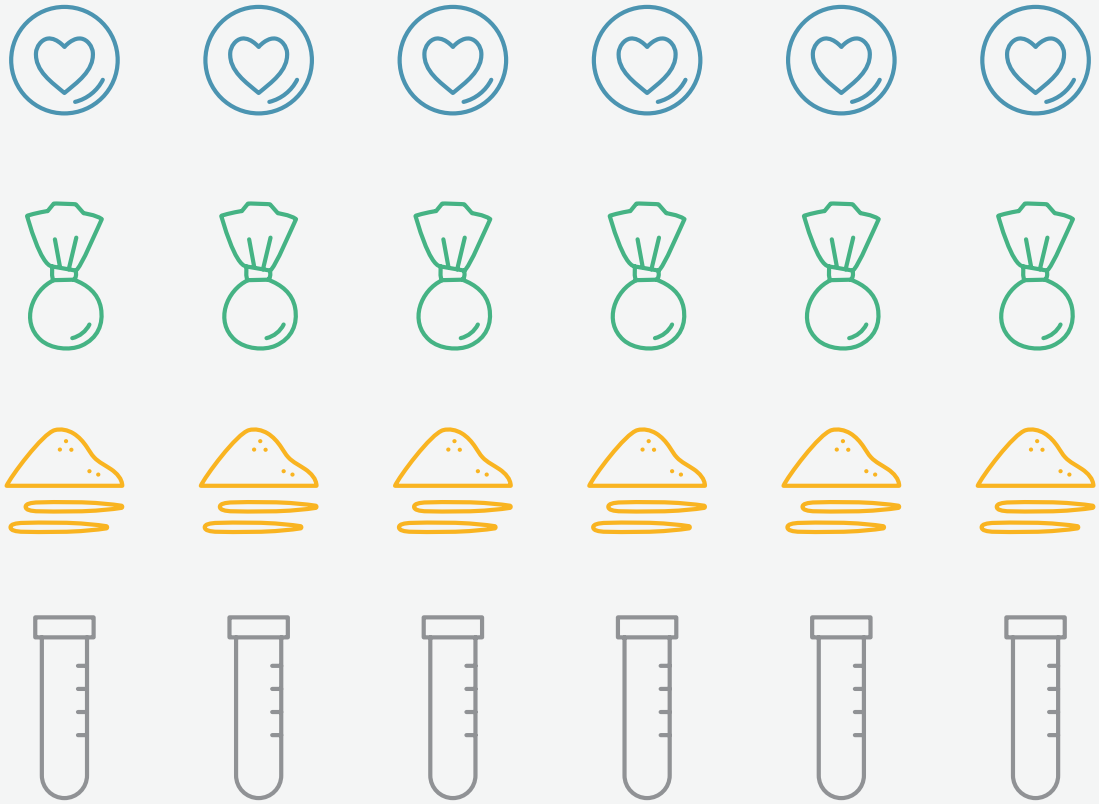

MDMA, AMPHETAMINE AND COCAINE MARKETS IN SPAIN

SEEN THROUGH A DRUG CHECKING SERVICE

Founded by:

ENERGY CONTROL

GROUP ABD

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MINISTERIO DE SANIDAD

SECRETARÍA DE ESTADO DE SANIDAD

DELEGACIÓN DEL GOBIERNO PARA EL PLAN NACIONAL SOBRE DROGAS

MDMA, amphetamine and cocaine markets in Spain. Seen through a drug checking service.

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INTRODUCTION

Illegal drug markets are, by their very nature, obscure, dynamic and changing.

The alterations made to the sold substances, in terms of composition and purity, are common over time and are made in order to increase, dilute, supplement or enhance the effects of substances (Cole, Jones, McVeigh, Kicman, Syed & Bellis, 2010), which makes the products used for this purpose have a strategic use (Broseus et al., 2015). Adulteration, understood in this study as the intentional use of pharmacologically active substances that may be added to the substance (adulteration by addition) or that may replace it (adulteration by substitution), is a phenomenon involving multiple substances that may differ depending on the particular market, although, in general, they tend not to pose greater risks than the substance they adulterate (Coomber, 1997). However, sometimes, the presence of adulterants can increase the risks, so that, in addition to being a concern for consumers who seek ways to know the composition and take precautions (Decorte, 2001; Jacinto, Duterte, Sales and Murphy, 2008; Palamar, Acosta, Sutherland, Shedlin, & Barratt, 2019; Soukup-Baljak, Greer, Amlani, Sampson, & Buxton, 2015), it is also a public health issue of concern to the institutions in charge of addressing the problems derived from the consumption of these substances. In this way, monitoring the market for illegal substances is a useful tool for health institutions and users of psychoactive substances.

Sources of information on adulteration are, however, limited. On the one hand, there is data from interceptions and confiscations carried out by the authorities. However, this information is not usually accessible, and, when it is, the reports are scarce and/or published some time after the analysis is carried out, which makes them less useful from the point of view of Public Health. In Spain, the National Institute of Toxicology and Forensic Sciences published comprehensive data on the purity and adulterants found in confiscated samples in its annual reports until 2017, but this information was no longer published in the following years. On the other hand, the drug checking services that exist in different countries have proven to be a very useful tool for monitoring the market of illicit substances and their different and variable compositions (Butterfield, Barratt, Ezard and Day, 2016; Maghsoudi, Tanguay, Scarfone, Rammohan, Ziegler et al., 2022; Vidal-Giné et al., 2017). Similarly, and to a lesser extent, there are studies published in scientific literature, such as those documenting new analytical methods, which also provide information on the composition of substances, despite not being their main objective (see, for example, Vonmoos et al., 2018, and Eliaerts et al., 2019).

With this report, from Energy Control we have sought to document the evolution of three drug markets in Spain: MDMA, amphetamine and cocaine. These are, after cannabis, the illegal psychoactive substances most consumed by the population and those for which most samples are received in our drug checking service. A detailed explanation of these services can be found in Vidal (2019) and on the programme's website (https://energycontrol.org/servicio-de-analisis/). After an introductory review of these three markets from the studies published to date, we present the results found, in terms of purity and adulteration, in samples of MDMA, amphetamine and cocaine voluntarily submitted by users of our services between 2017 and 2021, in the case of MDMA and amphetamine, and between 2014 and 2021 in the case of cocaine samples. In addition, as an update of a previous work (Vidal, Fornís & Ventura, 2014), the use of new psychoactive substances (NPS) as adulterants of these three substances has been investigated. Finally, we have drawn a series of conclusions that may be useful for all those who, in one way or another, work with people who use psychoactive substances and, of course, for the people who use them.

MDMA

3,4-methylenedioxymethamphetamine (MDMA) belongs to the phenethylamine family and is available on the market in two forms: tablets and crystals. According to data from the EMCDDA (*European Monitoring Centre for Drugs and Drug Addiction*), it is estimated to be the third most consumed illegal substance in Europe, with a prevalence of consumption during the last 12 months of 2.6 million people that has remained stable over the last few years (EMCDDA, 2022). In Spain, it is estimated that approximately 5% of the population aged 18-64 years have consumed it at least once in their lifetime and 0.9% of the total Spanish population has consumed it during the last 12 months. However, its consumption tends to occur among young people, decreasing as age increases. Men consume it significantly more than women (OEDA, 2021a). However, although prevalence among the general population tends to be low, its use is more prevalent among people who go to nightlife events, especially those linked to electronic music (Palamar, 2020).

Since 2018, it is the fifth most confiscated substance in Europe, accounting for 2-3% of total confiscations made. In Spain, the quantities of MDMA (in the tablet form) have been decreasing in recent years, until 2020 with the confiscation of 1,561,311 tablets, the largest number since 1998. In the crystal form, 190 kg were confiscated in 2020, less than the 278 kg the previous year (Ministry of the Interior, 2021). Despite the extent of its use and the volume of confiscations, recent studies in Europe on its composition are scarce, although they coincide in pointing to a significant increase in the amount of MDMA present in tablets and low adulteration, which, when it occurs, is usually with caffeine. Vidal et al. (2017), based on analyzes of 6,200 MDMA samples received at Energy Control's (Spain) analytical services between 2000 and 2014, concluded that there were clear differences between MDMA crystal and tablets in terms of composition, purity and adulteration. Although caffeine was the main adulterant in both formats, differential patterns of adulteration were identified. For example, meta-chlorophenylpiperazine (mCPP) and 2C-B appeared almost exclusively in tablets, whereas phenacetin, paracetamol or dextromethorphan appeared more frequently in crystals. Furthermore, while crystal purity remained relatively stable throughout the entire period studied, since 2009 the average amount of MDMA in tablets increased from 53.3 milligrams to 113.5 milligrams in 2014. The authors concluded that analyzes of the MDMA market should be different between the two formats because they follow different patterns in terms of adulteration and purity. Couchman et al. (2019), in the UK, analyzed 412 samples in the period 2001 and 2018, finding an upward trend in the amount of MDMA in the tablets analyzed in the final stage of the period. The most frequently found adulterant was caffeine (22 samples). Other adulterants found, although infrequent, were MDEA, mCPP, ketamine, amphetamine and methamphetamine, among others. Meanwhile, Żubrycka et al. (2022) found 19 different adulterants in the 168 samples of MDMA analyzed in Poland between 2016 and 2020, with caffeine again among the most frequently found. Finally, Pascoe, Radley, Simmons, and Measham (2022) found an increase in adulteration in MDMA samples tested at three music festivals held in the UK in 2021 over what was found at those same festivals in 2019. Specifically, the authors found an increase in substitution adulteration, primarily with caffeine and synthetic cathinones such as 4-chloromethcathinone (4-CMC), 3-methylmethcathinone (3-MMC) and N-ethylbutylone (ethylone) which they attributed to both the effects of Brexit and the reopening of nightlife events months earlier than in other European countries.

The latest European drug reports produced by the EMCDDA present purity and adulteration data from this market from the TEDI network of testing services operating in Europe (see https://www.tedinetwork.org/ for more information on this network). The results of these services have shown how the average quantity in tablets circulating in Europe has undergone a significant increase in recent years while adulteration levels have remained relatively low and stable. Thus, between 2018 and 2020, the average MDMA content was around 180 milligrams, with tablets containing up to 366 milligrams being detected in 2020. Crystal purity remained relatively stable.

Although adulteration was infrequent during this period, caffeine was again the most frequently identified adulterant.

Amphetamine

Amphetamine belongs to the phenethylamines family and is usually found on the market in the form of sulfate (*speed*), appearing as a white powder, although it sometimes comes with a high degree of humidity, forming a pasty mass (paste). It is presumed that the purpose of selling the humid speed is to increase its weight and, therefore, the economic gains for those who distribute it.

Amphetamine is estimated to be the fourth most widely used illicit substance in Europe, with around two million people having used it in the last year (EMCDDA, 2022). In Spain, 4.3% of the general population admits having used it some time in their lives and it decreases to 0.7% in the last 12 months, although use tends to be more common among men between the age of 25-34 (OEDA, 2021a). Since 2018, amphetamine accounts for 5-6% of total confiscations (EMCDDA, 2022) while, in Spain, quantities confiscated appear to be on an upward trend since 2017 (Ministry of the Interior, 2021).

The amphetamine market has received the least attention. There are few recent studies focusing on describing the composition of amphetamine samples, either from police confiscations or from analytical services. Żubrycka et al. (2022) analyzed 1,264 amphetamine samples in Poland between 2016 and 2020. Caffeine was the most commonly found adulterant, present in 94% of the samples and being by far the most commonly used adulterant, accounting for 74.5% of all adulterants. In Europe, the average purity of amphetamine analyzed in the analytical services of the TEDI network is estimated to be 37% in 2019 and 35% in 2020 (EMCDDA, 2021a). Of the 652 samples analyzed between January and June 2019 by these services, 71% contained amphetamine and one or more psychoactive substances, 24% contained amphetamine and one or more non-active substances and the remaining 5% did not contain amphetamine (EMCDDA, 2020). The *Drug Information Monitoring System* (DIMS) of the Netherlands has observed a continued increase in the purity of amphetamine between 2017 and 2021, and the presence of caffeine in one third of the samples analyzed in 2021 (DIMS, 2022).

Cocaine hydrochloride

It is estimated that about 3.5 million people in Europe have consumed it in the last 12 months, although in 2020 the number would reach 4.3 million (EMCDDA, 2022). In Spain, it is estimated that approximately 11% of the population between 18 and 64 used it at least once in their lifetime and 2.5% have used it in the last 12 months. Unlike MDMA and amphetamine, most users are concentrated between the ages of 25-44 years old (OEDA, 2021a). In Europe, cocaine is the second most confiscated substance after cannabis, accounting for 9-13 percent of total confiscations, reaching its highest level (213 tons) in 2020 (EMCDDA, 2022). In 2020, more than 36,000 kg of cocaine were confiscated in Spain, continuing the downward trend that started in 2019 (Ministry of the Interior, 2021).

Unlike MDMA and amphetamine, several studies on the composition of cocaine have been carried out in Europe. In general, they all show that the purity of cocaine is variable, although it seems to have increased in recent years, and that adulteration is frequent, especially with levamisole. In Italy, Bertol et al. (2018) analyzed cocaine samples confiscated between 2006 and 2016 in the province of Florence finding an average purity of 87%, exceeding both national and European average values. Also in Italy, Verri et al. (2019) found very similar results in two other regions. Morelato et al. (2019) in Switzerland analyzed police samples collected between 2006 and 2015. Of the 7,841 cocaine samples, 97% contained some adulterant and/or diluent substance. The average number of adulterants found was 3, with a maximum of 9 and

with highly variable combinations. The main adulterants found were: phenacetin, levamisole, lidocaine, caffeine, diltiazem and hydroxyzine among others. In Denmark, Hesse et al. (2021) also found a significant increase in purity in the 1,460 cocaine samples analyzed between 2006 and 2019 produced especially in the last years of the study period in accordance with European trends. As adulterants, they identified levamisole, diltiazem, caffeine, procaine, lidocaine, phenacetin and, paracetamol. In Luxembourg, Bourmaud et al. (2021) analyzed between 2019 and 2020 the purity and content of 1,078 samples from customs, police raids and consumption rooms, with average purities of 72%, 50% and 42% respectively. The most frequently identified adulterants were levamisole, phenacetin and caffeine. Żubrycka et al. (2022) analyzed 228 cocaine samples in Poland and found levamisole, phenacetin and caffeine as the main adulterants. Other interesting studies where most of the same adulterant substances are also found in Europe, but with fewer samples are those of Pichini et al. (2017), Kudlacek et al. (2017), Martello et al. (2017), LeFrançois et al. (2019), Eliaerts et al. (2019), Cuesta (2021) and Deconinck et al. (2021).

