination of different data collections has to be used. In the light of the many gaps in the data it was decided to focus again solely on an estimate of the market size for heroin, as was done in the first iteration of the market size estimates. For this an estimate of the number of heroin users in each country is required and since most people who use heroin are frequent, often dependent users, an estimate of 'high-risk heroin users' is likely to be the best approximation.

One of the EMCDDA's key indicators is the problem drug use indicator. Within this indicator, data on the number of high-risk opioid users are part of the core dataset. In some cases, countries specify the main opioid drug used and then, if that is heroin, a high-risk heroin user estimate is available instead of an high-risk opioid user estimate. This was the case for six countries (Czechia, France, Greece, Hungary, Italy, Spain).

Where there were no estimates of high-risk heroin users available, it was necessary to impute this based on high-risk opioid user estimates in combination with treatment data (TDI), if available. If this information was not available, other data sources such as overall high-risk drug use estimates or estimates of the number of people who inject drugs had to be used. In some cases published data from sources other than EMCDDA data collections had to be used, as described in the section on imputation procedures.

In estimating the size of the heroin market an important factor to take into account is whether or not the individual is in treatment, because while in treatment heroin consumption is considerably reduced. As some people may be in treatment for long periods of time, particularly if they are in OST, this is an important consideration. Nevertheless, a significant proportion will 'top up' with heroin even while in treatment, so those in treatment cannot be excluded from the estimation process. McSweeney and Skrine (2013) investigated the impact of OST on heroin use and estimated that there was a 70 % reduction in the amount of pure heroin consumed while people were retained in OST. Since many of the methods used to estimate the numbers of high-risk opioid users utilise treatment data in some way as part of the estimation process, the estimates may include people in OST. The reduced heroin use by this group therefore needs to be taken account of in some way when estimating heroin market size. However, if the high-risk opioid user estimates do not include people in OST it will be necessary to make sure those are also included in the market size estimation process.

Thus our basic approach involved obtaining an estimate of the number of high-risk heroin users sub-divided into those in treatment and those out of treatment for each country. It was decided that the best available data for estimating those in treatment were the number of clients in OST provided by the availability and access to treatment 'indicator'. This was the data collection with the most complete coverage, with fairly recent data available for most countries. The approach taken for estimating the number in treatment if OST data were not available is described below, together with the methods for imputing the overall number of problem heroin users where this was not directly available.

Imputation procedures

Estimates for the number of heroin users in treatment and the number who are out of treatment were required to take account of the different amounts used by these two groups. The basic approach to obtaining these estimates was to first obtain an overall estimate of the number of heroin users from available high-risk prevalence estimates. An estimate of the number of in-treatment heroin users was obtained based on OST and treatment data. The estimated number of heroin users who were not in treatment was then taken as the difference between the overall number of heroin users and the number of in-treatment heroin users.

Overall number of high-risk heroin users

The most common method used to obtain an overall number of heroin users was to take high-risk opioid user values and adjust them by the proportion of primary heroin users among all primary opioid users in treatment (TDI). This method was adopted for the 19 countries with high-risk opioid user estimates (Austria, Croatia, Cyprus, Finland, Germany, Ireland, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Turkey, United Kingdom).

For the six countries that reported high-risk heroin user values, the value was used directly for five countries (Czechia, Greece, Hungary, Italy, Spain). The number of high-risk heroin users reported for France was substantially lower than that reported for clients receiving OST and was therefore substituted by the available high-risk opioid user value, adjusted by the TDI proportion as above.

Among the five countries without a reported high-risk opioid user value, for Bulgaria, Denmark and Estonia the number of high-risk opioid users was estimated as described in the correction for high-risk opioid users of cannabis above, and the treatment proportion for heroin then applied. For Belgium, a different approach was used. The number of clients receiving OST treatment was multiplied by the treatment proportion for heroin to obtain an estimate of the number of heroin users receiving OST. This was then divided by the average proportion of opioid users receiving OST in the 17 countries where this was available and greater than 30 % (coverage less than 30 % is considered low by WHO standards and unlikely to be the case in Belgium) to scale up from OST clients to the overall number of heroin users. For Sweden, it was decided to use the more recent estimates of the number of people who inject drugs instead of the older numbers from the PDU indicator as the basis of the estimation. To obtain the number of people injecting heroin, the estimate of the overall number of people who inject drugs was multiplied by the proportion of people entering treatment who inject drugs who reported primary heroin use. An estimate of the proportion of heroin users who inject drugs, again obtained from treatment data, was then applied to this estimated number of people who inject heroin to obtain the estimated number of high-risk heroin users.

Heroin users in-treatment

Numbers in OST treatment are taken as the best available estimate of the numbers in treatment, although this does ignore any other types of treatment. The OST numbers relate to treatment of all types of opioids, so were adjusted using the proportion of primary heroin users among all primary opioid drug users in treatment to provide the number heroin users in treatment.

Heroin users out-of-treatment

In general terms, the estimate of the number of out-of-treatment heroin users will be the difference between the overall number of heroin users and the estimated number in treatment. However, for this to be the case it is necessary to establish if the overall heroin use estimate includes those in treatment. The amount of information on this varied by country and where no information was available it was assumed that they were included.

For eleven countries, information was available that indicated that heroin users who were receiving OST were included (Austria, Cyprus, Finland, France, Ireland, Italy, Luxembourg, Malta, Netherlands, Romania, Slovenia) and for a further six (Belgium, Germany, Latvia, Portugal, Spain, United Kingdom) the estimation process for the overall heroin use figure implied that OST clients were included, for example treatment registries being used in the estimation process of high-risk users. For Norway, it was known that OST clients were excluded from the high-risk opioid user estimate and so no correction made. For Greece, new OST clients were included in the high-risk heroin user estimate and a correction made using the difference between the 2017 and 2016 OST numbers to estimate the number of new OST clients. For the remaining eleven countries, it was necessary to assume they were included in the absence of any further information.

Confidence intervals

Establishing the level of uncertainty around the market size estimates is an area that requires improvement and could be addressd in future rounds of the process. In this case, the confidence intervals (CIs) around the estimate of high-risk heroin users were used to provide a range for the market size estimates. In most cases, these were obtained by applying the same process as used for the central values on the reported lower and upper values of the high-risk estimates used.

Only the central high-risk heroin estimate and no CIs were provided for the heroin estimates in Czechia. The central estimate of high-risk opioid users in that country was 13 100 users and that of heroin users 3 900. The proportion of the central high-risk heroin use estimate within the central high-risk opioid user estimate was applied to the lower and higher confidence interval of the high-risk opioid user estimate to obtain CI for the heroin value.

Treatment data

Treatment data was generally available for most countries which supports its use within the imputation process. As a general principle, the data from the TDI that was used to adjust the high-risk opioid user estimates was taken from the same collection year as the high-risk opioid user estimate and not the most recent year available, so that both high-risk opioid user and TDI estimates refer to the same point in time. However, this was not possible for Czechia, while in the United Kingdom the high-risk opioid user estimate referred to a period spanning two years (2010/11). For Czechia, TDI data from 2014 were used since there was a change in the TDI system after that. For the United Kingdom, TDI data from 2011 were used.

The proportion of heroin users among opioid users in treatment was not available for Germany and Norway. In the case of Germany, data reported on route of administration among treatment entrants did provide a breakdown of heroin as opposed to all other opioids, and this proportion was used as a proxy, the assumption being that the data for route of administration did not differ systematically from that available for treatment entrants as a whole. In the case of Norway, no information on the proportion of heroin users among opioid users from TDI was available. Given the lack of data, an EU average proportion of heroin users among opioid users in treatment (76 %), for the year from which the high-risk opioid user estimate was available, was used.

Table 7: Number of users, prices and amounts used in the market size estimates for heroin

Country	Estimated number of heroin users		Price per gram (EUR)			Amount of heroin used per year (grams)	
	In treatment	Out of treatment	Year	Price	Measure used	Those in treatment	Those out of treatment
Austria	15 120	14 859	2017	60	Mode	67.1976	216
Belgium	13 818	10 857	2017	20	Mode	67.1976	216
Bulgaria	2 830	9 524	2017	25	Mode	67.1976	216
Croatia	4 759	3 585	2017	52	Mode	67.1976	216
Cyprus	112	516	2017	100	Mode	67.1976	216
Czechia	2 772	1 128	2017	30.38	Mode	67.1976	216
Denmark	3 336	3 892	2017	100	Mode	67.1976	216
Estonia	64	502	2017	15	Mode	67.1976	216
Finland	27	124	2015	150	Mode	67.1976	216
France	120 144	21 071	2017	39.7	Mode	67.1976	216
Germany	39 058	34 036	2014	42.6	Mean	67.1976	216
Greece	8 479	14 785	2017	17.5	Mean	67.1976	216
Hungary	555	2 689	2015	38.8	Mean	67.1976	216
Ireland	8 708	8 227	2017	140	Mean	67.1976	216
Italy	66 766	168 234	2017	45.72	Mean	67.1976	216
Latvia	503	4 835	2017	100	Mode	67.1976	216
Lithuania	1 188	6 053	2017	46.5	Min-max average	67.1976	216
Luxembourg	1 071	656	2017	40	Mode	67.1976	216
Malta	1 025	400	2017	26	Mean	67.1976	216
Netherlands	6 408	3 399	2015	38.3	Mean	67.1976	216
Norway	5 369	6 860	2017	91.73	Mean	67.1976	216
Poland	1 872	8 743	2017	50	Mode	67.1976	216
Portugal	16 572	15 859	2017	50	Mode	67.1976	216
Romania	1 442	17 675	2017	45.97	EU average	67.1976	216
Slovakia	525	3 751	2017	70	Mean	67.1976	216
Slovenia	2 638	1 588	2017	30	Mode	67.1976	216
Spain	51 892	16 405	2017	57.41	Mean	67.1976	216
Sweden	2 072	1 834	2017	72	Mode	67.1976	216
Turkey	11 744	219	2016	65.82	Min-max average	67.1976	216
United Kingdom	124 487	166 108	2017	55	Mode	67.1976	216

Note: Yellow highlighs denote imputations.

5.2 Amounts of heroin used in and out of treatment

Most data available on the amounts of heroin used by people when in and out of treatment come from treatment outcome research studies available for a few countries but using different methods. The available data were reviewed by McSweeney and Skrine (2013) in the 'Further insights' study and, once again, that study was drawn on for the estimation process here.

McSweeney and Skrine establish estimates of the number of days and amounts used for those prior to entering treatment and the reduction in both the number of days and amounts used during treatment based on published data and face to face interviews with a small sample of heroin users in four Member States

(Czechia, Italy, Netherlands, United Kingdom (England)). In combination, these data provide a range for the estimated amounts of illicit heroin used on a typical day prior to entering treatment ranging from 0.5 to 1 gram per day, so the mid-point of 0.75 grams per day was used for the calculation of quantities used out of treatment. Similarly, for frequency of heroin use among this group a 'best' estimate of 24 days of use per month was used, based on consideration of the data obtained from a range of studies. The amounts of heroin used for those in OST were calculated using the middle estimate of the reduction in heroin use for those retained in treatment, given in Table 14 of the report (McSweeney and Skrine, 2013). The amounts used per year obtained in this way that were used in these market size estimates are 216 grams per year for those out of treatment and 67 grams per year for those in treatment. As with the other drugs, the shortage of data on the amounts used is a major limitation; here, the breakdown required was in and out of treatment.

