Cannabis sales revenue in France

A new direct estimate by expenditure

tendances

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In 2007, the OFDT provided for the first time an estimate of the sales revenue from the cannabis market, the most commonly used illicit substance in France [1, 2]. The total annual purchase expenditure was then estimated at between 746 and 832 million euros. A decade later, the landscape has changed: cannabis use has become entrenched, with, in particular, an established population of cannabis users over the age of 30 [3]. There are currently about 18 million lifetime users in the adolescent and adult population (11-64 years old) in France, compared to 12.4 million in 2005, and nearly 900 000 daily users[1], compared to 550 000 in 2005 [4, 5]. In addition, the cannabis market has developed: supply has diversified with the emergence in Europe of a market for herbal cannabis supported by local production and a constantly developing practice of home cultivation [6]. On the other hand, average tetrahydrocannabinol (THC) levels have risen and accessibility has increased through new business practices such as home delivery, online sales or promotional pricing policies communicated by SMS [7].

In this context, while the assessment of the impact of these changes on economic, social and health levels is often debated, estimating the amount of cannabis sales revenue is important and provides a measure of the influence of this economic sector. However, this exercise faces two major obstacles, since both the quantities sold and the retail prices of an illicit product remain, by definition, unknown in public statistics[2]. In order to get around these difficulties, the OFDT has introduced a module of questions in the Health Barometer survey of the French Public Health Agency (*Santé publique France*) and in its Survey on Health and Use on National Defence and Citizenship Day (ESCAPAD) which directly questions users on the frequency of their cannabis purchases during the year and the amount of their last expenditure. If the primary objective is to renew the estimate, it is also a question of testing a calculation method that is easily reproducible and comparable over time.

The amount of purchases declared by consumers led to an estimated sales revenue of 1.2 billion euros in 2017.

This issue of *Tendances* reports on the use of these new questions asked simultaneously in 2017 in these two surveys and proposes a new estimate of the cannabis market in France's sales revenue.

■ Sales revenue and black market

In theory, an evaluation of the sales revenue of a sector of economic activity is obtained by simply multiplying the retail price by the quantities sold. In France, as in most countries, this economic calculation does not pose a major problem, particularly regarding the legal and tax reporting obligations that come into play and which are generally accessible and made public. The problem is quite different in terms of the market for an illicit substance such as cannabis.

Since it is difficult to turn to individuals involved in the supply for this information, this obstacle can be overcome by questioning users. This involves estimating either the quantities used (and possibly the unit price) or, more simply, the expenditure related to cannabis use. Cannabis sales revenue can then be defined as the total sum of reported purchase expenditure (of cannabis) by the resident population over a given period of time.

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However, collecting and measuring quantities used and unit prices from users can be relatively difficult[3]. It is simpler to ask them about the amounts of their recent purchases (generally during the month preceding the survey) and to calculate, by adding up the numbers from their declarations, the average annual expenditure without having to resort to exogenous data or information. However, this approach requires several kinds of information: Who is using? How often? And, of course, how much are they spending? Finally, it is essential that this information comes from a representative sample of the population so that extrapolation to the total population is possible and unbiased.

■ Estimated sales revenue in 2017

The Health Barometer survey interviews adults aged 18 to 75 by telephone. In addition to the usual questions on possible illegal psychoactive substance use [3], the 2017 exercise has included questions on the expenditure and number of cannabis purchases during the year. Only respondents under 65 years of age who said that they had used cannabis at least once in the past 30 days (n = 1 115) were included. For adolescents, a question about spending in the past month was also put to a subsample (n = 12 471) of the ESCAPAD 2017 survey, in which 2 548 respondents had used cannabis in the last month.

The direct estimate of average expenditure is based mainly on declarations of the amounts purchased by cannabis users in the last thirty days, the only ones asked about this issue in the two surveys involved (see questions in Box 1). This choice to question only recent users is based on the observation of a concentration of purchases in the population with the highest use (Box 2). Indeed, in the 2017 Health Barometer survey, 82% of daily users declared that they spent money in the

past 30 days compared with 41.8% of users in the last month, and in the 2017 ESCAPAD survey, 61.5% of users in the last year declared that they obtained their cannabis for free [10], which is the case for only 26.3% of users in the last month.