In Spain, Villar Núñez et al. (2018) analyzed 8,644 confiscated cocaine samples in La Coruña and Vigo between 2007 and 2014. which they classified according to the amount confiscated. The first three categories, consisting of samples between 30 mg and 100 g, accounted for 75% of the total and had a purity ranging from 24% to 69%. For samples of 100 g or more, purity ranged from 38% to 81%. The highest purities occurred in the final periods of the study, in line with European trends at the time. Eighty-two percent of the samples contained adulterants: levamisole (47%), phenacetin (36% of samples), lidocaine (23%), boric acid (19%), caffeine (13%), piracetam (9%) and diltiazem (5%). Levamisole increased its presence while boric acid decreased, becoming present in almost 90% of the 2014 samples. Phenacetin, levamisole and boric acid were the three substances found in all sample categories. The authors concluded that these substances are added at the beginning of the production while further down the distribution chain more substances are incorporated.

Although cocaine purity in the retail has increased in Europe since 2010, and in 2019 it reached its highest level in the last decade (EMCDDA-Europol, 2022), in Spain cocaine purity shows a downward trend since 2000, being particularly noticeable from 2008 and in doses and grams versus kilograms where this decrease was not so marked (OEDA, 2022). In addition, the results of analytical services showed that, in 2020, the main adulterant in cocaine was levamisole, followed by phenacetin, caffeine and lidocaine, with almost 40% of the samples analyzed containing no adulterant at all (EMCDDA-Europol, 2022).

THE STUDY

THE STUDY

Objectives

The aim of this study is to analyze the evolution of purity and adulteration in the MDMA, amphetamine and cocaine markets in Spain in recent years.

Since adulteration is a common practice in drug markets, a detailed analysis of it is offered, not only in terms of the temporal evolution of the two main forms of adulteration (addition and substitution), but also of the substances used for it, as well as the resulting combinations.

More specifically, the study has pursued two general goals: to describe the evolution of purity and adulteration practices in the MDMA, amphetamine and cocaine markets and to describe the level of discrepancy between the results obtained in the analysis of samples and the expectations users have about their composition (see Table 1).

Secondarily, in the case of the amphetamine market, we have sought to obtain information on the belief among the consumer population that amphetamine in wet paste format is more pure. This practice of selling a moistened and therefore heavier product has come together with the belief that this format has higher purity levels, possibly in an attempt to mislead consumers.

Table 1. Study objective

GENERAL OBJECTIVE	SPECIFIC OBJECTIVES
1. Describe the drug markets in Spain in relation to purity and adulteration indicators in samples submitted as MDMA, amphetamine and cocaine in a drug checking service.	1.1. To analyze the evolution of the average purity index during the study period for each market. 1.2. To analyze the evolution of the average adulteration index during the study period for each market. 1.3. To compare the average adulteration index between the different markets analyzed.
2. Examine the level of discrepancy between the results obtained from the analysis of MDMA, amphetamine and cocaine samples, voluntarily submitted to a drug checking service, and the users expectations about their composition.	2.1. Analyze the evolution of the average discrepancy rate during the study period for each market. 2.2. Compare the discrepancy rate between the different markets analyzed.

Samples

The study included all the samples received in the four drug checking services of the Energy Control programme and which had been acquired or obtained as MDMA, speed or cocaine. All the samples were given voluntarily by the users within the context of the services own activity, either in person, in situ in the nightlife areas where the mobile services were installed or by post. Samples from harm reduction services (Redan) were also included in the study.

For MDMA and speed samples, the period considered was from 2017 to 2021, while for cocaine samples, the study period was from 2014 to 2021. The reason for choosing these time ranges is that, in the case of MDMA and amphetamine, data from the last 5 years were sufficient to assess the recent evolution of these markets. In the case of cocaine, given the scarcity of studies in our country and internationally, it was considered appropriate to extend the period to provide a bigger perspective of its evolution.

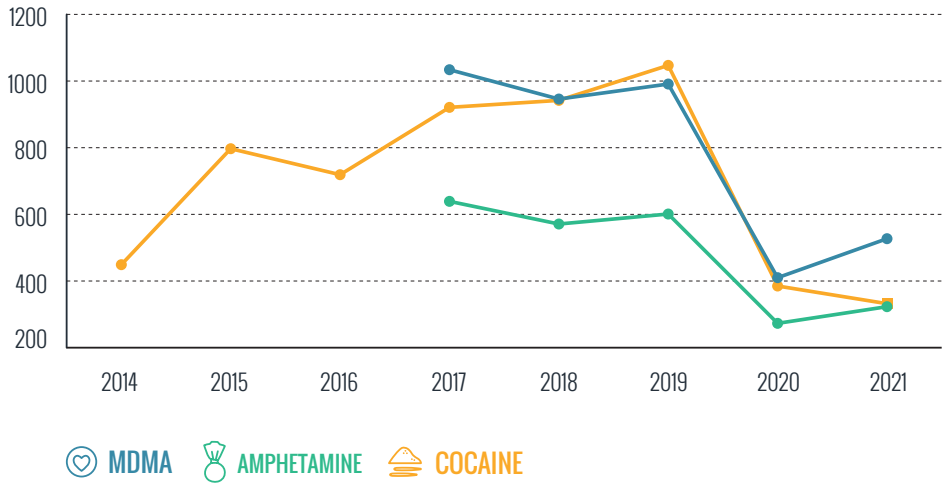
Table 2. Analyzed samples according to the different types of service

	MDMA	*Speed*	Cocaine	Total
Mail	354 (9,1%)	367 (15,2%)	913 (16,3%)	1.634 (13,7%)
In situ	507 (13,0%)	179 (7,4%)	193 (3,5%)	879 (7,4%)
Presential	3.028 (77,5%)	1.831 (76,1%)	4.256 (76,1%)	9.115 (76,6%)
Redan	19 (0,5%)	30 (1,2%)	230 (4,1%)	279 (2,3%)
Total	**3.908**	**2.407**	**5592**	**11.907**

Impact of the Pandemic on Testing Services

As with many other care services, testing services were impacted by the pandemic and the measures taken in different areas. As can be seen in Figure 1, the number of samples received by testing services declined significantly. Possibly, the decrease in the consumption of the substances that are most commonly tested in these services (OEDA, 2021b) and the restrictions on mobility in the first months of the pandemic were important factors that determined that, in 2020 and 2021, fewer people made use of the services. However, once opportunities for consumption progressively increased in 2021 (Vidal and Navarro, 2021), services also began to recover modestly.

Figure 1. Evolution in the number of samples analyzed according to the type of substance



Analytical techniques

The data on purity and adulteration presented in this report correspond to those of the samples that have been analyzed at IMIM (Hospital del Mar Institute of Medical Research), located in the Biomedical Research Park of Barcelona (PRBB), thanks to the collaboration with the project since 2000. However, samples that have been analyzed in recreational areas using less precise analytical techniques have been excluded from the study. The techniques used are those described below:

Gas chromatography-mass spectrometry (GC-MS): This system is used to separate and identify most of the compounds. We perform a first screening analysis with this technique to detect compounds. We also use GC-MS to quantify cocaine and amphetamine.

Liquid chromatography-mass spectrometry (LC-MS): With this system we can quantify substances that can degrade at high temperatures such as LSD or Modafinil. We can also quantify drugs that require high precision techniques such as fentanyl.

Ultraviolet-visible spectroscopy (UV/Vis): This technique is used in order to quantificate MDMA.

Variables

The following variables have been included in the study:

» **Year**: Year in which the sample was received at the analytical service.

» **Place of origin**: Province in Spain where the sample came from.

» **Format**: Presentation format of the sample:

  » MDMA: pill, crystal and others.

  » Speed: powder, paste and others.

  » Cocaine: powder and others.

- **Expectation**: Refers to the type of substance that the person using the service reported to be delivering. However, only samples that the person reported as MDMA, speed or cocaine have been included.
- **Composition**: The different substances identified in a sample.
- **Result**: Based on the composition identified in the sample, the sample was assigned to one of the following categories:
  - Unadulterated: when only the substance (MDMA, amphetamine or cocaine) was present in the sample.
  - Adulterated by addition: when, in addition to the substance, one or more intentionally added substances were identified.
  - Adulterated by substitution: when, instead of the substance, one or more substances were identified.
  - No active substance: when no pharmacologically active substance was found in the sample.
- **Purity**: amount of substance (MDMA, amphetamine or cocaine), expressed in milligrams (in the case of pills) or percentage (in the case of powder or paste samples). Quantification analysis was not always made on all samples received, as there was sometimes insufficient quantity to be able to perform the analyzes.
- **Adulteration rate**: Annual average of adulterants found in the sample. Adulterant is understood as any substance other than the expected substance (MDMA, amphetamine or cocaine) and that has been intentionally used as an additive or substitute for it. Thus, other substances that could be present as metabolites, precursors, by-products of synthesis or impurities were not considered as adulterants and therefore were not included in the calculation of the adulteration rate.
- **Discrepancy rate**: Annual percentage of samples adulterated in any possible way Indicates the degree to which the composition of the substance conforms or does not conform to the user's expectation.
- **Adulterants**: Substances used as adulterants in the sample.

The following variables were calculated from the already mentioned variables:

- **Total number of samples analyzed,** splitted up by each year.
- **Average purity index**, splitted up by year and presentation format.
- **Average adulteration rate**, splitted up by year and presentation format.
- **Discrepancy rate** (percentage of adulterated samples[1]), splitted up by year and presentation format.

1 Samples included in the categories "Adulterated by addition", "Adulterated by substitution" or "No active substance".

MDMA MARKET

MDMA MARKET

Between 2017 and 2021, 3908 samples purchased as MDMA were received by analytical services.

Throughout this period, crystal and pills were the two most common forms of presentation, with no major year-on-year variations. The most frequent way of obtaining MDMA was meeting with the supplier, although the number of samples purchased through the Deep Web experienced notable growth, rising from 6.4% of samples in 2017 to 17.5% in 2021. When bought from a supplier, in most cases this was a close or trusted person. However, purchasing from an unknown supplier increased significantly over the period studied, from 13.8% in 2017 to 20.3% in 2021.

Table 3. Characteristics of the MDMA samples received

	2017	2018	2019	2020	2021	Total
Analyzed samples	**1.034**	**946**	**991**	**410**	**527**	**3.908**
Presentation (%)						
Crystal	49,0	45,8	42,0	42,2	43,1	45,0
Tablets	50,6	54,2	57,8	56,1	56,7	54,7
Others	0,4	-	0,2	0,7	0,2	0,3
Context of acquisition (%)						
Deep Web	6,4	9,6	10,4	16,1	17,5	10,7
On internet	1,6	2,5	1,6	2,4	0,8	1,8
On the street	-	1,3	7,5	6,1	3,2	3,3
On the party	2,7	5,8	9,4	8,0	2,3	5,7
Meeting the supplier	63,8	66,4	60,5	56,1	65,3	63,0
Other	22,3	12,3	6,4	5,6	8,2	12,2
DK / NA	3,1	2,1	4,2	5,6	2,8	3,4
Supplier (%)						
Trusted dealer	50,0	57,6	53,7	45,6	45,5	51,7
Unknown dealer	13,8	13,2	19,8	21,2	20,3	16,8
Found	1,9	1,6	2,4	2,0	1,3	1,9
Close person	15,4	12,1	13,0	15,9	17,5	14,3
Other	15,8	12,9	7,6	11,0	12,7	12,1
DK / NA	3,1	2,6	3,5	4,4	2,7	3,2

Purity

The amount of MDMA in crystal and tablet samples is analyzed separately. For crystal samples, the purity of MDMA is expressed as a percentage, while for tablets the dose is expressed in milligrams.

The average purity found in crystal samples remained relatively stable between 2017 and 2021, standing at 80.5 % for the whole period. The lowest percentage of MDMA was found in a sample of the year 2017 (5%). Whereas, every year, the maximum percentages found were close to 100%.

For tablets, an increase in the average dose of MDMA was observed between 2017 and 2020, from 170.16 mg to 188.12 mg. However, in 2021, the average dose found in tablets decreased to 169.48mg. The samples with the lowest doses were identified in 2019 and 2020 (6mg and 9mg respectively), while the tablets with the highest doses of MDMA were analyzed in 2018 (361 milligrams). From that year onwards, the highest doses identified each year in MDMA tablets always exceeded 300 milligrams.