5.3 Calculating the value of the market

The data on prices were drawn from the EMCDDA's annual data collection; the rules followed to select a price when more than one was provided are the following: select mode, mean, median, average of minimum and maximum (min-max average), in sequence of availability. The price for 'brown' heroin was used, as this is the most common form, and 'unspecified' was assumed to be brown. The prices were collected as retail prices and were not adjusted for purity, given the shortage of information and difficulty in linking the two data sources.

For Denmark, a 2012 value was used in the absence of more recent data. For Estonia and Ireland, a 2015 value was used in the absence of more recent data. The actual values used to obtain estimates for the size of the market from the above process in terms of quantities and values related to the different groups of users are shown in Table 7.

It needs to be borne in mind that we have not adjusted for purity (which is known to vary quite markedly between countries and over time) in the estimates shown in Table 8, so the quantity represents heroin of street level purity, whatever that may be.

See Table A20 for data sources used to estimate the number of heroin clients and Table A21 for prices.

Table 8: Market size estimates for heroin

	European Union			**European Union, Norway and Turkey**		
	Amount (tonnes)			Amount (tonnes)		
	Mid	Low	High	Mid	Low	High
Heroin users in treatment	33.6	33.6	33.6	34.6	34.6	34.6
Heroin users out of treatment	115.4	93.4	147.7	118.6	96.4	151.2
Total	**149.0**	127.0	181.2	**153.3**	131	185.8
	Value (EUR million)			Value (EUR million)		
	Mid	Low	High	Mid	Low	High
Total	**7 440.9**	6 394.0	9 119.6	**7 694.4**	6 635.2	9 385.5

6 Overall size of the EU drug market

6.1 Overall size of the market

The overall size of the EU drug market, and the market in the European Union, Norway and Turkey, was obtained by summing the individual estimates for cannabis, stimulants and heroin (Table 9). These estimates indicate that adults living in the European Union spent at least EUR 30 billion on illicit drugs in the past year, with cannabis making up the largest share of this (39 %), followed by cocaine (31 %) and heroin (25 %). As highlighted throughout this report, these new estimates incorporate not only more recent data on prevalence and prices but also new data on amounts of drugs used from a much wider range of countries than previously available and hence are not comparable with the previous estimates.

As discussed in detail elsewhere in the report, because of gaps in the data, under-coverage of data sources, and under-reporting, the estimates are likely to be underestimates and should be interpreted as minimum values. Another important point to note is that the estimates produced here focus only on the main illicit drugs consumed in Europe, cannabis, cocaine, heroin, amphetamines and MDMA and do not include other illicit drugs, for example hallucinogens and new psychoactive substances, because the data on consumption of these drugs is not consistently collected and in general the prevalence of use is quite low.

Much of the data used to produce the market size estimates come from surveys and hence will be subject to sampling and other sources of error. We have attempted to take account of some of this error by making use of information on the confidence intervals around some of the estimates to produce the 'low' and 'high' estimates shown in the table. However, given the many sources of uncertainty within the underlying data this is a very limited approach and an important area for development in the future will be to consider more appropriate ways of estimating the variance in the estimates.

Table 9: Estimates of the size of the European illicit drug market, 2017

	European Union			**European Union, Norway and Turkey**		
	Quantity			Quantity		
	Mid	Low	High	Mid	Low	High
Cannabis (tonnes)	1 550.97	1 405.73	1 710.33	1 597.30	1 450.25	1 758.47
Cocaine (tonnes)	118.56	99.65	137.46	120.40	101.32	139.47
Amphetamines (tonnes)	61.99	50.99	81.18	63.55	52.71	83.29
MDMA (million tablets)	59.73	49.70	69.76	63.09	52.85	73.33
Heroin (tonnes)	148.86	126.81	181.17	153.09	130.83	185.60
	Value (EUR million)			Value (EUR million)		
	Mid	Low	High	Mid	Low	High
Cannabis	11 635.04	10 533.99	12 823.34	12 070.56	10 949.11	13 279.25
Cocaine	9 068.96	7 635.30	10 502.60	9 237.40	7 788.91	10 685.87
Amphetamines	1 007.69	830.88	1 283.50	1 054.41	869.73	1 346.11
MDMA	528.63	437.33	619.94	582.48	487.83	677.14
Heroin	7 440.86	6 394.04	9 119.55	7 694.40	6 635.18	9 385.49
Total	29 681.19	25 831.54	34 348.93	30 639.25	26 730.76	35 373.86

6.2 How do these estimates compare with other estimates of market size?

An estimate of the size and value of the retail market for illicit drugs is an important element of the data needed to build a picture of the drug market and its significance. Therefore, despite the challenges in

calculating these estimates, a number of estimates have been made, covering different geographical areas, time periods, drugs and elements of the market (see Table 10). It is instructive to consider these different estimates and how our market size estimates fit within these. However, it is important to recognise that there are different challenges and opportunities when undertaking one-off estimates as opposed to trying to develop processes that allow updating over time or when doing small area, country level, regional or global estimates. One common feature is the need to make many assumptions to compensate for gaps in our data and knowledge of the market.

An early attempt to estimate the size of the global drug market using a demand-side approach was undertaken by Kilmer and Pacula (2009) as part of a project funded by the European Commission. This report highlighted the large gaps in the basic data needed to undertake these estimates, particularly with respect to amounts of drugs used by different sub-groups of users, but even concerning the prevalence of use of drugs in some parts of the world. Nevertheless, they estimated the size of the global cannabis market in 2005 to be in the range of EUR 40 billion to 120 billion with approximately EUR 70 billion being their best estimate. The market in North America was the largest contributor to this total (about 25 %), with West/Central Europe contributing 19 %.

A more recent report on global transnational crime (May, 2017), uprating for inflation previous estimates published by UNODC at different times, estimated the value of the global market for the main illicit drugs (cannabis, cocaine, opiates and amphetamine-type stimulants) to be between USD 426 billion and USD 652 billion in 2014 (equivalent to EUR 310 billion to EUR 475 billion at 2014 exchange rates). They found cannabis to be the biggest contributor to the overall market size followed by cocaine, then opiates, and then amphetamine-type stimulants, as is the case in our estimates.

Rates of drug use are higher in the United States than in the European Union and so it is expected that the retail market value will be higher. Patterns of use are also different with, for example, methamphetamine use being much higher in the United States than in the European Union, which hampers comparisons. The most recent estimate of the size of the US market for cannabis, cocaine, heroin and methamphetamine indicates it was worth about USD 146 billion in 2016 at 2018 prices (equivalent to about EUR 127 billion) (Midgette et al., 2019). A demand-side approach was used to generate these estimates and some adjustment for underestimation in surveys was made for the estimate of the cannabis market size. The United States has a national household survey of drug use which facilitiates producing trends in estimates of the market size by providing annual data on prevalence of use. Nevertheless many of the data sources used within the estimates are quite old (including the information used to adjust for under-reporting) and are not being updated and the authors highlight the challenges this poses for producing market size estimates.

With respect to estimates of the EU drug market, a report of a wide-ranging EU-funded project, published in 2015, looking in detail at how the drug market in Europe operates as a business (Savona and Riccardi, 2015) included an estimate of the overall value of the markets for the same drugs as included in our estimates in 2010, which they estimated to be about EUR 28 billion or 0.23 % of GDP. This is of a similar order of magnitude to our estimates but they identified the heroin market as the major contributor, with cocaine and cannabis being slightly less, and amphetamines and MDMA significantly lower. UNODC in the 2017 World Drug Report (UNODC, 2017), based on Eurostat data for 21 EU countries, give an average value for the contribution of the drug market to GDP in 2015 of 0.32 %. This slightly higher figure than that calculated by Savona and Riccardi may reflect in part the impact of the 2008 financial crash and subsequent period of austerity on the size of the legal economy.

A recent study of the drug market in the Netherlands, focusing on the role of Dutch organised crime groups in the production of synthetic drugs for the global market (Tops et al., 2018) gives a figure of EUR 18.9 billion for the estimated global revenue relating to the quantity of synthetic drugs (mainly MDMA and amphetamine) produced in the Netherlands. This is essentially the contribution of production in the Netherlands to the global market for these drugs and, as they point out in the report, much of this revenue will be received by criminals

outside of the Netherlands and the European Union. They estimate that the money paid to producers is at least EUR 610 million, with production costs being around half this, at about EUR 280 million. In addition they estimate that Dutch traders receive a minimum of EUR 3 to 5 billion in revenue, although it is not clear exactly what is covered within this.

The data above confirms that while our overall market size estimate of about EUR 30 billion in 2017, equivalent to 0.2 % of the EU GDP for that year, which we recognise as a minimum estimate, is conservative it is not unreasonable and the relative importance of different markets is generally in line with what would be expected.

Table 10: Examples of estimates of the illicit drug market size at different geographical levels

Reference	Coverage	Year	Value	% of GDP	Notes
Global estimates					
Kilmer and Pacula (2009)	Global cannabis market	2005	EUR 70 billion		Range EUR 40 billion to 120 billion. Distinguished heavy and light users. Best estimate assumes 20 % under-reporting. North America EUR 17.3 billion; West/Central Europe EUR 13.5 billion
May (2017)	Global drug market	2014	USD 426 billion to 652 billion		Global trafficking market cannabis biggest contributor then cocaine, opiates, ATS. Equivalent to EUR 310 billion to 475 billion
US estimates					
Midgette et al. (2019)	US illicit drug market	2016	USD 146 billion		Valued in 2018 USD approximately equivalent to EUR 127 billion; covers cocaine, heroin, marijuana, and methamphetamine
European estimates					
Savona and Riccardi (2015)	European Union	2010	EUR 27.7 billion	0.23 %	Forms part of an in-depth study in 7 countries

7 Discussion

7.1 Limitations and validity of the estimates

Estimates of the size of the retail market for illicit drugs can contribute to our understanding of the drug situation, both in terms of supply and demand, and are valuable despite the many limitations in the estimation process illustrated above. However, they are only a small part of the overall picture. For example, they provide an estimate of the overall amount spent on drugs by those who use them, but nothing about the profit and losses at different stages of the supply chain, who is involved, how they operate, who benefits most, etc. As with legal retail markets, the overall value of the market is affected by a range of factors, not just by how many people consume the product and how much they consume but also by changes in price. So a reduction in the retail market value might, for example, be the result of a decrease in the amounts consumed while price remains constant or a decrease in the price of the product with consumption remaining stable.

Nevertheless, they can provide valuable insights, such as the relative importance of the markets for different drugs and of use by different sub-groups within these, and undertaking these estimates leads to improvements in the data and methods applied and the development of expertise, and the targeting of obvious data anomalies and gaps. The exercise brings into focus the areas that require improvement and suggests future developments.

The intention of the programme of work described in this report is to develop a method of estimating market size that can be repeated regularly, with changes or improvements in method and data documented, and builds on the data collected by all EU countries in as comparable a way as possible. The primary aim initially has been to provide an overall EU estimate covering all of the main drugs used in the European Union. The assumptions and imputations made in order to obtain figures for all countries, and issues on the comparability of the underlying data, have prompted us not to provide specific country-level estimates. As improvements are made in the method and data this may change.