In the 2017 Health Barometer survey, 63.8% of cannabis users in the last month (making up 6.4% of all 18-64 year olds) had bought cannabis (whether in herbal or resin form) at least once during the last year and 55.2% made a purchase in the month before the survey (Table 1). The average amount of their purchases was 80 euros without gender differentials, with women spending an average of 79 euros and men 81 euros (Table 2). In terms of those who used in the last month who did not mention buying cannabis in the last period (8.7%), but who nevertheless indicated that they had bought some during the last year (specifying the number of purchases),

it is possible to refer to the amount of their last expenditure, which averaged 51 euros (53 euros for men *vs* 47 euros for women). Assuming that the unit amount of a consumer's purchases remains stable over the year, the annual expenditure is then estimated by multiplying the expenditure declared in the last month by the frequency of purchase over the last year[4].

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3. While it is always possible to carry out *ad hoc* surveys to estimate retail prices, concerning quantities used, the estimate can quickly become more complex. For a product that is not standardised (such as manufactured cigarettes), measuring these quantities remains extremely difficult, given that they vary greatly from one user to another, depending on the type of product consumed (herbal cannabis, resin or oil, etc.), the frequency and pattern of use (smoking, inhaling, ingesting, etc.).

4. The unit amounts of the purchases were limited to a maximum of 300 euros, with the assumption that anything above this amount could be a group purchase (this concerned 15 respondents, or 2%). Similarly, the frequency of purchases in the year was frozen at 12 because whether or not there were several purchases during the month, the question was about the total amount spent over the whole month. For the Health Barometer survey, for users for whom only their last expenditure is known, this limit on the frequency of purchase was obviously not applied. On the other hand, their total annual amount was blocked at 3 300 euros, considering that it could not be higher than that of users who purchase amounts every month.

Table 1. Share of buyers in the last year and month among adults and teenagers (%)

	Purchase within the last year (at least once)			Purchase within the last month (at least once)			Purchase within the last year but not within the last month
	% Yes	% No	% of non-responses	% Yes	% No	% of non-responses	%
Users aged between 18-64 year olds in the last month (n = 1 115)	63.8	34.8	1.4	55.2	44.2	0.6	8.7
17-year-old users in the last month (n = 2 548)	60.6	24,3	15.1	40.1	41.8	18.0	na

na: not available
Sources: 2017 Health Barometers of Santé publique France – ESCAPAD 2017, processed by OFDT

Thus, in 2017, the adults questioned in the Health Barometer survey spent an average of 693 euros, i.e. a total expenditure of approximately 570 000 euros. In proportion to the total population aged 18-64, this amount corresponds to an estimated annual sales revenue of 1.01 billion euros.

In the ESCAPAD 2017 sub-sample, 21.0% of the adolescents surveyed reported using cannabis in the month prior to the survey. Among them, 60.6% (n = 1 535) had bought cannabis at least once during the year and 40.1% reported a purchase in the 30 days prior to the survey for an average amount of 68 euros. Among these adolescents, girls spent 25% less than boys.

The ESCAPAD survey accurately collects both the number of purchases and their circumstances (locations, sellers) but, unlike the Health Barometer survey, only asks about expenditure made over the last thirty days. It is therefore impossible to directly estimate the annual expenditures of young users who did not purchase cannabis in the last month but did specify that they had purchased cannabis during the last year (26.4% of those who did purchase during the year, n = 409), resulting in an underestimation of the total expenditure among 17-year-olds. However, this difficulty can be circumvented by means of indirect estimation by imputation (see below). As with the data from the Health Barometer survey, the total expenditure is then calculated by multiplying the amount declared or imputed by the purchase frequency during the last year[5]. In 2017, the monthly cannabis users surveyed in ESCAPAD thus spent a total annual amount of 788 000 euros (753 euros on average), which, when compared to the population of 17-year-olds, represents an estimated sales revenue of 51 million euros.