Table 4. MDMA purity

	2017	2018	2019	2020	2021	Total
Crystal						
Analyzed samples	**404**	**389**	**397**	**169**	**215**	**1.574**
Average %	78,5	81,2	81,8	79,7	81,2	80,5
Standard deviation	16,3	12,4	10,0	11,5	12,0	12,9
minimum %	5,0	7,0	38,0	29,0	7,0	5,0
maximum %	98,0	99,0	99,0	98,0	96,0	99,0
Tablets						
Analyzed samples	**406**	**424**	**524**	**218**	**278**	**1.850**
Average Mg	170,2	180,3	188,6	188,1	169,5	179,7
Standard deviation	52,8	54,2	51,9	49,9	57,5	53,8
minimum %	33	17	6	9	12	6
maximum %	287	361	327	333	319	361
Up to 74 mg (%)	3,7	5,0	1,0	1,4	6,5	3,4
Between 75 y 124 mg (%)	18,5	11,1	11,5	9,6	13,3	13,0
Between 125 y 149 mg (%)	14,3	9,2	12,4	11,5	13,3	12,1
150 mg o más (Alert) (%)	63,5	74,8	75,2	77,5	66,9	71,6

According to the criteria adopted by the *Trans European Drug Information* (TEDI), tablets containing more than 150 milligrams of MDMA would be subject to a consumer alert (TEDI, 2011). Most of the tablets tested since 2017 meet this criteria, with the percentage increasing from 2018 onwards and reaching its highest level in 2020 (77.5% of tablets contained more than 150mg). However, in 2021, this percentage fell to 66.9%, which, although high, was the second lowest of the entire period. Parallel to this decrease in 2021 there was an increase in the percentage of tablets with less than 75 mg and those between 75 and 124 mg.

Adulteration

The adulteration of MDMA in both crystal and tablets tested was low, although the percentage of adulterated tablets was always higher than the percentage of adulterated crystal samples (Table 5). For both formats, the highest adulteration was observed in 2017 (8.09 % of the crystal samples and 12.62 % of tablets were adulterated) but it decreased over the following years until it increased again in 2021.

Table 5. Percentage of MDMA samples adulterated according to the format

	2017	2018	2019	2020	2021	Total
Crystal	**8,1**	**4,8**	**4,5**	**4,0**	**7,0**	**5,9**
By addition	2,4	1,8	1,2	0,6	1,8	1,7
By substitution	4,3	2,3	1,9	3,4	4,8	3,2
With non-active products	1,4	07	1,4	-	0,4	1,0
Comprimidos	**12,6**	**7,4**	**5,1**	**4,4**	**9,4**	**8,00**
By addition	2,3	3,1	1,7	1,7	5,7	2,8
By substitution	6,9	1,8	2,8	1,7	3,7	3,6
With non-active products	3,4	2,5	0,5	0,9	-	1,7

CRegarding the type of adulteration (by addition of substances, substitution with other substances or with substances without pharmacological activity), the most frequent type of adulteration was by substitution, especially in tablets when considering the entire period studied. However, when observing the evolution of the types of adulteration over the years, it can be seen that adulteration by addition in tablets (5.7%), or adulteration by substitution in crystal (4.8%) reached its highest level in 2021.

Adulteration by addition

In the case of crystal, only 1.7% (n = 30 samples) of the samples were adulterated by addition. One or more intentionally added psychoactive compounds were identified with MDMA. Despite the small number of adulterated crystal samples, a total of 14 different adulterants were identified in these samples, with caffeine being the most frequent. In addition, 13 different compositions were identified, with MDMA combined with caffeine being the most frequent (12 samples). The number of distinct adulterants decreased over the period studied from 7 identified in 2017 to 2 in 2021 (See Appendix 1). As for the number of distinct compositions identified each year, this was decreasing from 6 in 2017 to 2 in 2021. The year in which the fewest adulterants and distinct compositions were identified was 2020, although it should be noted that this year also had a significant decrease in the number of samples analyzed due to the pandemic.

On the other hand, adulteration by addition was also infrequent in the case of tablets, being identified in only 2.8% (n = 59 samples) of all tablets, with no significant year-to-year variations over the entire period studied (see Appendix 3). In total, 18 different adulterants were identified in the tablets adulterated by addition which, combined, resulted in 18 different compositions. Again, the most frequently identified adulterant was caffeine (38 samples), followed by amphetamine sulphate (11 samples). The most frequent combination when MDMA in tablet form was adulterated by addition was

also with caffeine (29 samples). As with crystal, the small number of tablets adulterated by addition precludes drawing firm conclusions regarding the evolution of these indicators over the years, although it was noted that both the number of distinct adulterants identified and the number of distinct compositions identified were decreasing from 2019 onwards.

Adulteration by substitution

Although also infrequent, adulteration by substitution in MDMA crystal was somewhat higher than adulteration by addition, being identified in 3.2% (n = 57 samples) of the total crystal samples. The percentage of crystal samples adulterated by substitution was decreasing until 2019, but increased between 2020 and 2021. In total, 28 different adulterants were identified between 2017 and 2021, with methamphetamine being the most frequently found (9 samples). In addition, an equal number of different compositions were identified throughout the entire period, with methamphetamine substitution being the most frequently found (9 occurrences). Overall, the compositions identified were very diverse (see Appendix 2).

In tablets that had been bought as MDMA, adulteration by substitution was also infrequent in the period studied, being found in 3.6% of the tablets (n = 76 samples). However, the most frequently identified adulterants were different from those found in the case of crystal adulteration by substitution. Thus, the most frequently identified was caffeine (15 samples), followed by MDA (13 samples) and m-CPP (10 samples). The latter were only identified in the early years. A total of 29 different compositions were identified over the whole period (see Appendix 4).

NPS as MDMA adulterants

Although adulteration of MDMA, both in crystal and tablet form, was a relatively infrequent phenomenon in the samples analyzed during the period under study, the use of new psychoactive substances as adulterants is noteworthy, especially in cases of adulteration by substitution, particularly in tablets (Table 6). In general, most of the NPS identified (see Appendixes 1-4) were synthetic cathinones with MDMA-like effects, such as bk-EBDP or ethylone, or piperazines such as m-CPP, which was only identified in tablets between 2017 and 2019, alone or in combination with metoclopramide or caffeine. Only 3-MMC and 4-CMC appeared in both tablets and crystal samples.

Table 6. Number of MDMA samples in which the presence of NPS are identified as adulterants according to the format

	2017	2018	2019	2020	2021	Total
Crystal	**9**	**5**	**6**	**1**	**2**	**23**
By addition	1	1	1	-	-	3
By substitution	8	4	5	1	2	20
Tablets	**17**	**12**	**16**	**2**	**2**	**49**
By addition	1	6	1	1	1	10
By substitution	16	6	15	1	1	39
With non-active products	3,4	2,5	0,5	0,9	-	1,7

Figure 2. NPS as adulterants by addition in MDMA according to the format

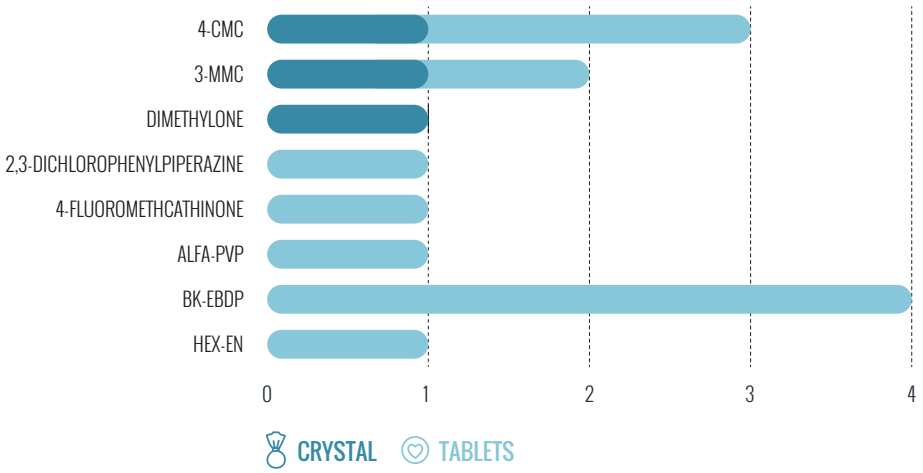
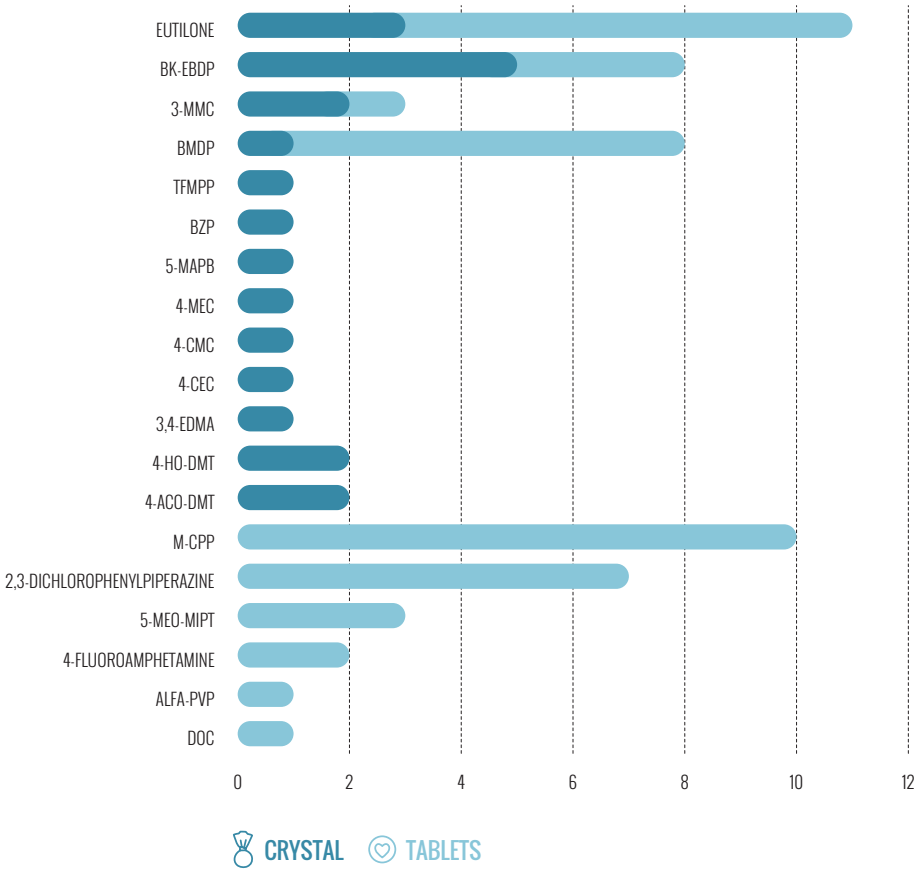


Figure 3. NPS as adulterants by substitution in MDMA according to the format



Adulteration and discrepancy rates

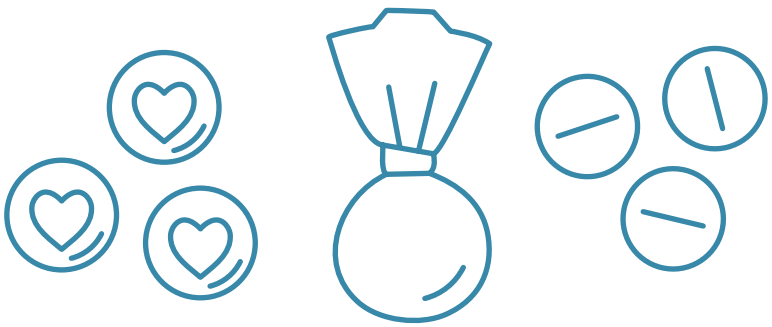
As mentioned above, the adulteration rate considered in this report is the annual average number of adulterants present in the adulterated samples analyzed. Due to the low number of samples adulterated by addition and substitution, respectively, in both MDMA crystal and tablets, this rate was only calculated for both formats, without disaggregating by adulteration method.

Throughout the entire period, the annual rate of adulteration remained stable, so that most adulterated samples tended to have one or at most two adulterants. Occasionally, samples were found with more adulterants.

On the other hand, the annual discrepancy rate (total percentage of samples adulterated by any means) showed a downward trend over the period studied, especially for tablets, but rose again in 2021. It is possible that the MDMA market has started from that year onwards and this period marked by low adulteration and presence of tablets with high concentrations of MDMA is coming to an end.