The huge diversity between countries in the European Union, in terms of the characteristics of the drug markets, the availability of data, the population size, the cultures and administrative systems, poses considerable challenges to producing retail market size estimates, and it is clear that the limitations result in an estimate of the total market size that is likely to be a considerable underestimate. It should also be recognised that in the short to medium term, improvements in method and data availability will influence the results, making it difficult to quantify trends currently.

Recent examples of innovative studies in this field include local smaller area studies such as that undertaken by Zobel et al. (2017, 2018), in Lausanne, Switzerland in which a wide range of data sources including wastewater analysis and seizures data are considered alongside survey data an interviews with police and users to produce an estimate of the local market size for heroin, cocaine and other stimulants. Caulkins et al. (2019) take advantage of the fact that legal cannabis market sales data are now becoming available in some jurisdictions to look at the extent to which web and general population survey data on cannabis match legal sales data in Washington State. Such studies may provide valuable insights that may improve market size estimation processes in the future.

Key areas of concern are summarised below, these include some more detailed consideration of possible ways of addressing these in the future and in some cases consideration of their possible impact.

How well do the estimates represent the situation in 2017?

The final market size estimates are based on data from different years, ranging from 2008 to 2017, so they will not accurately reflect the actual situation in 2017 and there may have been changes over time that have not

been taken into account. General population surveys (GPS) also ask about use in the previous year, so even in a survey conducted in 2017 some particpants will be providing information about use in 2016. Nevertheless, the data used in this round of market size estimates is more up-to-date than in the first round, and generally changes in patterns of drug use occur quite slowly so our estimate can be considered as reflecting the situation in 2017.

Under-coverage in general population surveys

Data from GPS are available for almost all countries, and many are updated regularly; however, there are inherent limitations in GPS data that will influence the market size estimates, and also issues specific to the individual country surveys that affect comparability. These include the issues of under-coverage (some users being missed by this data source) and under-reporting (self-report of use underestimating actual use), as described in the introduction. Both are likely to result in a substantial underestimation of the total market size.

To partially address under-coverage, the GPS estimates were supplemented with estimates of secondary use of cannabis, cocaine and amphetamines by high-risk opioid users, and also amphetamine use by marginalised groups of high-risk amphetamine users. A further development would be to extend this to groups of high-risk users of cocaine who would not be properly represented in GPS. It is also possible that some institutional populations or other sub-groups of the population may not be well-represented in GPS. There are often lower response rates among young people, although weighting is generally used to try to correct for this. In some countries some groups of young people may be living in accommodation not included in household surveys (for example, young people doing military service or living in student accommodation). Under-coverage of these groups may have a significant impact on estimates for drugs such as MDMA.

The population of users covered in these estimates is the 15- to 64-year-old population, meaning that drug use outside of this age group is not included. The estimates have been limited to the five main drugs and this could be extended, as more detailed information on the less prevalent drugs becomes available, incorporating information from targeted surveys within specific sub-populations.

Under-reporting of use in studies based on self-reports

As discussed in section 2.3 it is well-recognised that self-reported use is prone to reporting error and bias. Although there appears to sometimes be over-reporting, the main issue appears to be under-reporting. Since most of the data available on drug prevalence, frequency and amounts used are based on self-reported data, this is clearly an important issue for the market size estimates based on demand-side approaches. One possible course of action to address under-reporting would be to adjust the final estimates by a correction factor, as Kilmer and Pacula (2009) did. However, as under-reporting, which appears to be linked to social desirability factors, has been shown to vary between drugs and between different sub-groups of the population, it is also likely to vary considerably between different countries in the European Union due to very different levels of stigma and normalisation of drug use in different countries. At present there is no systematic collection of information on under-reporting across the countries and the data available are extremely sparse and in Europe mainly related to sub-groups of users.

The issue of trying to obtain and use data on under-reporting in surveys is illustrated by considering the recent study testing the use of the randomised response technique (RRT) to estimate the potential under-reporting in drug use in the first Georgian GPS, where there where were concerns that under-reporting might be considerable, as drug use is highly stigmatised in the country (Kirtadze et al., 2018). When the estimate of lifetime prevalence (LTP) of cannabis use was calculated using RRT, the estimate obtained, 31.9 % (95 % CI 26.9-36.9 %), was almost double that obtained in the standard GPS format, 17.3 % (15.5-19.1 %). However, in the same study, last year prevalence (LYP) of cannabis was 34.3 % (29.3-39.3 %) through RRT, compared to only 3.4 % in the main body of the survey. Thus the RRT LYP prevalence is higher than the LTP obtained this way, which is not plausible. This suggests some issues with the way the RRT operated. The RRT approach was also used for heroin and in this case the LTP based on standard GPS questions was 0.7 % (0.4-1.4 %), while the

RRT questions gave a LTP of 8 % (3-13 %). Georgian experts indicate that the prevalence of problematic heroin use in Georgia is 2.24 % in the 18-64 age group so this suggests that while there is clearly significant under-reporting in the GPS, the lifetime prevalence obtained using the RRT approach is plausible but may be somewhat exaggerated. However, this is an approach that merits further investigation as it may be more practical to use this approach than undertaking drug testing in a survey setting.

The issue of trying to transpose data on under-reporting from one country to another is illustrated by considering using the data above from Georgia. If we assume that the extent of under-reporting of lifetime use in Poland is the same as in Georgia (the reported LTP in Poland at 16.2 % is similar in magnitude to that in Georgia) and apply the results of the Georgian study to Poland, we obtain a revised estimate adjusted for potential under-reporting of 16.2 x (31.9/17.3) = 29.9 %. However, if you assume the same level of under-reporting for France, where the LTP obtained from GPS is 44.8 %, the adjusted LTP would be 82.6 %, which is not plausible. This suggests that it is probably important to have different correction factors for countries with similar prevalence levels and patterns of use.

A Spanish study among university students (Cobo et al., 2017) shows that consideration of under-reporting of frequency of use and amounts used may also be an issue. In a study using RRT compared with direct questioning, they found that the average number of joints used per year was 3 when obtained through direct questioning and 17 when using RRT. Similarly the average number of days of cannabis use in the last month was 1 and 7 days, respectively.

Studies comparing biological test results with self-reported illicit drug use, such as those discussed earlier in the report comparing oral fluid test with self-reported use among music festival attendees in Norway, also find low agreement especially for cocaine and MDMA (Gjerde et al., 2019). Overall, self-reported use of any one of amphetamines, cannabis, cocaine and MDMA during the past 48 hours was 5.5 %, while 10.8 % tested positive in oral fluid. The above results add to the suggestion that drug use prevalence will be underestimated in GPS; however, it is not clear how to use the above estimates that relate to a very short time period, and a specific sub-group in one country, in correcting for this underestimation.

A further development would be to investigate and collect the available information and promote the extension of these types of studies to more countries. In this iteration of the market size estimates, no correction factor has been applied, but this can be reconsidered in future iterations.

Problems relating to specific data items

Frequency of use data

In terms of further developments relating to the specific country surveys, using the available data has been the guiding criteria and continues to be the working model. The EMCDDA continues to encourage the regular completion of general population surveys and the reporting of frequency of use data. However, some consideration can be given to how the estimates would change if a greater level of imputation was used rather than using all data. Further work can be undertaken to establish the most appropriate survey results to adopt, and how to incorporate confidence intervals around the prevalence levels into the estimation. At the moment, data on confidence intervals are collected as part of GPS but are not available for all countries. In the existing estimates no adjustments have been made for variations in coverage of age and geography. These affect relatively few countries, and it was assumed it would not dramatically influence the results, though again this can be reconsidered in the next iteration.

Finally, it was not possible given the available data to construct as many user groups for stimulants as it was for cannabis. Four user groups were established for cannabis, with seven countries without the necessary data. The data requirements were reduced for stimulants, requiring only last year and last month prevalence to

construct two groups. On that basis five countries did not have complete data. In the absence of additional data, this limitation is likely to persist.

Including drug use by high-risk drug users

Including an estimate of the contribution of high-risk opioid users to the consumption of cannabis, cocaine and amphetamines is one area in which we have attempted to compensate for under-coverage within the GPS. However, the available estimates of the numbers of high-risk opioid users vary in terms of population covered, method and year across countries. For almost half the countries, the age of some of the estimates raises concerns as to whether they reflect the situation in more recent years. Additionally, the main sources of data for the high-risk opioid users are treatment data. So any changes in treatment policy or situation can influence the estimates. Missing data, both for numbers of high-risk opioid users, and for secondary drugs reported by opioid users entering treatment, weaken the estimates. In a limited number of estimates, the necessary metadata are not available, resulting in further assumptions being made. It is not possible to anticipate whether these data gaps will inflate or deflate the estimates.

The EMCDDA continues to promote the estimation of the numbers of high-risk opioid users with the national focal points, and encourages full completion of the TDI. Improvements in understanding the content of the data and establishing metadata may be achieved in the short term.

Whether or not OST clients are included or excluded in high-risk opioid user estimates and to what extent is very unclear and, since those in OST use much lower amounts of heroin than those outside treatment, this may cause substantial error in our estimates. OST coverage is increasing in many countries, so estimates can differ a lot between two successive years. As a result, the year of the estimate used can have a big influence of the estimates. In addition, the data on amounts of heroin used are also old and from a limited number of countries.

In some cases the lower limit of the problem heroin users estimate was lower than the number of OST clients, which give negative estimates for the out of treatment population. This points out the limitations of the data sources used to estimate the number of problem heroin estimates.

Estimates of use of amphetamine or methamphetamine by high-risk users were included in the market size esimates in the six EU Member States (Cyprus, Czechia, Finland, Germany, Lithuania, Slovakia) and Norway, where high-risk use of these substances is significant and estimates of high-risk use are available.

A further set of countries provide estimates of high-risk cocaine use. However, these data are estimated in a variety of ways. In some cases, they are based to some extent on GPS data and in other cases they may include high-risk opioid users who also use crack cocaine. It was therefore decided at this stage not to make use of any of the high-risk cocaine use estimates submitted as part of the PDU indicator in this round of estimates. This is an area for review and further development in future iterations of the market size estimations.

Information on patterns of use

The absence of data on amounts used by user group in most EU countries was highlighted as a major weakness in the market size estimation process in 2016. In the interim period this issue has been addressed to some extent by conducting the European Web Survey on Drugs in 15 countries. Wider adoption of the survey by the national focal points could continue to improve the availability of this data.

The information on use of cannabis resin and herb from the EWSD has also improved the way in which the cannabis market was split into resin and herb, as discussed in section 3.2. This will further improve if more countries undertake the survey and in the future might also provide some information on the use of other forms of cannabis.

Our knowledge of the amounts of different drugs used by high-risk drug users remains a major gap. Concerns about the lack of data of amounts of heroin used by high-risk heroin users were highlighted earlier in the report. But our knowledge concerning the amounts of other drugs used is just as great. In general, we just assumed that high-risk users used similar amounts to frequent users in the general population. However, this assumption may well be incorrect. For example, in the literature, country specific estimates were available for Czechia (Petroš et al., 2005) for different drugs including methamphetamine, the most widely consumed amphetamine in that country, and which is the main drug used among high-risk drug users (EMCDDA, 2019). For the estimates reported here, using data from the EWSD from the survey in Czechia, we estimated the annual consumption of methamphetamine in Czechia to be 1.5187 grams for infrequent users and 62.1 grams for frequent users and we applied the 62.1 grams to the high-risk methamphetamine user population as well. In the study by Vopravil and Rossi (2012), the corresponding amount for the high-risk population was 183.56 grams. In the future we should consider how, while still using a standardised approach, we might use additional relevant national data to improve our estimates.