■ **Risks of underestimation**

Any missing value, or more broadly the absence of data for a population that is known to be particularly affected (such as, in this case, users within the last month), creates the risk of underestimating expenditure [13]. To limit this bias, it is possible to use a direct imputation method known as random hot deck imputation, which consists of replacing a missing value (in this case the amount or number of purchases during the year) observed in a respondent known as the "recipient" by the value observed in a "donor", randomly selected from a set of people with the same profile as the recipient [14]. This method makes it possible

Purchases focused on a few users

Cannabis use is characterised by circumstances of use that are often collective, centred on the search for «conviviality» [11, 12]. According to the 2017 Health Barometer survey, one third of users in the last month declare that they did not need to buy cannabis, with being given it for free remaining the most frequent method of supply overall, although some may grow their own at home (i.e. 7% of recent users). Moreover, buying cannabis does not prevent the user from being offered cannabis (this is the case for 57.4% of those who bought cannabis in the year). Thus, for many users, use is based on giving or sharing. As a result, the cannabis market is relatively concentrated in the sense that purchases are mainly made by a minority of users: 90% of total expenditure is by 30% of adult users. Among 17-year-olds, this concentration is even more pronounced, with 20% of consumers spending most of their money during the year (90%).
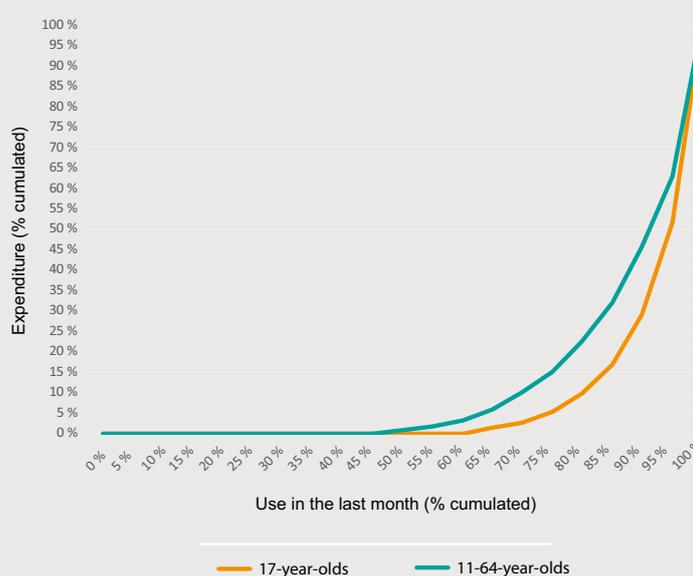
to estimate unknown amounts and purchase frequencies (the imputed values are always plausible because they are among those already provided by respondents) and proves to be reliable as soon as the matching variables are strongly linked to the variable that needs to be estimated[6].

Due to the way in which the Health Barometer survey is administered, the number of missing values is small. Thus, only twelve users in the last month did not wish to answer the purchase question or did not specify any expenditure. These consumers therefore received a purchase amount by imputation. In addition, it is likely that the expenditure estimate suffers from the fact that it does not take into account cannabis users in the

last year who did not use cannabis in the month before the survey: they were therefore not asked about their possible expenditure, although they may have made purchases. This case is all the more likely as their levels of use are significant: in particular, these are people using cannabis throughout the year (but not in the last month)

5. In the ESCAPAD survey, purchase frequency is the sum of transactions declared by the adolescent to "friends", "your usual dealer" and "an unknown dealer". In order to limit the risk of double counting, it is not the sum that is considered here, but the maximum of the two options of "friends" and "your usual dealer", which could potentially involve the same people.

6. Potential "donors" are selected from respondents similar to "recipients" in terms of socio-demographic profile and frequency of cannabis use, which remains one of the most influential factors in purchasing.

who declared an episode of regular or daily use at least one month, i.e. 122 individuals, including 65 daily smokers.