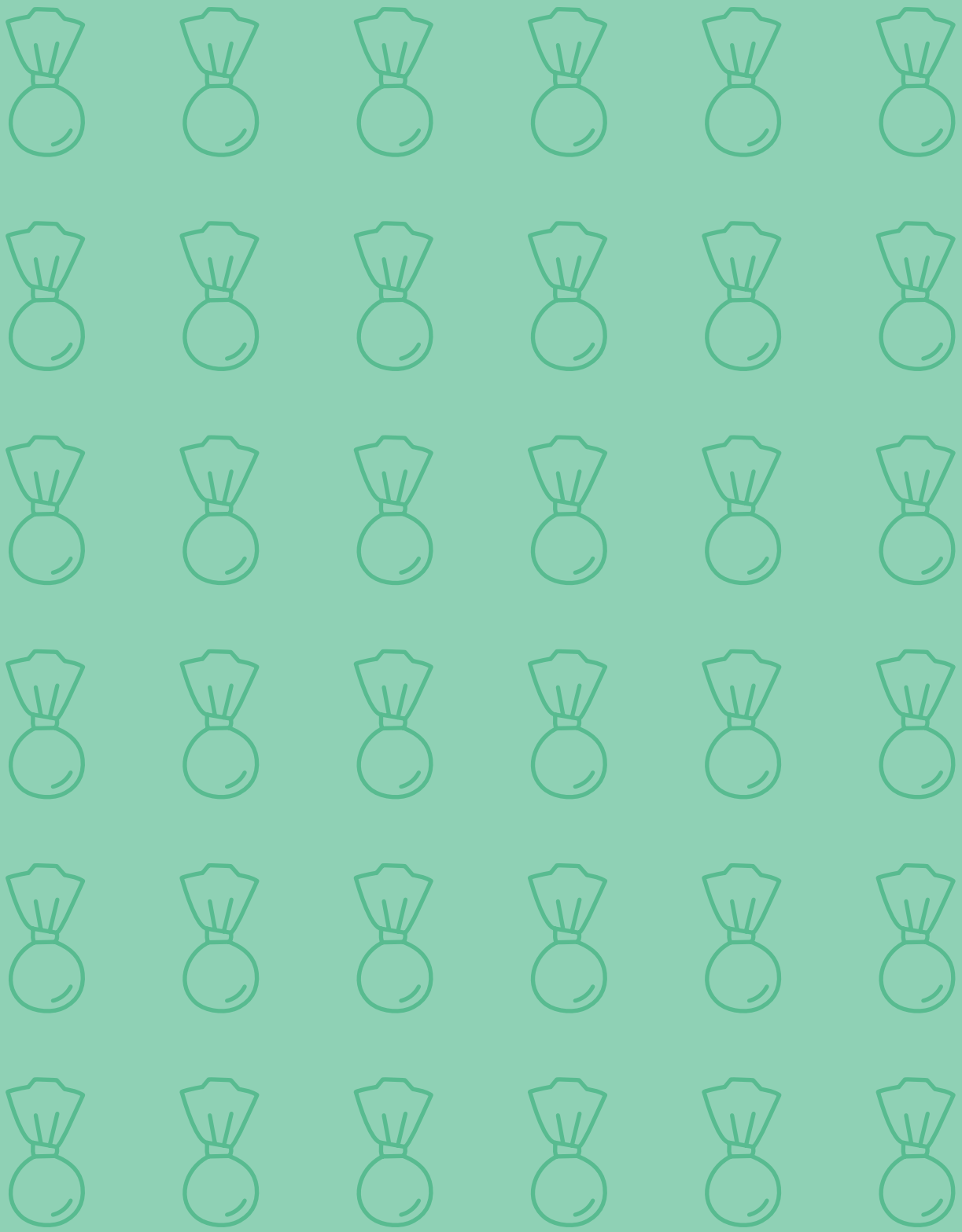
Table 7. MDMA adulteration and discrepancy rates according to the format

	2017	2018	2019	2020	2021	Total
Adulteration rate						
Crystal	1,2	1,2	1,2	1,4	1,1	1,2
Tablets	1,1	1,3	1,5	1,0	1,4	1,3
Discrepancy rate						
Crystal	8,1	4,8	4,5	4,0	7,0	5,9
Tablets	12,6	7,4	5,0	4,3	9,4	8,1



Abstract

	2017	2018	2019	2020	2021	Total
Crystal						
Analyzed samples (n)	507	433	416	177	227	1.760
Average purity (%)	78,5	81,2	81,8	79,7	81,2	80,5
Only substance (%)	91,9	95,2	95,4	96,0	93,0	94,1
Adulteration by addition (%)	2,4	1,8	1,2	0,6	1,8	1,7
Identified adulterants (n)	7	4	5	1	2	14
Identified compositions (n)	6	4	5	1	2	13
Adulteration by substitution (%)	4,3	2,3	1,9	3,4	4,8	3,2
Identified adulterants (n)	16	9	9	6	7	28
Identified compositions (n)	14	6	8	4	8	28
No substance (%)	1,4	0,7	1,4	-	0,4	1,0
Adulteration rate	1,24	1,17	1,15	1,43	1,07	1,20
Discrepancy rate	8,1	4,8	4,5	4,0	7,0	5,9
Tablets						
Analyzed samples (n)	523	513	573	230	299	2.138
Average purity (mg)	170,2	180,3	188,6	188,1	169,5	179,7
Only substance (%)	87,4	92,6	94,9	95,7	90,6	92,0
Adulteration by addition (%)	2,3	3,1	1,7	1,7	5,7	2,8
Identified adulterants (n)	6	8	4	3	6	18
Identified compositions (n)	5	7	4	3	7	18
Adulteration by substitution (%)	6,9	1,8	2,8	1,7	3,7	3,6
Identified adulterants (n)	11	9	12	3	7	23
Identified compositions (n)	12	7	11	3	7	29
No substance (%)	3,4	2,5	0,5	0,9	-	1,7
Adulteration rate	1,13	1,32	1,46	1,00	1,36	1,27
Discrepancy rate	12,6	7,4	5,1	4,4	9,4	8,00



AMPHETAMINE MARKET

AMPHETAMINE MARKET

Between 2017 and 2021, a total of 2,407 samples received at the drug checking services had been acquired as *speed*.

The percentage of powder samples progressively increased from 2017 to reach 83.9 percent of all samples in 2021. This increase was at the expense of the paste presentation which decreased to just over 14%.

Two-thirds of the samples had been obtained meeting the supplier, although, as was observed for MDMA, over the years the percentage of samples that had been obtained through the Deep Web increased, rising from 8% in 2017 to 14% in 2020. A trusted supplier (56.6%) or a close person (14.7%) were the main types of supplier, although there was an increase in the percentage of samples that had been acquired from unknown suppliers, rising to 15% of all samples from 2020 onwards.

Table 8. Characteristics of the *speed* samples received

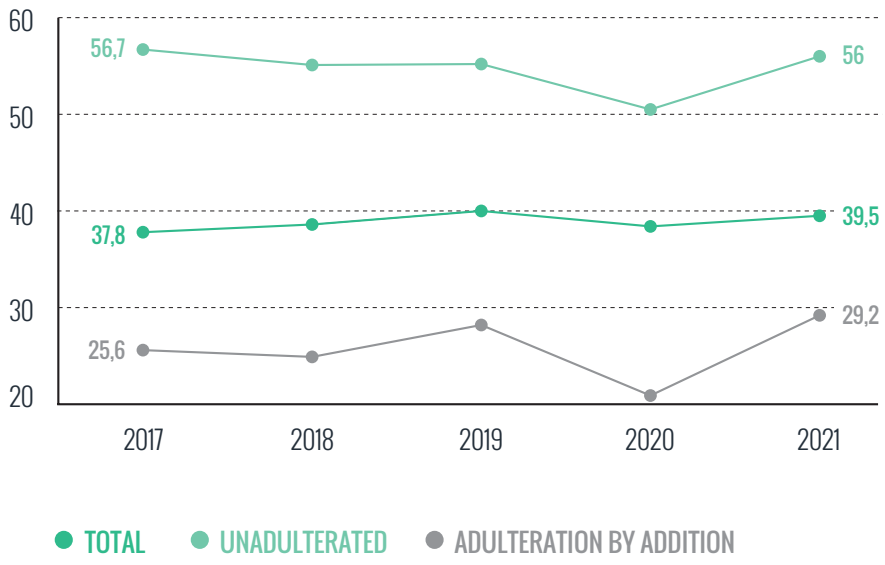
	2017	2018	2019	2020	2021	Total
Analyzed samples	**639**	**571**	**601**	**273**	**323**	**2.407**
Presentation (%)						
Powder	65,3	71,6	78,5	82,8	83,9	74,6
Paste	33,5	27,1	19,1	16,8	14,6	24,0
Others	1,3	1,2	2,3	0,4	1,5	1,4
Acquisition context (%)						
Deep Web	8,0	9,1	9,7	14,3	14,2	10,2
On internet	1,9	1,6	0,5	1,5	-	1,2
On the street	-	1,2	5,0	5,9	2,8	2,6
On the party	3,0	1,2	7,0	4,8	2,5	3,7
Meeting the supplier	63,7	71,3	66,6	60,8	68,4	66,5
Other	20,2	13,7	4,3	5,1	4,0	10,8
DK / NA	3,3	1,9	7,0	7,7	8,0	5,0
Supplier (%)						
Trusted Dealer	54,5	60,2	58,7	53,5	52,9	56,6
Unknown Dealer	9,2	11,0	11,3	15,4	15,2	11,7
Found	1,3	0,4	0,3	0,4	0,6	0,6
Close person	15,8	13,7	16,0	15,0	11,5	14,7
Other	16,0	12,4	6,7	7,7	10,5	11,1
NS / NC	3,3	2,3	7,0	8,1	9,3	5,3

Purity

The amount of amphetamine present in the analyzed samples remained stable over the whole period under study, averaging 39% and with no major year-on-year variations. However, it is important to highlight the variability in the purity of the samples analyzed.

When comparing the purity percentages according to whether the sample was adulterated or not, it was found that unadulterated samples tended to contain about twice the amount of amphetamine than adulterated samples.

Figure 4. Amphetamine purity in unadulterated, adulterated and total samples



In terms of purity trends, there was a significant decrease in the percentage of samples containing less than 25% amphetamine, resulting in an increase in the percentage of samples containing between 26% and 75% amphetamine.

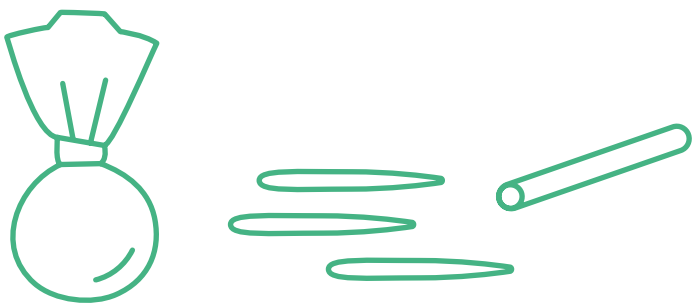
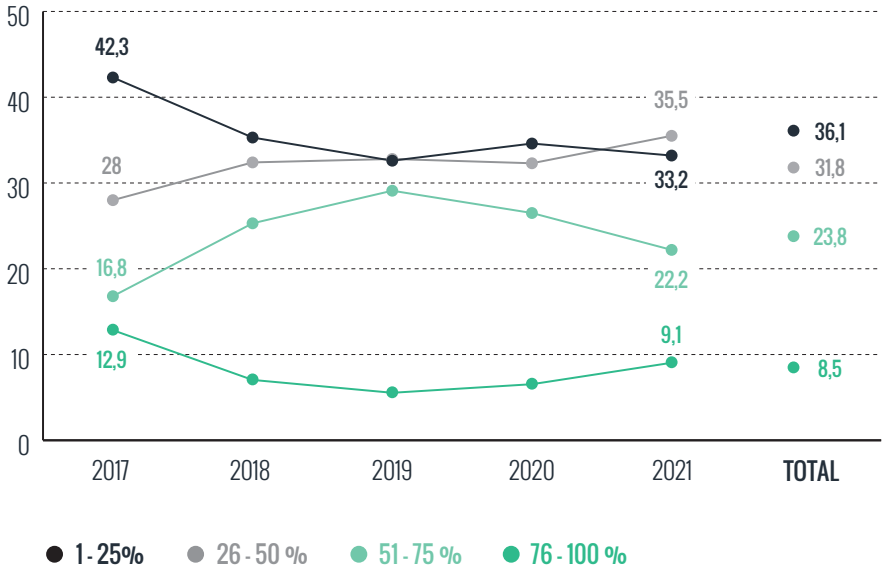


Figure 5. Evolution of speed purity according to ranges



There was no difference in purity between the powder and paste formats of *speed* samples, which invalidates the common assumption that paste *speed* is higher quality in terms of purity.

Table 9. *Speed* purity according to paste or powder presentation

	2017	2018	2019	2020	2021	Total
***Speed* in powder**						
Analyzed samples	**382**	**375**	**453**	**213**	**259**	**1.682**
Average %	37,9	39,2	39,8	38,5	39,5	39,0
Standard deviation	26,6	23,4	23,0	22,5	23,7	24,0
***Speed* in paste**						
Analyzed samples	**197**	**143**	**108**	**44**	**46**	**538**
Average %	37,7	37,2	41,7	38,0	40,1	38,6
Standard deviation	24,1	21,2	20,4	22,3	20,5	22,2

Adulteration

Between 2017 and 2020, the percentage of *speed* samples received that **contained only amphetamine** increased from 39.4% in 2017 to 59.0% in 2020, although in 2021 it fell sharply to 37.2%, the lowest percentage of the entire period (Table 2). As a result, 2020 was the year in which the lowest percentage of adulterated samples was found.

Table 10. Percentage of adulterated speed samples

	2017	2018	2019	2020	2021	Total
Sin adulterar	39,4	46,9	42,8	59,0	37,2	44,0
Adulteradas	60,6	53,1	57,2	41,0	62,8	58,3
Por adición	57,0	51,1	54,4	39,6	59,8	53,3
Por sustitución	3,4	1,8	2,8	1,1	2,2	2,5
Con productos no activos	0,2	0,2	-	0,4	0,9	2,5

Adulteration of speed is mainly by addition, with caffeine being the most commonly used substance. Adulteration by substitution was identified in a very low percentage of the samples, with 2017 being the year when it was mostly found.

Adulteration by addition

Most of the adulteration of amphetamine is done by the addition of a substance, especially caffeine, which is by far the most commonly used adulterant (1,266 occurrences; 98.6% of all samples adulterated by addition). In total, 18 different adulterants and 26 different combinations with amphetamine were identified (see Appendix 6). Among the most commonly used adulterants, in addition to caffeine (and to a much lesser extent than caffeine) were paracetamol (17 samples) and phenacetin (10 samples). In terms of combinations, the most frequent was amphetamine and caffeine (1,225 samples), followed far behind by amphetamine, caffeine and paracetamol (13 samples). 2017 was the year in which the most variety of adulterants were identified (9 adulterants) and 2020 the least (2 adulterants). Meanwhile, 2017 was also the year in which the most distinct combinations were identified (12). This number decreased until 2020 but increased again in 2021.