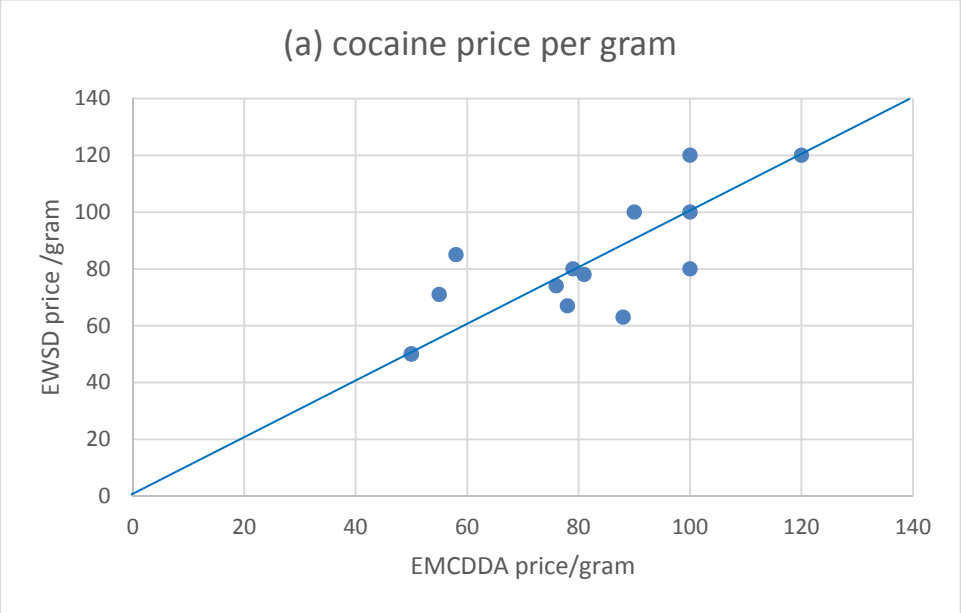
The EWSD also collected information on different forms of stimulants used (e.g. MDMA crystal and tablets, cocaine and crack), including methamphetamine and amphetamine differentiation in some countries. Further work could be undertaken to consider how this more detailed information might be used within market size estimates.

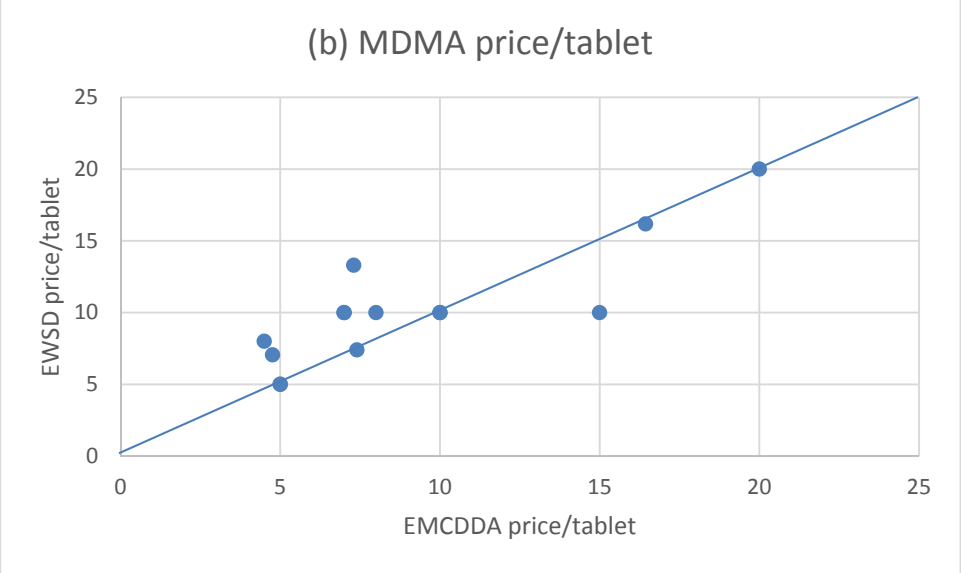
Price data used to estimate the value of the market

As previously mentioned, the way in which the average prices for drugs reported to the EMCDDA are collected is very variable and can reflect different levels of the market. In addition, the format of the estimate varies between countries, with some providing one or more of mode, mean or median, and a few only providing a range, further adding to the complexity. Following the approach taken in a recent publication analysing EMCDDA price data, it was decided to use mode instead of mean value as the statistic of preference for this iteration since '… measures (e.g. ranges, means) take in anomalies at either end of the scale, which may skew the representativeness of the data, while the mode establishes the price most commonly encountered …' (Groshkova et al., 2018, p. 188). Where mode is not available and more than one measure of price is available, the order of preference is mean, median, average of minimum and maximum. This change makes very little difference to the prices chosen.

The variability in the sources of price data raises concerns about the robustness of the data and the EWSD provided an opportunity to investigate this in the sample of countries that took part, since participants were asked about the the amounts of drugs they usually purchased on one occasion and also how much they generally pay for this. We compared the price data from EWSD with that from the EMCDDA collection tool for cocaine (Table A17) and MDMA (Table A18). For cocaine, in 6 out of the 13 countries where mode is available through EMCDDA standard collection, the mode was almost identical (±EUR 2) in the two data sources. Generally the data are quite comparable and there is no consistent pattern of one source tending to be higher than another. For MDMA, the types of price data available were more limited but there is also generally quite good agreement with identical or very close prices in 8 of the 14 countries. However, where there is variability, there appears to be a tendency for prices in the web survey to be higher than in the data reported to EMCDDA.

Figure 1: Comparison of price data from the EMCDDA data collections and from the EWSD for cocaine and MDMA





It is worth noting that we have not included any consideration of purity in the calculations of market size estimates, given the difficulties in obtaining data and linking prices to purity on a routine basis in the European Union. This remains an area to be considered in the future.

7.2 Areas for future development

In addition to continued efforts to improve the quality and completeness of the data reported to the EMCDDA, a number of broad areas for work to improve the market size estimates going forward have been highlighted within this report. Key areas for further work are as follows.

- A systematic data collection on studies of under-reporting in surveys across the European Union in order to help establish the likely level of underestimation within our estimates, and to inform the development of correction factors if appropriate, is a key area for future development.

- It would be useful to work with national focal points and other national experts to consider the face validity of the national estimates underpinning the overall EU market size estimates to identify ways of improving the estimates, the source data and imputation processes.
- A review of the standard GPS questions to better identify different groups of users based on frequency/intensity of use would be valuable, although it is likely to take a considerable amount of time before any improved data would be available.
- Improving our understanding of the amounts used by different groups of drug users is another key area for development. Expanding the range of countries with information from the EWSD will improve the estimates of use by people in the household population. To improve the heroin market size estimates and use of other drugs by high-risk users is another knowledge gap that would benefit from further work.
- The methods we have used to give an idea of the uncertainty in the estimates are very limited and this is another important area for development.

8 Concluding remarks

This report describes the second iteration of the market size estimation exercise, attempting to establish a regular and repeated estimation of market size for the European Union of cannabis, heroin, cocaine, amphetamines and MDMA, using available monitored data as far as possible.

Following the first market size estimates published in 2016, some of the data gaps initially identified have been reduced in this second round of estimates. This was possible due to the establishment of the EWSD, initiated in order to fill in data gaps, especially in areas in which it is difficult for our routine monitoring systems to address, such as the amounts of drugs used. Further reductions to data gaps were made possible by encouraging or clarifying the reporting of the standard EMCDDA indicators, leading to data collected through the routine monitoring being available for more countries and being more recent than in the first round, for example in the areas of high-risk population and general population surveys.

Despite the many limitations highlighted throughout the report, this second round exercise was improved compared to the previous one. The changes in the methodology do not allow time trends to be assessed at this point. Further improvement in the methodology is an ongoing project aiming to reduce uncertainty and increase our understanding of the drug market. Until then, all limitations and assumptions need to be clearly stated to allow for the correct interpretation of the estimates. Looking to the future, it will also be important to consider how we obtain the information necessary to monitor drug markets that are increasingly, diverse characterised by a wider range of products and modes of use.

Abbreviations

ATS	Amphetamine type stimulants
CI	confidence interval
EWSD	European Web Survey on Drugs
GDP	gross domestic product
GPS	general population survey
LMT	last month prevalence
LYP	last year prevalence
LTP	lifetime prevalence
OST	opioid substitution treatment
PDU	problem drug use indicator
RRT	randomised response technique
TDI	treatment demand indicator
UNODC	United Nations Office on Drugs and Crime
WHO	World Health Organization

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Appendix tables

Table A1: Regression results: number of users in the last month in each user group against lifetime prevalence and the ratio of last month to last year prevalence

Dependent variable		Occasional	Frequent	Intensive
Lifetime prevalence	B	−0.006	0.003	0.003
	SE	0.0027	0.002	0.002
	t	2.05	1.40	1.53
	p	0.053	0.177	0.142
Last month/last year prevalence	B	−0.712**	−0.206	0.918***
	SE	0.213	0.155	0.1444
	t	3.34	1.33	6.39
	p	0.003	0.199	<0.001
Constant	B	0.976***	0.362**	−0.339**
	SE	0.121	0.088	0.082
	t	8.06	1.33	4.15
	p	<0.001	0.001	<0.001
r2		0.44	0.14	0.68
P		0.022	0.20	<0.001
df_r		21	21	21

Note: * p<0.05, ** p<0.01, *** p<0.001

Table A2: Cannabis users — number and proportion of last month users for each user group (GPS)

			Number of users						Proportion of last month users*		
Country	Year	Sample size	Last month	1-3 per month	4-19 per month	20+ per month	Not known	Valid last month	Occasional	Frequent	Intensive
Austria	2015	3477	76	37	21	14	4	72	0.51	0.29	0.19
Belgium	2013	4931	125	51	48	26	0	125	0.41	0.38	0.21
Bulgaria	2016	3996	156	104	42	10	0	156	0.67	0.27	0.06
Croatia	2015	4959	245	125	80	38	2	243	0.51	0.33	0.16
Cyprus	2016	3500	39	23	9	10	0	42	0.55	0.21	0.24
Czechia	2017	1261	158	59	92	7	0	158	0.37	0.58	0.04
Denmark	2017	10196	272	134	74	56	8	264	0.51	0.28	0.21
Estonia	2008	1401									
Finland	2014	3128	75	30	26	8	11	64	0.47	0.41	0.13
France	2017	12798	899	301	294	291	13	886	0.34	0.33	0.33
Germany	2015	9204	386	180	113	81	13	374	0.48	0.30	0.22
Greece	2015	1519	19	9	6	4	0	19	0.47	0.32	0.21
Hungary	2015	2274	9	6	2	1	0	9	0.67	0.22	0.11
Ireland	2015										
Italy	2017	10502	477	203	180	94	0	477	0.43	0.38	0.20
Latvia	2015	4513	67	27	11	5	24	43	0.63	0.26	0.12
Lithuania	2016	4794	51	26	20	1	4	47	0.55	0.43	0.02
Luxembourg	2014	3344									
Malta	2013										
Netherlands	2017	5883	199	95	59	44	0	198	0.48	0.30	0.22
Norway	2017	1883	45	25	20	2	0	47	0.53	0.43	0.04
Poland	2014	1135	24	20	2	2	0	24	0.83	0.08	0.08
Portugal	2016	9632	419	43	84	285	7	412	0.10	0.20	0.69
Romania	2016	7200	100	64	26	1	9	91	0.70	0.29	0.01
Slovakia	2015	8029	168	70	60	20	18	150	0.47	0.40	0.13
Slovenia	2012	7514	172	86	50	34	1	170	0.51	0.29	0.20
Spain	2017	21249	1924	42	407	574	519	1023	0.04	0.40	0.56
Sweden	2017	7990									
Turkey	2017										
United Kingdom	2017	21257	1357	926	193	128	111	1247	0.74	0.15	0.10

*Proportions are calculated using valid last month as the denominator.