The latter category was therefore assigned the amounts of purchases by smokers in the last month who also declared an episode of regular or daily use during the year (i.e., 732 possible "donors", 532 of whom had a past episode of daily use)[7].

In the ESCAPAD survey, the same procedure was applied to non–response, which is more important in self-administered[8] surveys, among adolescent users during the last month: those who did not specify a purchase frequency or method or did not declare a purchase amount during the last 30 days (22.8% of users during the last month).

On the other hand, contrary to the process for the French Public Health Barometer, it did not appear desirable to estimate by imputation the purchase frequencies and the amounts spent by users in the last year but not in the last month, given the lack of information on possible episodes of regular or daily use. However, given the large proportion of those who said they had never purchased cannabis (64.0%), the underestimation that may result remains small. Summary Table 3 (p. 5) shows that the estimates of the total amounts corrected for non-response are relatively low compared to the initial calculation.

The calculation of cannabis sales revenue in France in 2017 refers to the product of the amount of purchases declared or estimated by the total number of individuals in the entire population of France in 2017, i.e. 38.6 million individuals aged 17-64 years[9]. Sales revenue in France in 2017 reached 1.2 billion euros (i.e. about 0.05% of GDP in 2017). The corrections proposed by imputation result in a positive variation of around 12% (total expenditure calculated before imputation is 1.06 billion euros). Expenditure is driven mainly by purchases by male users, which account for 75% of expenditure, mirroring usage levels in the month, which are 2.5 times higher for men.

7. Hot deck imputation included the period of heavy use, gender, amount and purchase frequency prior to the last month, smoking status, and household type.
8. In the case of a self-administered questionnaire, non-response is generally more frequent than in a face-to-face or telephone survey.
9. Inference to the whole population assumes that both surveys are representative of the study population and that coverage bias or non-response bias remains limited.

Increase in sales revenue between 2010 and 2017

While expenditure on cannabis use has most certainly increased over the last decade, it is difficult to provide a measurement of this development given the differences in the calculation methods used for previous estimates, which make comparisons risky. In 2005, the absence of a question in the Health Barometer survey on the amount of expenditure had dictated a calculation based on the estimated quantities smoked (in grams) and the unit price. The same applies to the estimate [8] based on the 2010 Health Barometer data, whose calculation method - even if it is also based on a question concerning the amount spent over the last thirty days - still differs too much from the one provided here.

It is possible, however, by involving the question on expenditure in 2010, to provide an estimate, with a consistent methodology, of the development of expenditure between 2010 and 2017. It is possible to recalculate a sales revenue for each of the two years in exactly the same way by limiting the calculation to daily users only. Restricting calculations to these users alone makes it possible to avoid non-response bias, which will not affect the results much, and to concentrate on a majority of the population that spends money and is perfectly comparable. However, there is still a difficulty concerning purchase frequency, since in 2010 this data, which is necessary to calculate the total annual expenditure (which is the monthly average multiplied by the purchase frequency), was not available. For the purposes of comparison, for example, it can be assumed that there were a total of 12 purchases in both 2010 and 2017. It should be noted that, in this case, the annual sales revenue is overestimated: the average annual expenditure in 2017 will rise from 965 euros (based on the frequencies actually declared by daily users, i.e. 10 per year on average) to 1 392 euros, assuming 12 purchases during the year, i.e. a positive variation of around 200 million euros on the final estimate of the calculated sales revenue. But in the end, what is important is to be able to estimate a variation in the amounts between 2010 and 2017 using a calculation method that is robust in terms of comparison.