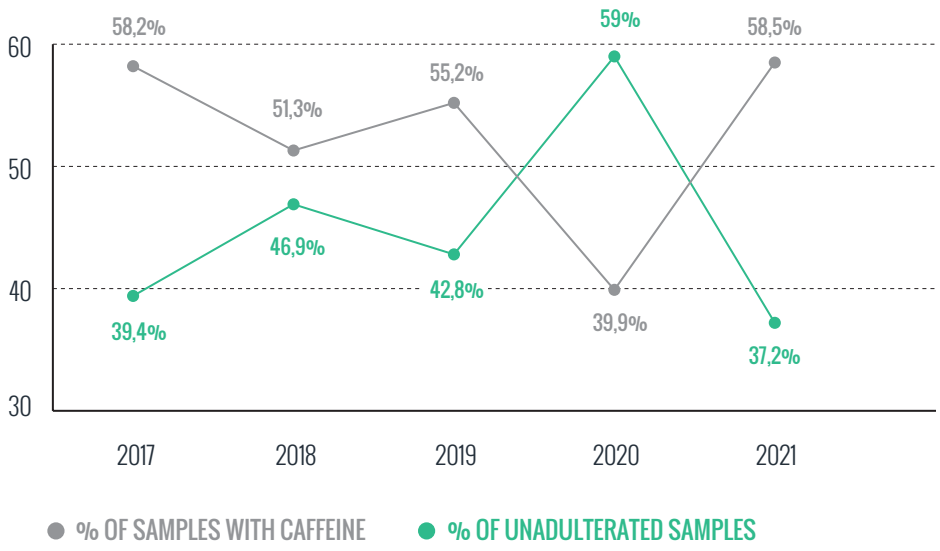
Adulteration by substitution

As mentioned above, amphetamine adulteration by substitution was identified in only a small percentage of the samples (2.5%), with no significant year-on-year variation (see Appendix 7). Although only 59 amphetamine samples were adulterated by substitution, 18 different adulterants were found in these samples, with 2017 being the year in which the most different adulterants were identified (14 adulterants). Again, caffeine was the most identified adulterant (29 occurrences), followed by cocaine hydrochloride (9 occurrences), ketamine (7 occurrences) and methamphetamine (5 occurrences). In addition, 21 different compositions were identified, although the most frequent was the substitution of amphetamine with caffeine.

Caffeine

Given the relevance of caffeine as an adulterant of amphetamine, both by addition and substitution, an analysis of the evolution of the presence of this adulterant was carried out.

Figure 6. Evolution of the presence of caffeine compared to unadulterated samples



As can be seen, there was a significant decrease in the percentage of samples adulterated with caffeine between 2017 and 2020, being 2020 the year in which the lowest percentage was reached and with the highest percentage of unadulterated samples. However, in 2021, the percentage of samples with caffeine returned to 2017 levels. Thus, the decrease in the presence of caffeine in adulterated samples did not result in a substitution of caffeine by other adulterants, but rather in an increase in the number of unadulterated samples.

NPS as amphetamine adulterants

Between 2017 and 2021 only 6 amphetamine samples adulterated with new psychoactive substances were identified (see Appendix 6 and Appendix 7): two by addition and four by substitution. The NPS identified were 4-fluoroamphetamine (1 sample), dibutylone (1 sample), methoxetamine (1 sample), mephedrone (2 samples) and deschloroketamine (2 samples).

Adulteration and discrepancy rates

Due to the hegemony of caffeine as the main and only adulterant of amphetamine, the **adulteration rate** (annual average of adulterants present in the adulterated samples analyzed) was 1, with no relevant year-on-year variations.

On the other hand, the **annual discrepancy rate** (total percentage of samples adulterated by any form) decreased from 60.6% in 2017 to 41.0% in 2020. However, in 2021, this rate increased significantly to the rate of the whole series.

Table 11. Amphetamine adulteration and discrepancy rates

	2017	2018	2019	2020	2021	Total
Adulteration rate	1,1	1,0	1,0	1,0	1,1	1,1
Addition	1,1	1,0	1,0	1,0	1,0	1,0
Substitution	1,5	1,2	1,2	2,0	1,3	1,4
Discrepancy rate	60,6	53,1	57,2	41,0	62,8	58,3

Abstract

	2017	2018	2019	2020	2021	Total
Analyzed samples (n)	**639**	**571**	**601**	**273**	**323**	**2.407**
Average purity (%)	37,8	38,6	40,0	38,4	39,5	38,9
Only substance (%)	39,4	46,9	42,8	59,0	37,2	44,0
Adulteration by addition (%)	57,0	51,1	54,4	39,6	59,8	53,3
Identified adulterants (n)	10	8	6	2	8	18
Identified compositions (n)	12	9	7	2	10	26
Adulteration by substitution (%)	3,4	1,8	2,8	1,1	2,2	2,5
Identified adulterants (n)	14	6	8	6	4	18
Identified compositions (n)	15	6	8	3	4	21
No substance (%)	0,2	0,2	-	0,4	0,9	2,5
Adulteration rate	1,1	1,0	1,0	1,0	1,1	1,1
Discrepancy rate	60,6	53,1	57,2	41,0	62,8	58,3

THE COCAINE MARKET

THE COCAINE MARKET

Due to a change in the system of recording in the drug checking services which affected information relating to acquisitions contexts and suppliers, data can only be provided from 2016 onwards.

The majority of the cocaine samples came in powder form. The main context of acquisition is meeting the supplier. Unlike MDMA or amphetamine, the percentage of samples coming from the Deep-Web has remained at low levels throughout the period studied. In terms of the type of supplier, the main supplier is a trusted dealer, although the percentage of samples that had been obtained from an unknown supplier has been increasing over the years, peaking in 2020 (22.9% of cocaine samples).

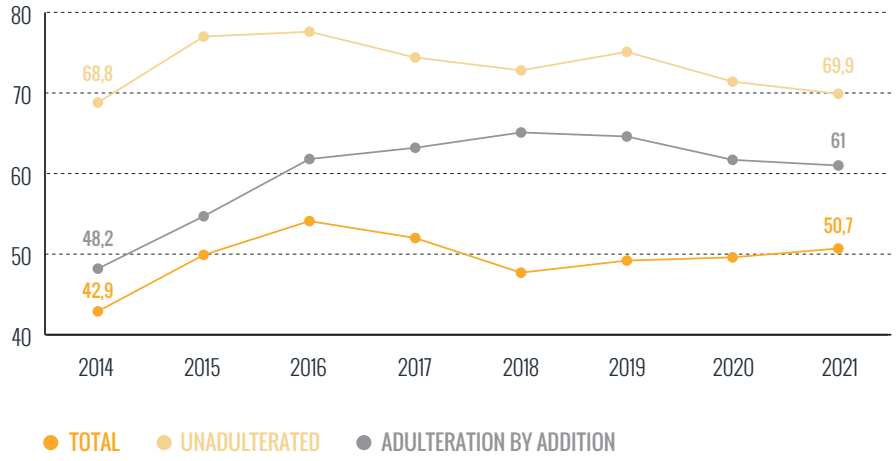
Table 12. Characteristics of the cocaine samples received

	2014	2015	2016	2017	2018	2019	2020	2021	Total
Analyzed samples	**449**	**797**	**719**	**921**	**942**	**1.047**	**385**	**332**	**5.592**
Presentation (%)									
Powder	100,0	100,0	100,0	99,7	99,6	99,1	99,0	99,4	99,6
Others	-	-	-	0,3	0,4	0,9	1,0	0,6	0,4
Acquisition context (%)									
Deep Web			2,5	2,7	2,5	4,0	2,3	3,6	3,0
On internet			3,8	0,8	0,4	0,5	0,8	-	1,1
On the street			-	0,1	2,5	8,1	7,8	6,6	3,7
On the party			2,2	1,4	3,1	9,0	10,9	5,1	4,9
Meeting the supplier			71,2	72,6	78,5	69,5	61,8	74,1	72,1
Other			17,1	19,1	10,6	4,7	6,2	3,6	11,1
DK / NA			3,2	3,3	2,3	4,2	10,1	6,9	4,2
Supplier (%)									
Trusted dealer			60,9	60,7	63,0	61,7	55,8	60,5	61,0
Unknown dealer			10,3	12,1	15,9	19,5	22,9	19,3	15,9
Found			0,4	0,9	0,8	0,8	0,3	0,3	0,7
Close person			12,7	12,6	10,3	12,0	8,3	9,9	11,4
Other			12,5	10,5	7,3	3,4	2,9	3,6	7,2
DK / NA			3,2	3,3	2,7	2,6	9,9	6,3	3,8

Purity

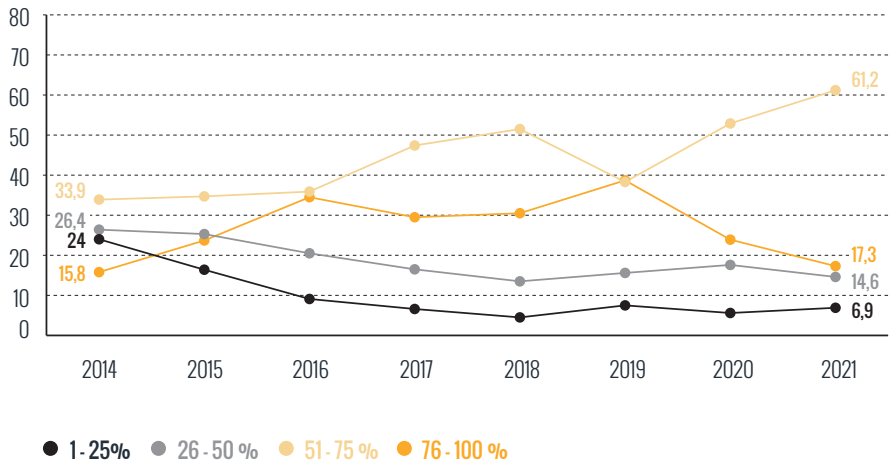
The purity of cocaine experienced an increase from 48.2% in 2014 to 65.1% in 2018. However, from 2019 onwards, the percentage of cocaine present in the samples decreased slightly until 2021. As expected, the purity in the unadulterated samples was higher than in the adulterated samples. In the unadulterated samples, purity remained above 70% throughout the period, while in the adulterated samples, purity increased significantly in 2016 to around 50% in the following years.

Figure 7. Purity evolution in cocaine. Unadulterated, adulterated and total samples



Considering the whole period, 42.9% of the cocaine samples had a purity between 51-75%, followed by 76-100% which accounted for 29.2% of the total samples. 18.4% had a purity between 26-50% and only 9.5% had a purity below 25%. 18.4% had a purity between 26-50% and only 9.5% had a purity below 25%. In terms of evolution, there was a significant increase in samples with cocaine content of between 51 and 75%, from 33.9% in 2014 to 61.2% in 2021. As of 2018, approximately 80% of samples contained more than 50% cocaine.

Figure 8. Percentage of cocaine samples according to different purity ranges



Adulteration

Throughout the entire period, the percentage of unadulterated cocaine samples increased from 19.4% in 2014 to a peak of 67.9% in 2018. After this year, unadulterated samples progressively declined to 53.0% in 2021. In total, they have accounted for 45.3% of all cocaine samples analyzed. This has meant that adulteration has been progressively decreasing, although, overall, it has always been significant except in 2018.

Adulteration of cocaine is mostly by addition of a number of substances which have remained virtually unchanged over the period studied. Adulteration by substitution or with pharmacologically inactive substances has been anecdotal.

Table 13. Percentage of adulterated cocaine samples

	2014	2015	2016	2017	2018	2019	2020	2021	Total
Unadulterated	19,4	20,3	31,4	49,1	67,9	57,6	49,1	53,0	45,3
Adulterated	80,6	79,7	68,6	50,9	32,1	42,4	50,9	47,0	54,7
By addition	75,7	78,4	65,4	47,8	29,7	39,5	46,8	44,0	51,8
By substitution	4,9	1,1	2,8	2,9	2,1	2,4	3,6	2,7	2,6
No active substance	-	0,1	0,4	0,2	0,2	0,5	0,5	0,3	0,3

Adulteration by addition

Adulteration of cocaine occurs mainly by addition. Over the period studied, a total of 34 different adulterants were identified. 2021 is when the least number of different adulterants were identified (12 adulterants) while 2016 was the year when the highest number of adulterants were identified (21 adulterants). The most frequently identified adulterants were levamisole (2,010 samples; 69.4% of all samples adulterated by addition), caffeine (1,256 samples; 43.4%), phenacetin (1,016 samples; 35.1%), lidocaine (443 samples; 15.3%) and tetracaine (402 samples; 13.9%). On the other hand, between 2014 and 2021, a total of 179 different compositions were identified, with cocaine combined with levamisole being the most frequent (1,074 samples representing 37.1% of all cocaine samples adulterated by addition) (See Appendix 9). The year in which more combinations were detected was 2015 (73 combinations).

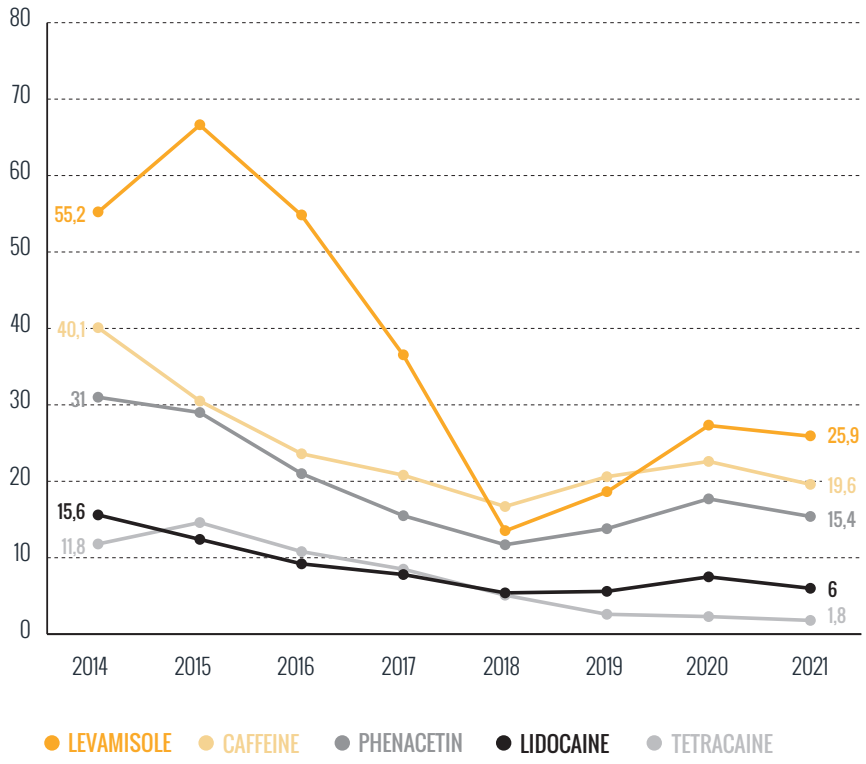
Adulteration by substitution

Although adulteration of cocaine samples by substitution was infrequent (only 146 samples out of 5,592 analyzed), the high number of different adulterants and compositions identified is relevant. Thus, a total of 37 different adulterants were found, with 2015 being the year in which the lowest number of adulterants were identified. Caffeine was identified in 37.0% of the samples adulterated by substitution. On the other hand, in terms of composition, 64 different compositions were identified, which shows the enormous variability of substances used in this minority method (see Appendix 10).