Table A3: Cannabis prevalence rates and population data by country (GPS)

Country	Year	Sample size	LTP	LYP	LMP	Infrequent	Occasional	Regular	Intensive	2017 Eurostat population aged 15-64
Austria	2015	3477	23.6	6.4	2.5	3.9	1.28	0.73	0.49	5883608
Belgium	2013	4931	15	4.6	2.6	2	1.06	1.00	0.54	7328664
Bulgaria	2016	3996	8.3	4.2	2.5	1.7	1.67	0.67	0.16	4628724
Croatia	2015	4959	19.4	7.9	5	2.9	2.57	1.65	0.78	2736501
Cyprus	2016	3500	12.1	2.2	1.2	1	0.66	0.26	0.29	582452
Czechia	2017	1261	28.6	8.9	2	6.9	0.75	1.16	0.09	6942623
Denmark	2017	10196	38.4	6.4	2.9	3.5	1.47	0.81	0.62	3692029
Estonia	2008	1401	19.9	6	1.4	4.6	0.98	0.52	0.00	847552
Finland	2014	3128	21.7	6.8	2.5	4.3	1.17	1.02	0.31	3459144
France	2017	12798	44.76	11.01	6.43	4.58	2.18	2.13	2.11	41856972
Germany	2015	9204	27.2	6.1	3.1	3	1.49	0.94	0.67	53963380
Greece	2015	1519	11	2.8	1.3	1.5	0.62	0.41	0.27	6893783
Hungary	2015	2274	7.4	1.5	0.7	0.8	0.47	0.16	0.08	6546470
Ireland	2015		27.9	7.7	4.4	3.3	1.86	1.40	1.14	3129411
Italy	2017	10502	32.7	10.2	5.5	4.7	2.34	2.08	1.08	38878311
Latvia	2015	4513	9.8	4.2	1.6	2.6	1.00	0.41	0.19	1258620
Lithuania	2016	4794	10.8	2.7	1.1	1.6	0.61	0.47	0.02	1875585
Luxembourg	2014	3344	23.3	4.9	2.2	2.7	1.10	0.68	0.43	410613
Malta	2013		4.3	0.9	0.4	0.5	0.25	0.11	0.03	308634
Netherlands	2017	5883	26.6	9.2	5.8	3.4	2.78	1.73	1.29	11140079
Norway	2017	1883	24.5	5.3	2.5	2.8	1.33	1.06	0.11	3445785
Poland	2014	1135	16.2	4.6	2.1	2.5	1.75	0.18	0.18	25956990
Portugal	2016	9632	11	5.1	4.3	0.8	0.45	0.88	2.97	6690517
Romania	2016	7200	5.8	3.2	1.4	1.8	0.98	0.40	0.02	13091697
Slovakia	2015	8029	15.8	4.3	2.1	2.2	0.98	0.84	0.28	3780456
Slovenia	2012	7514	15.8	4.4	2.3	2.1	1.16	0.68	0.46	1366875
Spain	2017	21249	35.2	11	9.1	1.9	0.37	3.62	5.11	30700225
Sweden	2017	7990	15.1	4.6	1.6	3	1.03	0.53	0.04	6257302
Turkey	2017		2.725	1.11	0.755	0.355	0.36	0.18	0.22	54237586
United Kingdom	2017	21257	30	7.2	3.3	3.9	2.45	0.51	0.34	42181558

Note: Yellow highlights denote estimated values; red highlights denote estimates out of bounds, replaced with 0.

Table A4: Estimated numbers of problem opioid users and the proportion estimated to be cannabis users based on secondary drug use among treatment entrants for opioid use

Country	Estimated number of problem opioid users				Treatment entrants for opioids using cannabis as secondary drug
	Year	Central	Lower	Upper	%
Austria	2017	36943	35764	38122	26.32
Belgium	EU average	28713	28713	28713	21.50
Bulgaria	2016	14573	7228	21917	12.20
Croatia	2015	8874	7200	11547	62.57
Cyprus	2017	1168	916	1536	30.19
Czechia	2017	13100	12600	13600	18.82
Denmark	2009	16000	15069	16930	25.33
Estonia	2015	9930	8926	11143	22.37
Finland	2012	13836	12700	15090	26.72
France	2017	210000	180000	240000	38.30
Germany	2016	146908	134316	159500	22.37
Greece	2017	14462	12435	17023	34.59
Hungary	2010-11	3244	2910	3577	22.37
Ireland	2014	18988	18720	21454	21.34
Italy	2017	235000	223000	247000	18.26
Latvia	2017	7100	5812	8766	22.37
Lithuania	2016	7503	5108	12444	22.37
Luxembourg	2015	1738	1738	1738	43.09
Malta	2017	1425	1332	1544	40.74
Netherlands	2012	14000	12700	16300	10.93
Norway	2013	9015	6708	13977	22.37
Poland	2014	14664	10915	18412	31.64
Portugal	2015	33290	24070	48565	48.12
Romania	2017	20288	10084	36907	6.13
Slovakia	2008	4888	3966	9782	15.39
Slovenia	2017	4873	4283	5666	23.22
Spain	2016	68297	46014	90579	23.88
Sweden	2007	12110	12110	12110	22.37
Turkey	2011	12733	11126	26537	7.558
United Kingdom	2011	341576	336153	354421	12.468

Note: Yellow highlights denote imputed values.

Table A5: Amounts of cannabis used per year by type of cannabis user, herbal

Country	Infrequent users			Occasional users			Regular users			Intensive users		
	Trimmed mean	Lower bound	Upper bound	Trimmed mean	Lower bound	Upper bound	Trimmed mean	Lower bound	Upper bound	Trimmed mean	Lower bound	Upper bound
Austria	1.06	0.88	1.24	8.80	7.63	9.97	93.95	84.62	103.29	299.52	277.56	321.47
Belgium	0.97	0.86	1.08	6.80	5.98	7.63	65.10	59.09	71.12	255.12	241.82	268.43
Bulgaria	0.82	0.79	0.85	7.57	7.27	7.87	65.11	62.76	67.47	230.52	223.62	237.42
Croatia	0.47	0.32	0.63	6.62	3.92	9.32	53.06	38.91	67.21	165.88	122.27	209.50
Cyprus	0.82	0.79	0.85	7.57	7.27	7.87	65.11	62.76	67.47	230.52	223.62	237.42
Czechia	0.82	0.79	0.85	7.57	7.27	7.87	65.11	62.76	67.47	230.52	223.62	237.42
Denmark	0.82	0.79	0.85	7.57	7.27	7.87	65.11	62.76	67.47	230.52	223.62	237.42
Estonia	0.62	0.54	0.71	6.13	5.19	7.08	56.29	47.67	64.92	206.59	163.54	249.65
Finland	1.10	0.97	1.22	9.67	8.56	10.77	78.61	70.20	87.02	277.43	246.31	308.54
France	0.42	0.35	0.50	5.63	4.73	6.52	45.12	38.61	51.63	161.07	146.14	176.00
Germany	0.82	0.79	0.85	7.57	7.27	7.87	65.11	62.76	67.47	230.52	223.62	237.42
Greece	0.82	0.79	0.85	7.57	7.27	7.87	65.11	62.76	67.47	230.52	223.62	237.42
Hungary	0.82	0.79	0.85	7.57	7.27	7.87	65.11	62.76	67.47	230.52	223.62	237.42
Ireland	0.82	0.79	0.85	7.57	7.27	7.87	65.11	62.76	67.47	230.52	223.62	237.42
Italy	0.92	0.79	1.04	6.67	5.87	7.47	58.29	51.35	65.22	196.93	177.78	216.08
Latvia	0.82	0.74	0.89	8.25	7.43	9.06	66.05	60.10	72.00	228.45	202.24	254.67
Lithuania	0.68	0.58	0.79	7.28	5.81	8.76	43.15	34.07	52.23	210.07	143.85	276.29
Luxembourg	0.85	0.69	1.02	6.97	5.60	8.33	62.54	52.49	72.58	252.63	224.59	280.68
Malta	0.82	0.79	0.85	7.57	7.27	7.87	65.11	62.76	67.47	230.52	223.62	237.42
Netherlands	0.41	0.28	0.54	4.50	3.14	5.86	47.48	34.23	60.73	179.77	142.12	217.41
Norway	0.82	0.79	0.85	7.57	7.27	7.87	65.11	62.76	67.47	230.52	223.62	237.42
Poland	0.90	0.82	0.97	8.29	7.54	9.04	68.04	62.22	73.86	242.27	216.53	268.00
Portugal	0.82	0.79	0.85	7.57	7.27	7.87	65.11	62.76	67.47	230.52	223.62	237.42
Romania	0.82	0.79	0.85	7.57	7.27	7.87	65.11	62.76	67.47	230.52	223.62	237.42
Slovakia	0.82	0.79	0.85	7.57	7.27	7.87	65.11	62.76	67.47	230.52	223.62	237.42
Slovenia	0.82	0.79	0.85	7.57	7.27	7.87	65.11	62.76	67.47	230.52	223.62	237.42
Spain	0.82	0.79	0.85	7.57	7.27	7.87	65.11	62.76	67.47	230.52	223.62	237.42
Sweden	0.82	0.79	0.85	7.57	7.27	7.87	65.11	62.76	67.47	230.52	223.62	237.42
Turkey	0.82	0.79	0.85	7.57	7.27	7.87	65.11	62.76	67.47	230.52	223.62	237.42
United Kingdom	0.93	0.64	1.22	10.88	7.38	14.37	92.56	58.45	126.67	272.45	194.91	349.99

Note: Yellow highlights denote imputed values.