Table 2. Estimates of cannabis expenditure among daily smokers in 2010 and 2017

Year	% of daily users	Proportion of buyers in the last month	Average monthly expenditure	Estimated total (total population)
2010	1.1 %	84 %	130 €	551 537 888 €
2017	2.2 %	82 %	116 €	949 775 777 €

Note: The total estimate is the average expenditure multiplied by 12, then put in proportion with the entire population.
Sources: 2010 and 2017 Health Barometers of Santé publique France, processed by OFDT

There was a 72% increase in expenditure between 2010 and 2017, while the share of daily users doubled over the same period. This lower increase in revenue is partly due to lower monthly expenditure (130 euros on average in 2010 *vs* 116 euros in 2017). This could have decreased due to the increase in THC levels (leading users to reduce the quantities used) [7] but also to the spread of home cultivation [6]. If the share of home cultivation declared in the last year among users during the last month did not vary between 2010 and 2017 (approximately 7 to 8%), in the Health Barometer survey, it is not inconceivable to assume that its contribution to personal use has risen with increased yields and quality. In the adolescent population, the most recent ESCAPAD data shows a wide diffusion of herbal cannabis among adolescents [10]: in 2017, nearly two thirds (67%) reported having used herbal cannabis during their last use.

Table 3. Summary of calculated purchase amounts (weighted data)

		18-64-year-olds (n = 25 319)			17-year-olds (n = 12 471)		
		Together (n = 1 115)	Men (n = 781)	Women (n = 334)	Together (n = 2 548)	Boys (n = 1 471)	Girls (n = 1 077)
Buyers in the last month	Average expenditure in the last month	€80	€81	€79	€68	€74	€55
	Average expenditure in the last year	€760	€769	€733			
Buyers within the last year but not within the last month	Average expenditure of the last purchase	€51	€53	€47			
	Average expenditure in the last year	€289	€323	€193			
Total	Average expenditure in the last year	€693	€707	€654	€753	€836	€604
	Total expenditure in the last year	€570 234	€433 958	€136 276	€788 683	€562 509	€226 174
	Total in the population	€1 009 546 805	€769 295 959	€240 250 846	€51 344 929	€37 062 752	€14 282 177
	Total adjusted for non-response	€1 084 113 810	€798 485 981	€285 627 829	€60 604 687	€42 816 56	€17 788 126

Sources: 2017 Health Barometer of Santé publique France – ESCAPAD 2017, processed by OFDT

■ **Discussion**

The proposed method estimates sales revenue from cannabis in 2017 at 1.2 billion euros (1.3 billion $). This estimate represents a minimum level because, while the imputation procedures reduce underestimation, their impact on the final estimate remains modest and a number of additional biases are still enduring.

The first, and probably the least significant, is the failure to include purchases among adolescents under 17 years of age due to the lack of information on expenditure in surveys of secondary school students. In 2022, the next edition of the National Health and Substances survey among adolescents in middle and high school (EnCLASS) is expected to fill this gap.

On the other hand, the fact that a proportion of illegal drug users are not represented in the expenditure estimates is more detrimental. It is in fact likely that the users most involved in the use of illicit drugs are not included in the Health Barometer survey, whose modus operandi (telephone) does not make it possible to cover certain specific populations. This last point is notably corroborated by the results of an Internet survey conducted in 2016 among drug users, which showed that a proportion of the cannabis users surveyed were not included in the Health Barometer survey [15].

The same is true for the most problematic drug users, attending CAARUD low-threshold structures. These individuals, often in precarious situations, are partially missed by telephone surveys conducted among the general population, even though they are a population with high levels of cannabis use [16]. For these users, whose share in the population is difficult to estimate precisely, a module of specific questions should also be developed in a future edition of the ENa-CAARUD survey (the National survey of CAARUDs' clients).

■ **Conclusion**

Estimating cannabis sales revenue through declarations of expenditure is therefore not only possible but also conceptually simpler and more reliable than estimating quantities smoked and unit prices. Taking into account the number of purchases during the last year or the amount of the last expenditure also significantly improves the estimate.

It is unfortunate that a robust measurement of the development of expenditure on cannabis cannot be provided due to differences in the way in which past estimates have been calculated. However, the objective that guided this work was to provide a rigorous and easily reproducible method whose reliability can be appreciated by everyone and which would now make it possible to regularly monitor the sales revenue of cannabis comparable over time. In addition, the relative simplicity of the questions should facilitate the integration of the questions into other surveys, particularly those conducted in other European countries, and thus make international comparisons more reliable.

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