Evolution of the presence of the main adulterants

Overall, the presence of the five main cocaine adulterants decreased over the period studied. However, between 2014 and 2015, while the presence of the remaining adulterants was decreasing, the presence of levamisole rose to the highest levels of the whole period and started to decrease until 2018, when the lowest presence of all adulterants was identified. In 2020 and 2021, levamisole and phenacetin experienced a significant increase, although, in general, it is observed that from 2018 onwards no adulterant has been present in more than 30% of the samples.

Figure 9. Evolution of the presence of the five main adulterants in cocaine



NPS were anecdotally present as cocaine adulterants. Between 2014 and 2021 they only appeared as adulterants in 7 samples. The adulterants found were diphenidine (2 samples), N-ethyl-hexedrone (2 samples) and, with one appearance respectively: 3-MMC, 4-Cl-PVP, 4'-fluoroethylphenidate, alpha-PVP, ethylphenidate, isopropylphenidate, methoxetamine and N-ethyl-nor-pentedrone. In total, 10 NPS were identified (See Appendixes 9 and 10).

Adulteration and discrepancy rates

The cocaine adulteration rate (annual average of adulterants present in the adulterated samples analyzed) was decreasing over the years, with a maximum of 2.25 adulterants in 2014 and a minimum of 1.68 in 2019. Except in 2014 and 2021, the adulteration rate was always higher for samples adulterated by addition, especially in 2018 and 2020.

Table 14. Cocaine adulteration and discrepancy rates

	2014	2015	2016	2017	2018	2019	2020	2021	Total
Adulteration rate	2,15	2,09	1,97	1,96	1,89	1,68	1,84	1,73	1,94
Addition	2,15	2,09	1,98	1,97	1,91	1,68	1,86	1,73	1,95
Substitution	2,18	2,00	1,80	1,81	1,55	1,68	1,57	1,78	1,79
Discrepancy rate	80,6	79,7	68,6	50,9	32,1	42,4	50,9	47,0	54,7

Abstract

	2014	2015	2016	2017	2018	2019	2020	2021	Total
Analyzed samples (n)	**449**	**797**	**719**	**921**	**942**	**1.047**	**385**	**332**	**5.592**
Average purity (%)	48,2	54,7	61,8	63,2	65,1	64,6	61,7	61,0	60,9
Unadulterated (%)	19,4	20,3	31,4	49,1	67,9	57,6	49,1	53,0	45,3
Adulteration by addition (%)	75,7	78,4	65,4	47,8	29,7	39,5	46,8	44,0	51,8
Identified adulterants (n)	17	18	21	19	18	20	15	12	34
Identified compositions (n)	68	73	66	62	51	63	42	35	179
Adulteration by substitution (%)	4,9	1,1	2,8	2,9	2,1	2,4	3,6	2,7	2,6
Identified adulterants (n)	13	8	18	18	13	17	13	12	37
Identified compositions (n)	15	8	17	20	11	20	10	7	64
No substance (%)	-	0,1	0,4	0,2	0,2	0,5	0,5	0,3	0,3
Adulteration rate	2,15	2,09	1,97	1,96	1,89	1,68	1,84	1,73	1,94
Discrepancy rate	80,6	79,7	68,6	50,9	32,1	42,4	50,9	47,0	54,7

A COMPARISON BETWEEN THE THREE MARKETS

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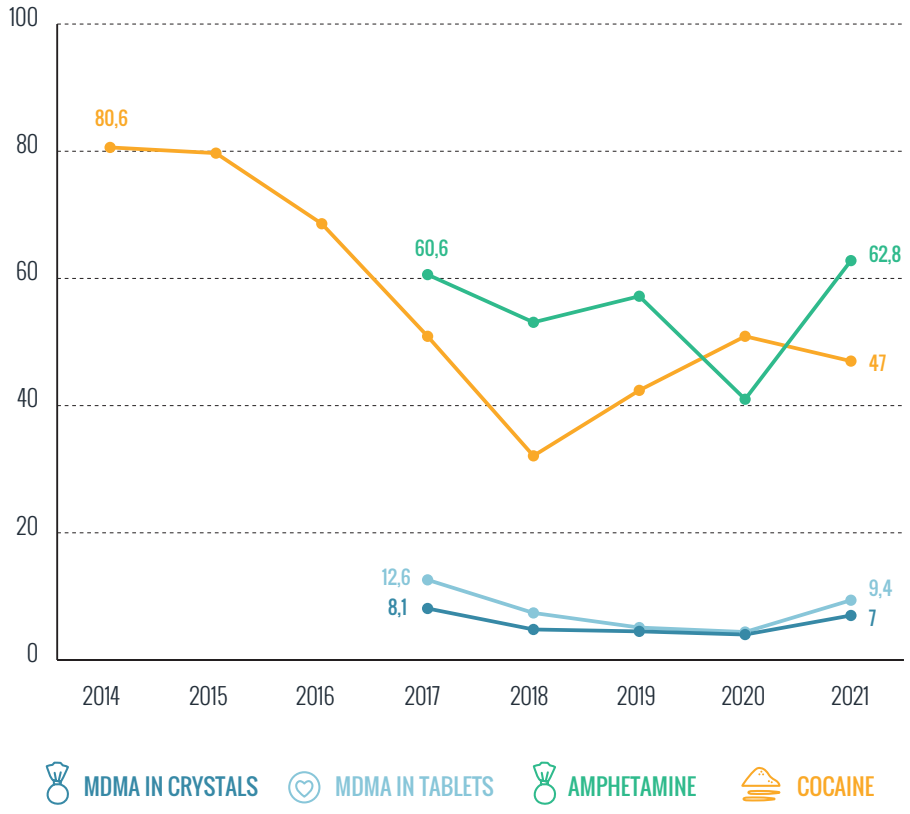
Comparative analysis of the adulteration and discrepancy rates between the three markets analyzed in this report shows that the MDMA market has been the least affected by adulteration. In fact, the low discrepancy rates indicate that the probability of the individual encountering a sample of MDMA adulterated in any way (addition, substitution or with no active substance) was relatively low. In contrast, amphetamine was found to be the most adulterated, followed closely by cocaine. Overall, it was noted that the discrepancy rates had followed a downward trend that changed in 2019 for cocaine and in 2021 for MDMA and amphetamine.

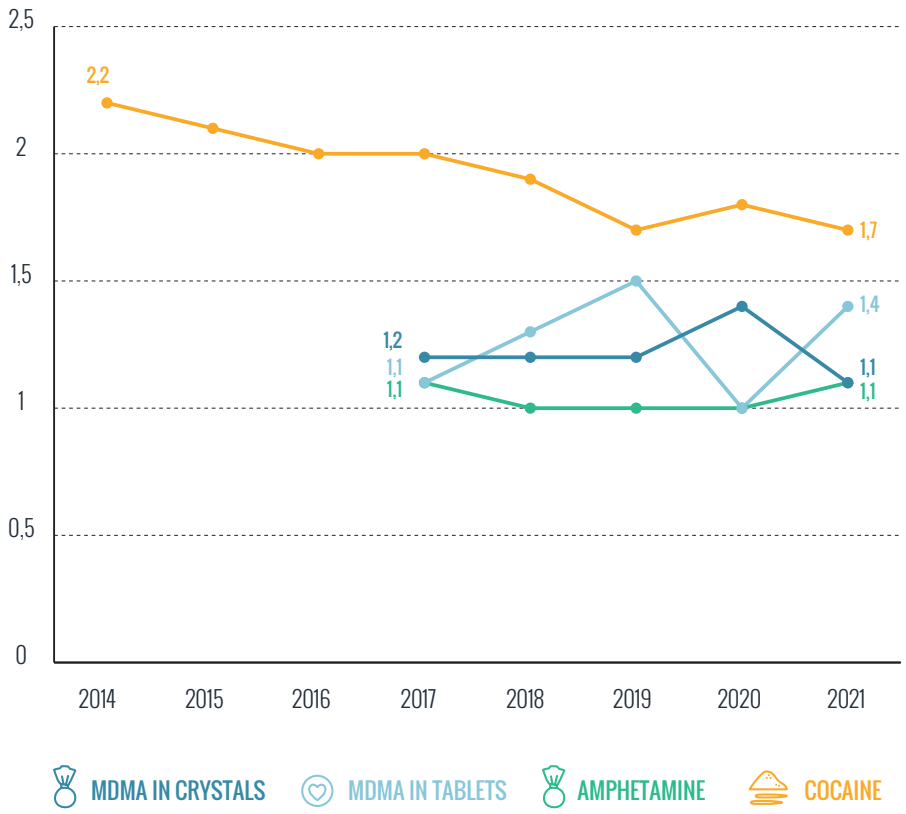
Figure 10. Evolution of MDMA, amphetamine and cocaine discrepancy rates



On the other hand, while the adulteration rate remained relatively stable in the MDMA and amphetamine markets, at between 1 and 1.5, the cocaine adulteration rate declined markedly over the entire period under study. Possibly, the increase in purity identified due to higher production in source countries (UNODC, 2022), has made adulteration of cocaine reaching the final consumer less necessary. However, the fact that levamisole continued to be the most frequently used adulterant limited the potential decrease in risks that could result from less adulteration. In the case of amphetamine, the adulteration rate remained virtually unchanged, with caffeine being virtually the only substance used as an adulterant. Finally, while some variability in

adulteration rates over the years was observed for MDMA, this should be interpreted with caution due to the low number of adulterated samples.

Figure 11. Evolution of MDMA, amphetamine and cocaine adulteration rates



CONCLUSIONS

The main conclusions drawn from the analysis of the results for the three markets studied are presented below. After some general conclusions, the main conclusions are offered for each one of them.

General conclusions

1. The findings of this report show that the Spanish market for MDMA, amphetamine and cocaine reflect the general dynamics observed in other European countries, such as increasing doses of MDMA in tablets, stable purity of crystal MDMA or increasing purity of cocaine.

2. Caffeine is the main adulterant in stimulant substances. Its prevalence can be explained by its high availability in all countries.

3. No particularly toxic adulterations have been identified, in line with those suggested by other authors (Coomber, 1997). Despite concerns raised at the beginning of the pandemic that suspected an increase in adulteration in the markets, no major alterations have been detected in the markets, at least until 2021.

4. Although the use of new psychoactive substances as adulterants of MDMA or amphetamine had been documented in previous studies (Vidal, Fornís & Ventura, 2014), in the period studied their presence has been anecdotal. Possibly, in a scenario marked by the high production of MDMA, amphetamine and cocaine, and in which adulteration in general seems to have decreased, the use of new substances as adulterants has practically disappeared. However, this practice was most identified in MDMA pills.

5. The impact of the pandemic has been mainly reflected in the services, both in the number of samples analyzed and in the number of people using them, and not so much in the markets. The first data at the beginning of the pandemic already showed the high resilience of the markets to the pandemic situation (EMCDDA, 2021b) and no relevant changes have been detected in this regard.

MDMA

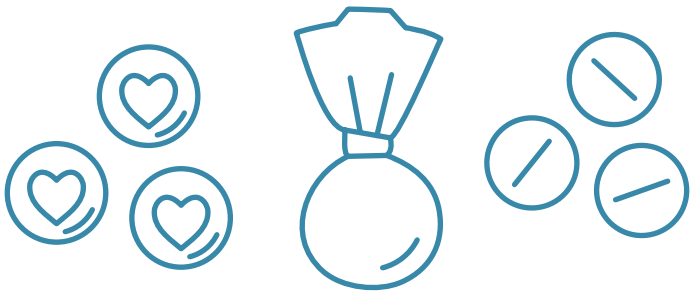
6. The results of the present study confirm the need, already raised in previous studies (Vidal et al., 2017) for a differentiated analysis between crystal and tablets circulating in the market, as they present different dynamics in terms of purity and adulteration practices.

7. Purity and adulteration data in the Spanish MDMA market are in line with the European situation. While the average purity of MDMA crystal in Spain remained relatively stable at around 80% between 2017 and 2021, the average dosage of MDMA in tablets was rising from 170 milligrams in 2017 to 188 in 2020.

8. MDMA, both in crystal and tablet form, showed very low levels of adulteration throughout the period under study. However, the number of different adulterants and the number of different compositions identified in both presentations decreased from 2019 onwards.

9. In 2021, however, there appears to be a change in trend that will need to be confirmed in the coming years, with a decrease in doses of MDMA in tablets and an increase in adulteration, both in crystal and tablets.

10. Adulteration of MDMA with new psychoactive substances was infrequent throughout the period under study. When it was observed, it involved substitutions of MDMA, especially in tablets.



Amphetamine

11. Compared to other markets (e.g. MDMA, cocaine or heroin), the amphetamine market has received the least attention and therefore the least information is available.