Table A6: Amounts of cannabis used per year by type of cannabis user, resin

Country	Infrequent users			Occasional users			Regular users			Intensive users		
	Trimmed mean	Lower bound	Upper bound	Trimmed mean	Lower bound	Upper bound	Trimmed mean	Lower bound	Upper bound	Trimmed mean	Lower bound	Upper bound
Austria	0.06	0.03	0.09	0.29	0.12	0.46	3.14	1.71	4.56	21.01	13.84	28.19
Belgium	0.10	0.06	0.13	0.67	0.47	0.87	3.58	2.71	4.46	13.80	10.64	16.96
Bulgaria	0.05	0.04	0.05	0.63	0.55	0.70	6.89	6.17	7.62	39.86	36.58	43.13
Croatia	0.28	0.19	0.38	2.43	1.69	3.17	11.77	8.75	14.78	53.68	43.96	63.40
Cyprus	0.05	0.04	0.05	0.63	0.55	0.70	6.89	6.17	7.62	39.86	36.58	43.13
Czechia	0.05	0.04	0.05	0.63	0.55	0.70	8.77	1.87	4.39	11.77	4.39	19.15
Denmark	0.05	0.04	0.05	0.63	0.55	0.70	6.89	6.17	7.62	39.86	36.58	43.13
Estonia	0.00	0.00	0.00	0.01	0.01	0.02	0.31	0.31	0.78	0.50	0.50	1.20
Finland	0.06	0.03	0.08	0.53	0.26	0.79	2.59	1.38	3.80	15.34	6.07	24.61
France	0.19	0.14	0.25	2.42	1.72	3.13	33.52	28.52	38.53	125.75	111.85	139.64
Germany	0.05	0.04	0.05	0.63	0.55	0.70	6.89	6.17	7.62	39.86	36.58	43.13
Greece	0.05	0.04	0.05	0.63	0.55	0.70	6.89	6.17	7.62	39.86	36.58	43.13
Hungary	0.05	0.04	0.05	0.63	0.55	0.70	6.89	6.17	7.62	39.86	36.58	43.13
Ireland	0.05	0.04	0.05	0.63	0.55	0.70	6.89	6.17	7.62	39.86	36.58	43.13
Italy	0.15	0.10	0.21	1.77	1.26	2.27	18.90	14.59	23.21	59.68	48.31	71.05
Latvia	0.00	0.00	0.00	0.02	0.00	0.04	0.24	0.11	0.38	3.28	0.00	8.52
Lithuania	0.00	0.00	0.00	0.13	0.03	0.24	1.23	0.00	2.67	1.23	0.20	2.25
Luxembourg	0.08	0.04	0.12	1.37	0.69	2.05	12.71	8.13	17.30	60.75	42.71	78.78
Malta	0.05	0.04	0.05	0.63	0.55	0.70	6.89	6.17	7.62	39.86	36.58	43.13
Netherlands	0.12	0.06	0.18	1.87	1.19	2.56	21.10	12.80	29.40	29.65	14.96	44.33
Norway	0.05	0.04	0.05	0.63	0.55	0.70	6.89	6.17	7.62	39.86	36.58	43.13
Poland	0.01	0.00	0.02	0.15	0.07	0.22	0.43	0.24	0.62	3.88	0.71	7.05
Portugal	0.05	0.04	0.05	0.63	0.55	0.70	6.89	6.17	7.62	39.86	36.58	43.13
Romania	0.05	0.04	0.05	0.63	0.55	0.70	6.89	6.17	7.62	39.86	36.58	43.13
Slovakia	0.05	0.04	0.05	0.63	0.55	0.70	6.89	6.17	7.62	39.86	36.58	43.13
Slovenia	0.05	0.04	0.05	0.63	0.55	0.70	6.89	6.17	7.62	39.86	36.58	43.13
Spain	0.05	0.04	0.05	0.63	0.55	0.70	6.89	6.17	7.62	39.86	36.58	43.13
Sweden	0.05	0.04	0.05	0.63	0.55	0.70	6.89	6.17	7.62	39.86	36.58	43.13
Turkey	0.05	0.04	0.05	0.63	0.55	0.70	6.89	6.17	7.62	39.86	36.58	43.13
United Kingdom	0.00	0.00	0.01	0.03	0.00	0.09	13.01	1.28	24.75	52.31	16.60	88.03

Note: Yellow highlights denote imputed values.

Table A7: Prices for cannabis herb and resin used in the estimation process (EUR/gram)

Country	Year	Herbal	Measure	Year	Resin	Measure
Austria	2017	8	Mode	2017	8	Mode
Belgium	2017	10	Mode	2017	10	Mode
Bulgaria	2015	5	Mode	2017	10	Mode
Croatia	2017	12.2	Mode	2017	12.9	Mode
Cyprus-A	2017	20	Mode	2017	12	Mode
Czechia	2017	6.46	Mode	2017	11.1	Mean
Denmark	2017	10.98	EU average	2017	7	Mode
Estonia	2017	20	Mode	2017	20	Mean
Finland	2017	17	Mode	2017	15	Mode
France-A	2017	10.2	Mode	2017	5.4	Mode
Germany	2017	10	Mean	2017	9.4	Mean
Greece	2017	19	Mean	2017	25	Mean
Hungary	2017	8.1	Mode	2017	8.1	Mode
Ireland	2017	20	Mean	2017	6	Mean
Italy	2017	9.85	Mean	2017	11.08	Mean
Latvia	2017	12	Mode	2017	13	Mode
Lithuania	2017	13	Mean	2017	13	Mean
Luxembourg	2017	10	Mode	2017	12.5	Mode
Malta	2017	19.75	Mean	2017	20.75	Mean
Netherlands	2017	4.04	Mean	2017	9.43	Mean
Norway	2017	16.19	Mean	2017	13.49	Mean
Poland-A	2017	7	Mode	2017	6	Mode
Portugal	2017	4.76	Mode	2017	1.67	Mode
Romania	2017	13.14	Min-max average	2017	15.32	Min-max average
Slovakia	2017	10	Mean	2017	15	Mean
Slovenia	2017	5	Mode	2017	10	Mode
Spain	2017	5.16	Mean	2017	6.04	Mean
Sweden	2017	10	Mode	2017	10	Mode
Turkey	2016	6.96	Min-max average	2016	19.62	Min-max average
United Kingdom	2017	5.5	Mode	2017	5.5	Mode

Note: Yellow highlights denote imputed data.

Table A8: Cocaine prevalence rates and prevalence levels used in the estimation process by user group, by country (GPS)

Country	Year of study	Sample size	LTP	LYP	LMP	Infrequent (LYP – LMP)	Frequent (LMP)
Austria	2015	3477	3	0.4	0.17	0.23	0.17
Belgium	2013	4931		0.5	0.21	0.29	0.21
Bulgaria	2016	3996	0.9	0.3	0.1	0.2	0.1
Croatia	2015	4959	2.7	0.8	0.3	0.5	0.3
Cyprus	2016	3500	1.4	0.2	0.1	0.1	0.1
Czechia	2017	1261	2.4	0.1	0.04	0.06	0.04
Denmark	2017	10196	6.4	1.6	0.7	0.9	0.7
Estonia	2008	1401		0.7	0.1	0.6	0.1
Finland	2014	3128	1.9	0.5	0.2	0.3	0.2
France	2017	20665	5.58	1.58	0.65	0.93	0.65
Germany	2015	9204	3.8	0.6	0.2	0.4	0.2
Greece	2015	1519	1.3	0.4	0.2	0.2	0.2
Hungary	2015	2274	1.2	0.3	0.2	0.1	0.2
Ireland	2015		7.8	1.5	0.5	1	0.5
Italy	2017	10502	6.9	1.2	0.4	0.8	0.4
Latvia	2015	4513	1.5	0.5	0.3	0.2	0.3
Lithuania	2016	4794	0.7	0.1	0.1	0	0.1
Luxembourg	2014	3344	2.5	0.4	0.2	0.2	0.2
Malta	2013		0.5	0.11	0.05	0.07	0.05
Netherlands	2017	5883	6.2	2.2	0.7	1.5	0.7
Norway	2017	1883	5.1	1.1	0.45	0.65	0.45
Poland	2014	1135	1.3	0.2	0.08	0.12	0.08
Portugal	2016	9632	1.2	0.2	0.1	0.1	0.1
Romania	2016	7200	0.7	0.2	0.1	0.1	0.1
Slovakia	2015	8029	0.7	0.1	0.1	0	0.1
Slovenia	2012	7514	2.1	0.5	0.1	0.4	0.1
Spain	2017	21249	10.3	2.2	1.1	1.1	1.1
Sweden	2017	11514		1.2	0.2	1	0.2
Turkey	2017		0.168	0.05	0.023	0.027	0.023
United Kingdom	2017	21257	10.7	2.7	1	1.7	1

Note: Yellow highlights denote imputed data.

Table A9: MDMA prevalence rates and prevalence levels used in the estimation process by user group, by country (GPS)

Country	Year of study	Sample size	LTP	LYP	LMP	Infrequent (LYP – LMP)	Frequent (LMP)
Austria	2015	3477	2.90	0.40	0.16	0.24	0.16
Belgium	2013	4931		0.30	0.12	0.18	0.12
Bulgaria	2016	3996	2.10	1.30	0.40	0.90	0.40
Croatia	2015	4959	3.00	0.60	0.30	0.30	0.30
Cyprus	2016	3500	1.10	0.10	0.04	0.06	0.04
Czechia	2017	1261	5.80	0.80	0.20	0.60	0.20
Denmark	2017	10196	3.20	0.50	0.10	0.40	0.10
Estonia	2008	1401		1.20	0.20	1.00	0.20
Finland	2014	3128	3.00	1.10	0.30	0.80	0.30
France	2017	20665	3.86	0.57	0.22	0.35	0.22
Germany	2015	9204	3.30	0.60	0.20	0.40	0.20
Greece	2015	1519	0.60	0.20	0.10	0.10	0.10
Hungary	2015	2274	3.95	0.88	0.55	0.33	0.55
Ireland	2015		9.20	2.10	1.00	1.10	1.00
Italy	2017	10502	2.70	0.40	0.10	0.30	0.10
Latvia	2015	4513	2.40	0.30	0.30	0.00	0.30
Lithuania	2016	4794	1.70	0.40	0.10	0.30	0.10
Luxembourg	2014	3344	1.90	0.20	0.10	0.10	0.10
Malta	2013		0.70	0.14	0.06	0.08	0.06
Netherlands	2017	5883	9.40	3.30	0.90	2.40	0.90
Norway	2017	1883	4.10	1.00	0.39	0.61	0.39
Poland	2014	1135	1.60	0.40	0.20	0.20	0.20
Portugal	2016	9632	0.70	0.10	0.04	0.06	0.04
Romania	2016	7200	0.50	0.10	0.04	0.06	0.04
Slovakia	2015	8029	3.10	0.60	0.10	0.50	0.10
Slovenia	2012	7514	2.10	0.30	0.10	0.20	0.10
Spain	2017	21249	3.60	0.60	0.20	0.40	0.20
Sweden	2017	11514		0.90	0.20	0.70	0.20
Turkey	2017		0.35	0.10	0.07	0.04	0.07
United Kingdom	2017	21257	10.00	1.70	0.50	1.20	0.50

Note: Yellow highlights denote imputed values.

Table A10: Amphetamines prevalence rates and prevalence levels used in the estimation process by user group, by country (GPS)

Country	Year of study	Sample size	LTP	LYP	LMP	Infrequent (LYP – LMP)	Frequent (LMP)
Austria	2015	3477	2.20	0.40	0.10	0.30	0.10
Belgium	2013	4931		0.20	0.08	0.12	0.08
Bulgaria	2016	3996	1.50	0.70	0.30	0.40	0.30
Croatia	2015	4959	3.50	1.00	0.50	0.50	0.50
Cyprus	2016	3500	0.50	0.10	0.04	0.06	0.04
Czechia	2017	1261	3.30	0.30	0.12	0.18	0.12
Denmark	2017	10196	7.00	0.70	0.30	0.40	0.30
Estonia	2008	1401		1.10	0.50	0.60	0.50
Finland	2014	3128	3.40	1.10	0.20	0.90	0.20
France	2017	20665	2.17	0.30	0.12	0.18	0.12
Germany	2015	9204	3.60	1.00	0.50	0.50	0.50
Greece	2004	4351	0.10	0.00	0	0.00	0.00
Hungary	2015	2274	1.72	0.45	0.31	0.14	0.31
Ireland	2015		4.10	0.30	0.12	0.18	0.12
Italy	2017	10502	2.40	0.10	0.04	0.06	0.04
Latvia	2015	4513	1.90	0.30	0.10	0.20	0.10
Lithuania	2016	4794	1.20	0.30	0.20	0.10	0.20
Luxembourg	2014	3344	1.60	0.10	0.03	0.07	0.03
Malta	2013		0.30	0.05	0.03	0.02	0.03
Netherlands	2017	5883	5.40	1.80	0.60	1.20	0.60
Norway	2017	1883	3.90	0.60	0.23	0.37	0.23
Poland	2014	1135	1.70	0.20	0.078	0.12	0.08
Portugal	2016	9632	0.40	0.00	0	0.00	0.00
Romania	2016	7200	0.30	0.10	0.04	0.06	0.04
Slovakia	2015	8029	1.40	0.40	0.30	0.10	0.30
Slovenia	2012	7514	0.90	0.30	0.10	0.20	0.10
Spain	2017	21249	4.00	0.50	0.20	0.30	0.20
Sweden	2017	11514		0.70	0.20	0.50	0.20
Turkey	2017		0.03	0.005	0.003	0.002	0.003
United Kingdom	2017	21257	9.90	0.50	0.10	0.4	0.1

Note: Yellow highlights denote imputed values.

Table A11: Estimated number of high-risk opioid users and the proportion estimated to be cocaine users based on secondary drug use among treatment entrants for opioid use

Country	Year of estimate	Central estimate	Low estimate	High estimate	Proportion assumed to be cocaine users (%)
Austria	2017	36943	35764	38122	33.46
Belgium	EU average	28713	28713	28713	31.65
Bulgaria	2016	14573	7228	21917	4.11
Croatia	2015	8874	7200	11547	28.29
Cyprus	2017	1168	916	1536	18.4
Czechia	2017	13100	12600	13600	0.39
Denmark	2009	16000	15069	16930	27.93
Estonia	2015	9930	8926	11144	34.44
Finland	2012	13836	12700	15090	0.55
France	2017	210000	180000	240000	31.23
Germany	2016	146908	134316	159500	34.44
Greece	2017	14462	12435	17023	10.37
Hungary	2010-11	3244	2910	3577	34.44
Ireland	2014	18988	18720	21454	18.53
Italy	2017	235000	223000	247000	24.15
Latvia	2017	7100	5812	8766	34.44
Lithuania	2016	7503	5108	12444	34.44
Luxembourg	2015	1738	1738	1738	71.54
Malta	2017	1425	1332	1544	36.7
Netherlands	2012	14000	12700	16300	30.48
Norway	2013	9015	6708	13977	34.44
Poland	2014	14664	10915	18412	11.68
Portugal	2015	33290	24070	48565	65.84
Romania	2017	20288	10084	36907	1.04
Slovakia	2008	4888	3966	9782	2.11
Slovenia	2017	4873	4283	5666	24.64
Spain	2016	68297	46014	90579	22.99
Sweden	2007	12110	12110	12110	34.44
Turkey	2011	12733	11126	26537	7.42
United Kingdom	2011	341576	336153	354421	53.99

Note: Yellow highlights denote imputed data.

Table A12: Estimated number of high-risk opioid users and proportion estimated to be amphetamines users based on secondary drug use among treatment entrants for opioid use

Country	Central estimate	Low estimate	High estimate	Proportion assumed to be users of amphetamines (%)
Austria	36943	35764	38122	10.88
Belgium	28713	28713	28713	4.97
Bulgaria	14573	7228	21917	7.49
Croatia	8874	7200	11547	11.46
Cyprus	1168	916	1536	8.02
Czechia	13100	12600	13600	60.39
Denmark	16000	15069	16930	14.34
Estonia	9930	8926	11143	4.30
Finland	13836	12700	15090	44.08
France	210000	180000	240000	1.46
Germany	146908	134316	159500	4.30
Greece	14462	12435	17023	2.04
Hungary	3244	2910	3577	4.30
Ireland	18988	18720	21454	0.5
Italy	235000	223000	247000	1.69
Latvia	7100	5812	8766	4.30
Lithuania	7503	5108	12444	4.30
Luxembourg	1738	1738	1738	4.88
Malta	1425	1332	1544	0.08
Netherlands	14000	12700	16300	1.27
Norway	9015	6708	13977	4.30
Poland	14664	10915	18412	26.74
Portugal	33290	24070	48565	3.93
Romania	20288	10084	36907	0.21
Slovakia	4888	3966	9782	44.61
Slovenia	4873	4283	5666	2.84
Spain	68297	46014	90579	0.54
Sweden	12109	12109	12109	4.30
Turkey	12733	11126	26537	3.89
United Kingdom	341576	336153	354421	2.49

Note: Yellow highlights denote imputed values.

Table A13: Estimates of the number of high-risk users of amphetamines

Country	Year	Method	Central estimate	Lower bound of prevalence estimate	Upper bound of prevalence estimate	Drug	Notes
Czechia	2017	TM	34700	34100	35400	Methamphetamine	
Germany	2015	GPS	101994	50997	254984	Amphetamine, methamphetamine	Age range is 18-64
Cyprus	2017	TP	176	118	304	Methamphetamine	
Latvia	2017	TM	2234	1794	2806	Amphetamine, methamphetamine, synthetic cathinones, other stimulants	
Norway	2013	TM	11208	8745	17072	Amphetamine, methamphetamine	

Table A14: Cocaine – amount used per year by type of user

Country	Infrequent users			Frequent users		
	Trimmed mean	Low	High	Trimmed mean	Low	High
Austria	2.06	1.85	2.27	32.70	25.50	39.90
Belgium	2.90	2.71	3.10	42.69	35.73	49.65
Bulgaria	3.01	2.91	3.11	53.81	48.88	58.74
Croatia	3.67	3.30	4.04	89.65	63.12	116.18
Cyprus	3.01	2.91	3.11	53.81	48.88	58.74
Czechia	2.50	1.86	3.15	53.81	48.88	58.74
Denmark	3.01	2.91	3.11	53.81	48.88	58.74
Estonia	2.45	2.15	2.75	62.07	31.69	92.45
Finland	3.78	3.29	4.28	54.01	32.53	75.50
France	3.76	3.32	4.20	63.13	51.24	75.02
Germany	3.01	2.91	3.11	53.81	48.88	58.74
Greece	3.01	2.91	3.11	53.81	48.88	58.74
Hungary	3.01	2.91	3.11	53.81	48.88	58.74
Ireland	3.01	2.91	3.11	53.81	48.88	58.74
Italy	2.44	2.07	2.80	48.89	30.51	67.27
Latvia	2.95	2.59	3.31	53.81	48.88	58.74
Lithuania	2.68	2.07	3.30	53.81	48.88	58.74
Luxembourg	3.78	2.64	4.92	98.08	34.59	161.56
Malta	3.01	2.91	3.11	53.81	48.88	58.74
Netherlands	3.34	2.84	3.83	68.95	45.79	92.12
Norway	3.01	2.91	3.11	53.81	48.88	58.74
Poland	3.21	2.94	3.48	49.94	24.55	75.31
Portugal	3.01	2.91	3.11	53.81	48.88	58.74
Romania	3.01	2.91	3.11	53.81	48.88	58.74
Slovakia	3.01	2.91	3.11	53.81	48.88	58.74
Slovenia	3.01	2.91	3.11	53.81	48.88	58.74
Spain	3.01	2.91	3.11	53.81	48.88	58.74
Sweden	3.01	2.91	3.11	53.81	48.88	58.74
Turkey	3.01	2.91	3.11	53.81	48.88	58.74
United Kingdom	2.95	2.01	3.89	53.81	48.88	58.74

Note: Yellow highlights denote imputed values.

Table A15: Amount used per year by type of MDMA user used in the estimates (in tablets)

	Infrequent			Frequent		
Country	Trimmed mean	Low	High	Trimmed mean	Low	High
Austria	4.9072	4.5229	5.2915	69.0887	56.7564	81.421
Belgium	5.6988	5.3373	6.0603	53.4954	45.9768	61.0139
Bulgaria	5.5611	5.4299	5.6924	64.3801	60.14	68.6201
Croatia	5.7976	5.3478	6.2474	101.3444	82.3594	120.3295
Cyprus	5.5611	5.4299	5.6924	64.3801	60.14	68.6201
Czechia	4.8418	3.68	6.0035	49.0921	31.1258	67.0584
Denmark	5.559	5.4299	5.6924	64.3801	60.14	68.6201
Estonia	6.1381	5.6026	6.6736	58.7339	44.6289	72.8389
Finland	5.6074	5.2621	5.9527	65.9833	53.8032	78.1634
France	6.572	5.9886	7.1553	61.2024	53.2724	69.1325
Germany	5.559	5.4299	5.6924	64.3801	60.14	68.6201
Greece	5.559	5.4299	5.6924	64.3801	60.14	68.6201
Hungary	5.559	5.4299	5.6924	64.3801	60.14	68.6201
Ireland	5.559	5.4299	5.6924	64.3801	60.14	68.6201
Italy	3.9783	3.1473	4.8093	64.3801	60.14	68.6201
Latvia	4.5383	4.1226	4.9541	48.3602	35.2774	61.4429
Lithuania	5.5377	4.7689	6.3065	93.0767	22.1932	163.9602
Luxembourg	4.7434	3.8446	5.6422	64.3801	60.14	68.6201
Malta	5.559	5.4299	5.6924	64.3801	60.14	68.6201
Netherlands	7.375	6.4293	8.3207	57.9385	44.5317	71.3454
Norway	5.559	5.4299	5.6924	64.3801	60.14	68.6201
Poland	5.1862	4.871	5.5015	57.2249	48.3084	66.1414
Portugal	5.559	5.4299	5.6924	64.3801	60.14	68.6201
Romania	5.559	5.4299	5.6924	64.3801	60.14	68.6201
Slovakia	5.559	5.4299	5.6924	64.3801	60.14	68.6201
Slovenia	5.559	5.4299	5.6924	64.3801	60.14	68.6201
Spain	5.559	5.4299	5.6924	64.3801	60.14	68.6201
Sweden	5.559	5.4299	5.6924	64.3801	60.14	68.6201
Turkey	5.559	5.4299	5.6924	64.3801	60.14	68.6201
United Kingdom	5.325	3.9392	6.7108	48.4839	30.1956	66.7721

Note: Yellow highlights denote imputed values.