12. Overall, the purity of amphetamine remained stable throughout the study period at around 38%. Moreover, no differences in purity were observed according to the presentation (powder or paste) of the speed samples, which invalidates the widely held assumption that paste (or wet) speed is of higher quality in terms of purity.

13. Between 2017 and 2020, there was a significant increase in the number of speed samples containing only amphetamine. These unadulterated samples tended to contain approximately twice the amount of amphetamine as adulterated samples.

14. Adulteration of speed is mainly by addition, with caffeine being the substance most commonly used as an adulterant. However, there was a significant decline in the number of samples containing caffeine until 2020, rebounding in 2021 to 2017 levels.

15. Adulteration of amphetamine with new psychoactive substances was very rare throughout the period under review.

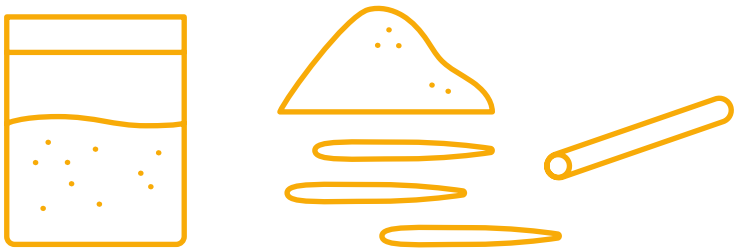
Cocaine hydrochloride

16. Cocaine purity, in line with other reports, saw a significant increase from 48% in 2014 to 65% in 2018 although, from 2019 onwards, it started to decrease. Parallel to the increase in purity was a significant increase in the percentage of unadulterated samples from 19% in 2014 to 68% in 2018.

17. Cocaine adulteration occurs mostly by addition of a set of substances that has remained virtually unchanged over the period studied: levamisole, caffeine, phenacetin and local anesthetics (mainly lidocaine and tetracaine). Significantly, in the samples adulterated by addition, a total of 179 different compositions were identified, although the most common was cocaine mixed with levamisole.

18. The presence of levamisole as an adulterant of cocaine suffered a very significant decrease throughout the period studied, from being present in 66.6% of the adulterated samples in 2015 to 13.5% of the samples in 2018. Although, from that year onwards, its presence increased again, it is still in the lowest percentages of the entire period studied.

19. Adulteration of cocaine with new psychoactive substances was very rare throughout the period under study.



END NOTES

As with other sources of information on illegal drug markets, the results obtained are not necessarily representative of the overall situation of these markets in Spain. However, the large number of samples analyzed in the drug checking service of the Energy Control programme of Asociación Bienestar y Desarrollo and the fact that their results are in line with those found by other services and studies, leads us to believe that the impact of this limitation may be minimal. In addition, testing services provide a unique insight into drug markets by obtaining data in contexts that are inaccessible to other information systems and, furthermore, they allow us to analyze the discrepancy between what a person thinks they are going to use and what they are actually using. This is why we believe that the results obtained from testing services should be part of national drug monitoring and information systems, as is already the case at the European level with the TEDI network data presented in the EMCDDA annual reports.

Finally, it is important to note that the findings of this report should be read in the context of the dynamics observed in recent years in these three markets. The production of MDMA, amphetamine and cocaine has experienced a significant increase that may well explain the results found in terms of purity and adulteration. In other words, at a time of record production, there may be less need for adulteration of substances. However, there are some indications that the situation may be changing again, especially in the MDMA market, and the need for such reporting will continue in the coming years.

REFERENCES

REFERENCES

Bertol E., Bigagli, L., D'Errico, S., Mari, F., Palumbo, D., Pascali, J. P., y Vaiano, F. (2018). Analysis of illicit drugs seized in the Province of Florence from 2006 to 2016. *Forensic Science International, 284*, 194-203.

Bourmaud, A., Dahm, G., Meys, F., Gengler, N., Origer, A., y Schneider, S. (2021). Investigation on heroin and cocaine quality in Luxembourg. *Harm Reduction Journal, 18*, 1, 1–8.

Broseus J., Gentile N., Bonadio Pont F., Garcia Gongora J. M., Gaste L., y Esseiva P. (2015). Qualitative, quantitative and temporal study of cutting agents for cocaine and heroin over 9 years. *Forensic Science International, 257*, 307–313.

Butterfield, R., Barratt, M., Ezard, N., y Day, R. O. (2016). Drug checking to improve monitoring of new psychoactive substances in Australia. *The Medical Journal of Australia, 204*, 4, 144-145.

Cole, C., Jones, L., McVeigh, J., Kicman, A., Syed, Q., y Bellis, M. (2010). Adulterants in illicit drugs: a review of empirical evidence. *Drug Testing and Analysis, 3*, 89-96.

Coomber, R. (1997). The adulteration of drugs: what dealers do to illicit drugs, and what they think is done to them. *Addiction Research, 5*, 4, 297–306.

Couchman, L., Frinculescu, A., Sobreira, C., Shine, T., Ramsey, J., Hecht, M., Kipper, K, Holt, D., y Johnston, A. (2019). Variability in content and dissolution profiles of MDMA tablets collected in the UK between 2001 and 2018 – a potential risk to users? *Drug Testing and Analysis, 11*, 8, 1172-1182.

Cuesta, M. J. (2021). *Estudio de cocaína en los decomisos ilícitos incautados en la comunidad autónoma de Castilla y León*. Universidad Complutense de Madrid.

Decorte, T. (2001). Quality control by cocaine users: underdeveloped harm reduction strategies. *European Addiction Research, 7*, 4, 161-175.

Drugs Information and Monitoring System - DIMS (2022). *Annual Report 2021*. Utrecht: Trimbos Instituut.

Eliaerts, J., Meert, N., Van Durme, F., Samyn, N., De Wael, K., y Dardenne, P. (2018). Practical tool for sampling and fast analysis of large cocaine seizures. *Drug Testing and Analysis, 10*, 6, 1039–1042.

EMCDDA (2021a). *Informe Europeo sobre Drogas 2021: Tendencias y novedades*. Luxemburgo: Oficina de Publicaciones de la Unión Europea.

EMCDDA (2021b). *Impact of COVID-19 on drug markets, use, harms and drug services in the community and prisions: results from an EMCDDA trendspotter study*. Luxemburgo: Oficina de Publicaciones de la Unión Europea.

EMCDDA (2022). *Informe Europeo sobre Drogas 2022: Tendencias y novedades*. Luxemburgo: Oficina de Publicaciones de la Unión Europea.

EMCDDA - Europol (2022). *EU Drug Market: Cocaine*, en EU Drugs Market: in-depth analysis. Luxemburgo: Oficina de Publicaciones de la Unión Europea.

Hesse, M., Thomsen, K. R., Thylstrup, B., Andersen, C. U., Reitzel, L. A., Worm-Leonhard, M., y Lindholst, C. (2021). Purity of street-level cocaine across Denmark from 2006 to 2019: Analysis of seized cocaine. *Forensic Science International, 329*, 111050.

Jacinto, C., Duterte, M., Sales, P., y Murphy, S. (2008). Maximising the highs and minimising the lows: harm reduction guidance within ecstasy distribution networks. *International Journal of Drug Policy, 19*, 5, 393-400.

Kudlacek, K., Hofmaier, T., Luf, A., Mayer, F. P., Stockner, T., Nagy, C., Holy, M., Freissmuth, M., Smchmid, R., y Sitte, H. H. (2017). Cocaine adulteration. *Journal of Chemical Neuroanatomy, 83-84*, 75-81.

Lefrançois, E., Augsburger, M., y Esseiva, P. (2018). Drug residues in used syringes in Switzerland: A comparative study. *Drug Testing and Analysis*, *10*, 5, 874–879.

Maghsoudi, N.; Tanguay, J.; Scarfone, K.; Rammohan, I.; Ziegler, C.; Werb, D., y Scheim, A. I. (2022). Drug checking for people who use drugs: a systematic review. *Addiction*, *117*, 3, 532-544.

Martello, S., Pieri, M., Ialongo, C., Pignalosa, S., Noce, G., Vernich, F., Russo, C., Mineo, F., Bernardini, S., y Marsella, L. T. (2017). Levamisole in Illicit Trafficking Cocaine Seized: A One-Year Study. *Journal of Psychoactive Drugs*, *49*, 5, 408–412.

Morelato, M., Franscella, D., Esseiva, P., y Broséus, J. (2019). When does the cutting of cocaine and heroin occur? The first large-scale study based on the chemical analysis of cocaine and heroin seizures in Switzerland. *International Journal of Drug Policy*, *73*, 7–15.

Observatorio Español de las Drogas y las Adicciones (2021a). *Informe 2021. Alcohol, tabaco y drogas ilegales en España*. Madrid: Ministerio de Sanidad. Delegación del Gobierno para el Plan Nacional sobre Drogas.

Observatorio Español de las Drogas y las Adicciones (2021b). *Impacto de la pandemia por COVID-19 durante el año 2020 en el patrón de consumo de sustancias psicoactivas y otros comportamientos con potencial adictivo*. Madrid: Ministerio de Sanidad. Delegación del Gobierno para el Plan Nacional sobre Drogas.

Observatorio Español de las Drogas y las Adicciones (2022). *Informe 2022. Alcohol, tabaco y drogas ilegales en España*. Madrid: Ministerio de Sanidad. Delegación del Gobierno para el Plan Nacional sobre Drogas.

Palamar, J.; Acosta, P., Sutherland, R.; Shedlin, M. G., y Barratt, M. J. (2019). Adulterants and altruism: a qualitative investigation of 'drug checkers' in Norh America. *International Journal of Drug Policy*, *74*, 160-169.

Palamar, J. (2020). Diffusion of ecstasy in the electronic dance music scene. *Substance Use and Misuse*, *55*, 13, 2243-2250.

Pascoe, M. J., Radley, S., Simmons, H. T. D., y Measham, F. (2022). The Cathinone Hydra: increased cathinone and caffeine adulteration in the English MDMA market after Brexit and COVID-19 lockdowns. *Drug Science, Policy and Law*, *8*, 1-12.

Pichini, S., Busardò, F. P., Gregori, A., Berretta, P., Gentili, S., y Pacifici, R. (2017). Purity and adulterant analysis of some recent drug seizures in Italy. *Drug Testing and Analysis*, *9*, 3, 485–490.

Soukup-Baljak, Y., Greer, A. M., Amlani, A., Sampson, O., y Buxton, J. A. (2015). Drug quality assessment practices and communication of drug alerts among people who use drugs. *International Journal of Drug Policy*, *26*, 12, 1251-1257.

TEDI (2011). First TEDI trend report. Barcelona. TEDI network publication.

UNODC (2022). *World Drug Report 2022*. Viena: United Nations publication.

Verri, P.; Rustichelli C., Ferrari, A., Marchesi, F., Baraldi, C., Licata, M., Vandelli, D., Palazzoli, F., Potì, F., y Silingardi E. (2019). Seizures of illicit substances for personal use in two Italian provinces: analysis of trends by type and purity from 2008 to 2017. *Substance Abuse Treatment, Prevention, and Policy*, *14*, 1, 41.

Vidal, C., Fornís, I., y Ventura, M. (2014). New psychoactive substances as adulterants of controlled drugs. A worrying phenomenon? *Drug Testing and Analysis, 6*, 7-8, 819-824.

Vidal-Giné, C., Ventura, M., Measham, F., Brunt, T. M., Bücheli, A., Paulos, C., Valente, H., Martins, D., Libois, B., Tögel, K., Jones, G., Karden, A., y Barratt, M. J. (2017). The utility of drug checking services as monitoring tools and more: A response to Pirona et al. *International Journal of Drug Policy*, *45*, 46-47.

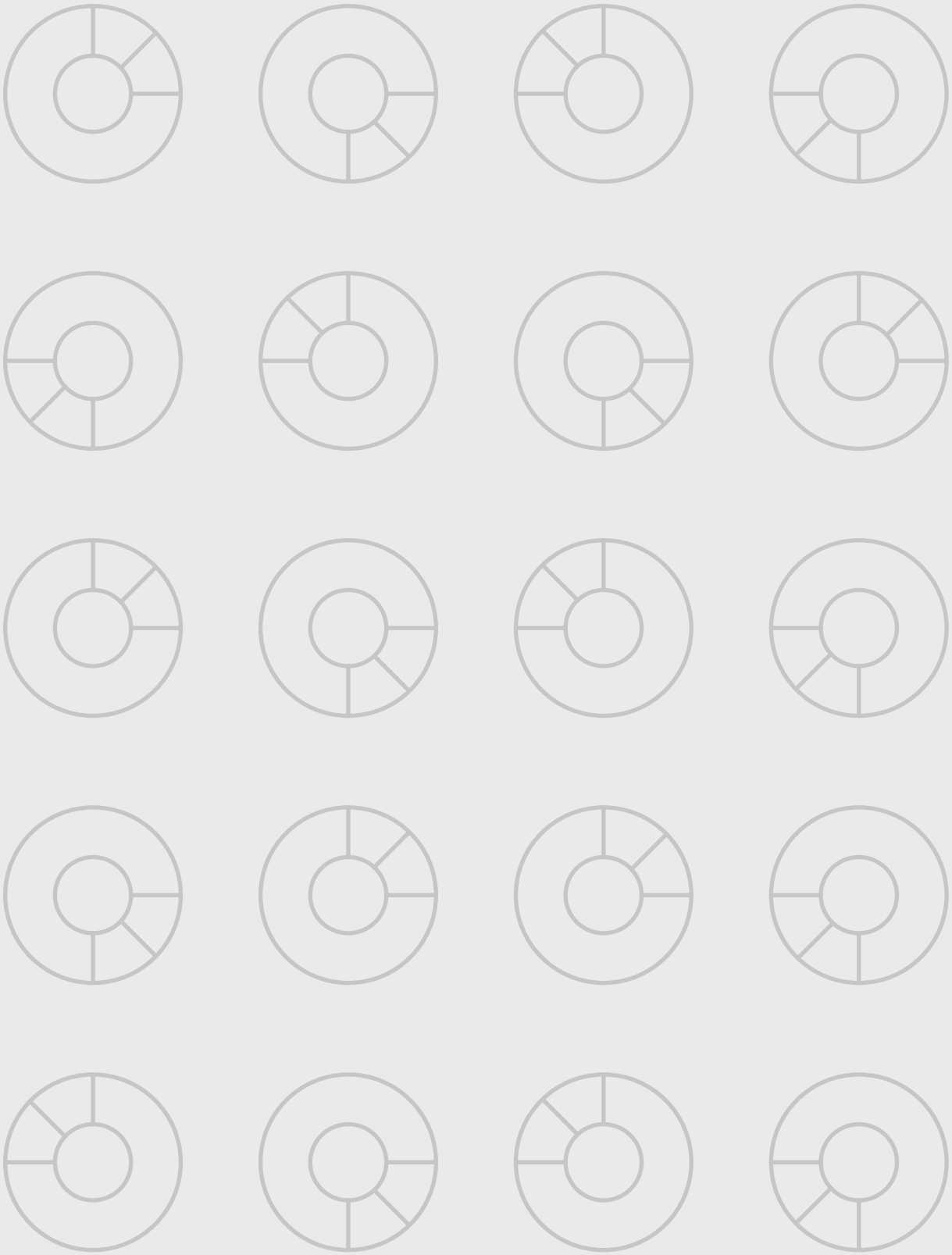
Vidal, C. (2019). Los servicios de análisis de sustancias: un instrumento imprescindible para la reducción de riesgos y daños. *Revista Española de Drogodependencias*, *3*, 67–77.