Table A16: Amount used per year by type of amphetamines user used in the estimates

	Infrequent users			Frequent users		
Country	Trimmed mean	Low	High	Trimmed mean	Low	High
Austria	2.8591	2.5157	3.2025	44.9336	37.7839	52.0834
Belgium	2.5175	2.1484	2.8866	74.6088	55.0099	94.2076
Bulgaria	3.4614	3.308	3.6147	69.6498	64.7215	74.578
Croatia	4.4775	3.9614	4.9936	94.0504	77.7711	110.3297
Cyprus	3.4614	3.308	3.6147	69.6498	64.7215	74.578
Czechia	1.5187	1.0472	1.9903	62.0595	38.2111	85.9079
Denmark	3.4614	3.308	3.6147	69.6498	64.7215	74.578
Estonia	3.0231	2.5085	3.5377	42.5258	27.174	57.8777
Finland	4.2167	3.7949	4.6384	89.7995	73.7513	105.8476
France	3.6279	3.0488	4.207	61.3577	49.1821	73.5334
Germany	3.4614	3.308	3.6147	69.6498	64.7215	74.578
Greece	3.4614	3.308	3.6147	69.6498	64.7215	74.578
Hungary	3.4614	3.308	3.6147	69.6498	64.7215	74.578
Ireland	3.4614	3.308	3.6147	69.6498	64.7215	74.578
Italy	2.4276	1.5139	3.3412	69.6498	64.7215	74.578
Latvia	2.9188	2.4953	3.3424	77.9782	46.2275	109.7289
Lithuania	3.5582	2.5361	4.5803	69.6498	64.7215	74.578
Luxembourg	2.3	1.5482	3.0518	69.6498	64.7215	74.578
Malta	3.4614	3.308	3.6147	69.6498	64.7215	74.578
Netherlands	3.1371	2.6022	3.6721	67.8221	47.8201	87.8241
Norway	3.4614	3.308	3.6147	69.6498	64.7215	74.578
Poland	3.9856	3.5401	4.4312	75.3948	60.3598	90.4298
Portugal	3.4614	3.308	3.6147	69.6498	64.7215	74.578
Romania	3.4614	3.308	3.6147	69.6498	64.7215	74.578
Slovakia	3.4614	3.308	3.6147	69.6498	64.7215	74.578
Slovenia	3.4614	3.308	3.6147	69.6498	64.7215	74.578
Spain	3.4614	3.308	3.6147	69.6498	64.7215	74.578
Sweden	3.4614	3.308	3.6147	69.6498	64.7215	74.578
Turkey	3.4614	3.308	3.6147	69.6498	64.7215	74.578
United Kingdom	3.4614	3.308	3.6147	69.6498	64.7215	74.578

Note: Yellow highlights denote imputed values – due to non-available data or small sample sizes (<30)).

Table A17: Prices for cocaine used in the estimation process (EUR per gram) compared with prices obtained in the EWSD

	FONTE data		Web survey data				
Country	Selected price	Summary measure	Min.	Max.	Mean	Median	Mode
Austria	100	Mode	14	160	84.3	90	100
Belgium	50	Mode	12.5	200	50.83	50	50
Bulgaria	61	Mode					
Croatia	78	Mode	9	133	73.5	66.5	67
Cyprus	100	Mode	40	100	78.5	80	80
Czechia	75.96	Mode	33.3	133.1	74.67	73.9	73.92
Denmark	67	Mode					
Estonia	120	Mode	15	200	103.75	105	120
Finland	100	Mode	10	230	107.36	120	120
France	79.4	Mode	8	150	70.05	70	80
Germany	71.6	Mean					
Greece	85	Mean					
Hungary	64.6	Mode					
Ireland	79.45	EU average					
Italy	80.95	Mean	6.5	125	77.6	80	100
Latvia	90	Mode	10	200	89	100	100
Lithuania	58	Mean	50	180	85.4	90	100
Luxembourg	100	Mode					
Malta	37.75	Mean					
Netherlands	50	Mode	15	100	44.6	50	50
Norway	102.52	Mean					
Poland	55	Mode	11.75	141	66.7	70.5	70.5
Portugal	100	Mode					
Romania	100	Min-max average					
Slovakia	100	Mean					
Slovenia	60	Mode					
Spain	59.29	Mean					
Sweden	94	Mode					
Turkey	75.95	Min-max average					
United Kingdom	88	Mode	17	127	80	76	63

Note: Yellow highlights denote imputed values.

Table A18: Prices for the MDMA used in the estimation process(EUR per gram) compared with prices obtained in the EWSD

	FONTE data		Web survey				
Country	Selected price	Summary measure	Min.	Max.	Mean	Median	Mode
Austria	9	mode	1	80	12.4	11.0	10
Belgium	5	mode	1	50	5.36	5	5
Bulgaria	5	mode					
Croatia	7.4	mode	0.13	19.95	9.87	9.98	13.3
Cyprus	10	mode	5	12.5	9.38	9.44	10
Czechia	7.60	mode	3.7	9.24	6.95	7.39	7.39
Denmark	6.7	mode					
Estonia	10	mode	1	25	10.1	10	10
Finland	20	mode	1	150	17.07	19.00	20
France	10	mode	1	40	9.8	10	10
Germany	7.7	mean					
Greece	6	mean					
Hungary	6.5	mode					
Ireland	10	mean					
Italy	15.65	mean	5	30	16.17	18	20
Latvia	4.5	min-max average	1	200	10.19	10.00	10
Lithuania	6	mean	1	22.5	8	8	10
Luxembourg	10	mode	2.5	20.0	8.75	10	10
Malta	8.5	mean					
Netherlands	4.1	mean	0.10	16.67	3.8	4	5
Norway *	30	min-max average					
Poland	5	mode	1.12	123.50	5.25	4.7	7.05
Portugal	10	mode					
Romania	13.14	min-max average					
Slovakia	7.5	mean					
Slovenia	5	mode					
Spain	10.56	mean					
Sweden	10	mode					
United Kingdom	10.26	min-max average	1.27	25.34	10.02	12.67	12.67

*2015 data

Table A19: Prices for amphetamines used in the estimation process (EUR per gram)

Country	FONTE data	
	Selected price	Summary measure
Austria	40	Mode
Belgium	10	Mode
Bulgaria	5	Mode
Croatia	16.5	Mode
Cyprus*	100	Mode
Czechia*	38	Mode
Denmark	20	Mode
Estonia	20	Mode
Finland	30	Mode
France	13.6	Mode
Germany	11.9	Mean
Greece	10	Mean
Hungary	9.7	Mode
Ireland	15	Mean
Italy	37.7	Mean
Latvia	12	Mode
Lithuania	25	Mean
Luxembourg	13	Mode
Malta	30	Mean
Netherlands	7.4	Mean
Norway	28.87	Mean
Poland	9	Mode
Portugal	26.31	Mean
Romania	26.16	EU average
Slovakia	50	Mean
Slovenia	20	Mode
Spain	26.86	Mean
Sweden	26	Mode
Turkey	40.505	Min-max average
United Kingdom	11	Mode

*Prices are for methamphetamine. Data for Malta are from 2014 and for Italy and Slovenia 2015, while 2016 data were used for Turkey. Note: Yellow highlight denotes imputed value.

Table A20: Problematic user estimates and other data from which the number of problem heroin users was derived

Country	Year of estimate	Type of PDU data available	High-risk heroin users			% of heroin users among high-risk opioid users in treatment	OST clients	OST clients in problematic user estimate
			Central estimate	Low estimate	High estimate			
Austria	2017	HROU	29979	29022	30936	81.15	18632	Fully included
Belgium	2017	–	24674	24366	24982	83.51	16546	not applicable
Bulgaria	2016	HRDU	12353	6127	18579	84.77	3338	Not clear
Croatia	2015	HROU	8343	6769	10856	94.02	5061	Not clear
Cyprus	2017	HROU	628	493	826	53.77	209	Fully included
Czechia	2017	HRHU	3900	3755	4053	55.44	5000	Fully included
Denmark	2009	HRDU	7227	6807	7647	45.17	7384	Not clear
Estonia	2015	PWID	566	509	635	5.7	1116	Not clear
Finland	2012	HROU	151	138	164	1.09	2439	Fully included
France	2017	HRHU	141225	121050	161400	67.25	178665	Fully included
Germany	2016	HROU	73101	66836	79367	49.76	78500	The entire case register was used in estimation OR entries (first or repeated) during the study period were included only.
Greece	2017	HRHU	23264	21237	25825	90.32	9388	New OST clients are counted (once) for continuing OST clients are not
Hungary	2010-11	HRHU	3244	2910	3577	77.67	715	not clear
Ireland	2014	HROU	16935	16696	19135	89.19	9764	Fully included
Italy	2017	HRHU	235000	223000	247000	95.87	69642	Fully included
Latvia	2017	HROU	5338	4370	6591	75.19	669	The entire OST case register was used in estimation
Lithuania	2016	HROU	7240	4929	12008	96.5	1231	Other
Luxembourg	2015	HROU	1727	1727	1727	99.39	1078	Fully included
Malta	2017	HROU	1425	1332	1544	100	1025	Fully included
Netherlands	2012	HROU	9807	8896	11418	70.05	9148	Fully included
Norway	2013	HROU	12229	10474	16005	76.1	7055	Excluded
Poland	2014	HROU	10614	7900	13327	72.38	2586	Unknown
Portugal	2015	HROU	32431	23449	47312	97.42	17011	Those OST clients which continue high risk drug use behaviours are included due to occurrence at data sources
Romania	2017	HROU	19117	9502	34777	94.23	1530	Fully included
Slovakia	2008	HROU	4276	3469	8556	87.47	600	Not clear
Slovenia	2017	HROU	4226	3715	4914	86.73	3042	Fully included

Table A20 (continued)

Country	Year of estimate	Type of PDU data available	High-risk heroin users			% of heroin users among high-risk opioid users in treatment	OST clients	OST clients in problematic user estimate
			Central estimate	Low estimate	High estimate			
Spain	2016	HRHU	68297	46014	90579	88.33	58749	Those OST clients which continue high risk drug use behaviours are included due to occurrence at data sources
Sweden	2008-11	PWID	4727	4488	4993	59.68	3472	Unknown
Turkey	2011	HROU	11963	10453	24932	93.95	12500	Not clear
United Kingdom	2014-15	HROU	290579	285965	301506	85.07	146327	The entire case register was used in estimation

Year of estimate primary refers to the estimate available through PDU, to which TDI and OST data should refer to as well. Exceptions in this approach are highlighted in yellow and detailed methodology in those situations is described in the text.

Table A21: Selected prices for heroin, 2017 or latest year available

Country	Price	Measure
Austria	60	Mode
Belgium	20	Mode
Bulgaria	25	Mode
Croatia	52	Mode
Cyprus	100	Mode
Czechia	30.4	Mode
Denmark	100*	Mode
Estonia	15**	Mode
Finland	150	Mode
France	39.7	Mode
Germany	42.6	Mean
Greece	17.5	Mean
Hungary	38.8	Mode
Ireland	140**	Mean
Italy	45.7	Mean
Latvia	100	Mode
Lithuania	46.5	Min-max average
Luxembourg	40	Mode
Malta	26	Mean
Netherlands	38.3	Mean
Norway	91.7	Mean
Poland	50	Mode
Portugal	50	Mode
Romania	46	Min-max average
Slovakia	70	Mean
Slovenia	30	Mode
Spain	57.4	Mean
Sweden	72	Mode
Turkey	65.8	Min-max average
United Kingdom	55	Mode

2012 data2015 data*