Vidal, C., y Navarro, J. (2021). *Fiesta, alcohol y otras drogas en tiempos de pandemia: integración de las pautas de prevención del contagio del nuevo coronavirus SARS-CoV-2 en los patrones de consumo recreativo de sustancias psicoactivas en personas usuarias de espacios de ocio*. Barcelona: Asociación Bienestar y Desarrollo (ABD).

Villar Núñez, M. Á., Sánchez, J., y Ruíz, M. A., (2017). Purity and adulteration in cocaine seizures and drug market inspection in Galicia (Spain) across an eight-year period. *Drug Testing and Analysis*, *10*, 2, 381–391.

Vonmoos, M., Hirsiger, S., Preller, K. H., Hulka, L. M., Allemann, D., Herdener, M., Baumgartner, M. R., y Quednow, B. B. (2018). Cognitive and neuroanatomical impairments associated with chronic exposure to levamisole-contaminated cocaine. *Translational Psychiatry*, *8,* 1, 235.

Żubrycka, A., Kwaśnica, A., Haczkiewicz, M., Sipa, K., Rudnicki, K., Skrzypek, S., y Poltorak, L. (2022). Illicit drugs street samples and their cutting agents. The result of the GC-MS based profiling defines the guidelines for sensors development. *Talanta*, *237*, 122904.



APPENDIXES

Appendix 1. Crystal MDMA: Adulteration by addition

	2017	2018	2019	2020	2021	Total
% of adulterated samples[1]	2,4	1,8	1,2	0,6	1,8	1,7
Number of identified adulterants	**7**	**4**	**5**	**1**	**2**	**14**
Caffeine	6	4	1	1	-	12
Procaine	-	-	-	-	3	3
Phenacetin	1	-	1	-	-	2
Phenethylamine	2	-	-	-	-	2
MDA	-	2	-	-	-	2
Unknown substance	-	-	1	-	1	2
3-MMC	-	1	-	-	-	1
4-CMC	1	-	-	-	-	1
Cocaine HCL	1	-	-	-	-	1
Dimethylone (bk-MDDMA)	-	-	1	-	-	1
Ketamine	-	-	1	-	-	1
Levamisole	1	-	-	-	-	1
Methamphetamine	1	-	-	-	-	1
Paracetamol	-	1	-	-	-	1
Number of identified compositions	**6**	**4**	**5**	**1**	**2**	**13**
MDMA + Caffeine	6	4	1	1	-	12
MDMA + Procaine	-	-	-	-	3	3
MDMA + Phenacetin	1	-	1	-	-	2
MDMA + Phenethylamine	2	-	-	-	-	2
MDMA + MDA	-	2	-	-	-	2
MDMA + Unknown substance	-	-	1	-	1	2
MDMA + 3-MMC	-	1	-	-	-	1
MDMA + 4-CMC	1	-	-	-	-	1
MDMA + Cocaine HCL + Levamisole	1	-	-	-	-	1
MDMA + Dimethylone (bk-MDDMA)	-	-	1	-	-	1
MDMA + Ketamine	-	-	1	-	-	1
MDMA + Methamphetamine	1	-	-	-	-	1
MDMA + Paracetamol	-	1	-	-	-	1

1 Percentage of the total crystal samples analyzed.

Appendix 2. Crystal MDMA: Adulteration by substitution

	2017	2018	2019	2020	2021	Total
% of adulterated samples[2]	**4,3**	**2,3**	**1,9**	**3,4**	**4,8**	**3,2**
Number of identified adulterants	**16**	**9**	**9**	**6**	**7**	**28**
Methamphetamine	1	3	1	1	3	9
Unknown substance	6	-	1	-	2	9
Caffeine	2	1	-	1	3	7
Cocaine HCL	-	1	-	4	-	5
N-Ethyl-Pentylone (bk-EBDP)	3	2	-	-	-	5
Amphetamine sulfate	3	-	1	-	-	4
Ketamine	1	-	2	-	1	4
Euthylone (bk-EBDB)	-	-	1	1	1	3
Phenethylamine	1	2	-	-	-	3
Procaine	3	-	-	-	-	3
3-MMC	1	-	1	-	-	2
4-AcO-DMT	2	-	-	-	-	2
4-HO-DMT	2	-	-	-	-	2
Phenacetin	-	1	-	1	-	2
3,4-EDMA	-	-	1	-	-	1
BMDP	-	-	1	-	-	1
3-CEC	-	-	1	-	-	1
4-CEC	-	1	-	-	-	1
4-CMC	1	-	-	-	-	1
4-MEC	-	1	-	-	-	1
5-MAPB	-	-	-	-	1	1
Aminophenazone	1	-	-	-	-	1
BZP	1	-	-	-	-	1
Dextromethorphan	-	-	-	-	1	1
Levamisole	-	-	-	1	-	1
Lidocaine	-	1	-	-	-	1
Metamizol (Dipyrone)	1	-	-	-	-	1
TFMPP	1	-	-	-	-	1
Number of identified compositions	**14**	**6**	**8**	**4**	**8**	**28**
Methamphetamine	1	3	1	1	3	9
Unknown substance	4	-	-	-	1	5
N-Ethyl-Pentylone (bk-EBDP)	2	2	-	-	-	4
Cocaine HCL	-	-	-	3	-	3
Eutilone (bk-EBDB)	-	-	1	1	1	3

2 Percentage of the total crystal samples analyzed.

Phenethylamine	1	2	-	-	-	3
Ketamine	1	-	1	-	1	3
Procaine	3	-	-	-	-	3
3-MMC	1	-	1	-	-	2
4-AcO-DMT + 4-HO-DMT	2	-	-	-	-	2
Amphetamine Sulfate + Caffeine	2	-	-	-	-	2
Caffeine	-	-	-	-	2	2
3,4-EDMA	-	-	1	-	-	1
3,4-Metilenedioxi-N-benzylcathinone (BMDP)	-	-	1	-	-	1
3-CEC	-	-	1	-	-	1
4-CEC	-	1	-	-	-	1
4-CMC	1	-	-	-	-	1
4-MEC	-	1	-	-	-	1
5-MAPB	-	-	-	-	1	1
Aminofenazona + Metamizol (Dipirona) + Unknown substance	1	-	-	-	-	1
Amphetamine Sulfate	1	-	-	-	-	1
Amphetamine Sulfate + Ketamine + Unknown substance	-	-	1	-	-	1
BZP + TFMPP	1	-	-	-	-	1
Caffeine + Cocaine HCL + Phenacetin + Levamisol	-	-	-	1	-	1
Caffeine + Cocaine HCL + Phenacetin + Lidocaine	-	1	-	-	-	1
Caffeine + Unknown substance	-	-	-	-	1	1
DXM	-	-	-	-	1	1
N-Ethyl-Pentylone (bk-EBDP) + Unknown substance	1	-	-	-	-	1

Appendix 3. MDMA tablets: Adulteration by addition

	2017	2018	2019	2020	2021	Total
% of analyzed samples[3]	**2,3**	**3,1**	**1,7**	**1,7**	**5,7**	**2,8**
Number of identified adulterants	**6**	**8**	**4**	**3**	**6**	**18**
Caffeine	9	10	7	2	10	38
Amphetamine sulfate	-	2	1	-	8	11
N-Ethyl-Pentylone (bk-EBDP)	-	4	-	-	-	4
2C-B	1	-	-	1	-	2
4-CMC	-	-	-	1	1	2
Phenethylamine	-	1	-	-	1	2
2,3-Dichlorophenylpiperazine	-	-	1	-	-	1
3-MMC	-	1	-	-	-	1
4-Fluorometcatinona	1	-	-	-	-	1
Valproic acid	-	1	-	-	-	1
Alfa-PVP	1	-	-	-	-	1
Phenacetin	1	-	-	-	-	1
Ketamine	-	-	-	-	1	1
MDA	-	-	1	-	-	1
N-Ethyl-Hexedrone (Hex-en)	-	1	-	-	-	1
Procaine	-	-	-	-	1	1
Sildenafil	1	-	-	-	-	1
Unknown substance	-	1	-	-	-	1
Number of identified compositions	**5**	**7**	**4**	**3**	**7**	**18**
MDMA + Caffeine	8	7	7	2	5	29
MDMA + Amphetamine Sulfate	-	1	1	-	3	5
MDMA + Amphetamine Sulfate + Caffeine	-	-	-	-	5	5
MDMA + N-Ethyl-Pentylone (bk-EBDP)	-	4	-	-	-	4
MDMA + 2C-B	1	-	-	1	-	2
MDMA + 4-CMC	-	-	-	1	1	2
MDMA + 2,3-Dichlorophenylpiperazine	-	-	1	-	-	1
MDMA + 3-MMC + Amphetamine Sulfate + Caffeine	-	1	-	-	-	1
MDMA + 4-Fluoromethcathinone + Alfa-PVP + Caffeine	1	-	-	-	-	1
MDMA + Valproic acid + Caffeine + Unknown substance	-	1	-	-	-	1
MDMA + Caffeine + Phenethylamine	-	1	-	-	-	1
MDMA + Phenacetin	1	-	-	-	-	1
MDMA + Phenethylamine	-	-	-	-	1	1
MDMA + Ketamine	-	-	-	-	1	1
MDMA + MDA	-	-	1	-	-	1
MDMA + N-Ethyl-Hexedrone (Hex-en)	-	1	-	-	-	1
MDMA + Procaine	-	-	-	-	1	1
MDMA + Sildenafil	1	-	-	-	-	1

3 Percentage of the total analyzed samples.

Appendix 4. MDMA tablets: Adulteration by substitution

	2017	2018	2019	2020	2021	Total
% of adulterated samples[4]	**6,9**	**1,8**	**2,8**	**1,7**	**3,7**	**3,6**
Number of identified adulterants	11	9	12	3	7	23
Caffeine	2	2	4	1	6	15
MDA	12	1	-	-	-	13
m-CPP	8	1	1	-	-	10
Unknown substance	5	-	1	-	3	9
Eutilone (bk-EBDB)	-	-	7	-	1	8
2,3-Dichlorophenylpiperazine	5	-	1	1	-	7
BMDP	-	-	7	-	-	7
2C-B	2	-	-	2	2	6
Amphetamine sulfate	1	1	1	-	2	5
5-MEO-MiPT	-	1	2	-	-	3
N-Ethyl-Pentylone (bk-EBDP)	-	3	-	-	-	3
4-Fluoroamphetamine	1	1	-	-	-	2
Metoclopramide	2	-	-	-	-	2
3-MMC	1	-	-	-	-	1
Alfa-PVP	1	-	-	-	-	1
Diphenhydramine	-	-	1	-	-	1
DOC	-	-	1	-	-	1
Phenethylamine	-	-	-	-	1	1
Methylclonazepam	-	-	1	-	-	1
Modafinil	-	1	-	-	-	1
Paracetamol	-	-	1	-	-	1
Procaine	-	-	-	-	1	1
Theophylline	-	1	-	-	-	1
Number of identified compositions	**12**	**7**	**11**	**3**	**7**	**29**
MDA	10	1	-	-	-	11
2,3-Dichlorophenylpiperazine	5	-	1	1	-	7
2C-B	2	-	-	2	2	6
m-CPP	6	-	-	-	-	6
Unknown substance	5	-	-	-	-	5
3,4-Methylendioxy-N-benzylcathinone (BMDP) + Eutilone (bk-EBDB)	-	-	4	-	-	4
5-MEO-MiPT	-	1	2	-	-	3
Caffeine	1	-	-	1	1	3
Caffeine + Unknown substance	-	-	-	-	3	3

4 Percentage of the total analyzed samples.

Euthylone (bk-EBDB)	-	-	2	-	1	3
N-Ethyl-Pentylone (bk-EBDP)	-	3	-	-	-	3
4-Fluoroamphetamine (4-FA)	1	1	-	-	-	2
Amphetamine Sulfate + Caffeine	-	-	-	-	2	2
Caffeine + m-CPP	-	1	1	-	-	2
m-CPP + Metoclopramide	2	-	-	-	-	2
3,4-Methylendioxy-N-benzylcathinone (BMDP)	-	-	1	-	-	1
3,4-Methylendioxy-N-benzylcathinone (BMDP) + Caffeine	-	-	1	-	-	1
3,4-Methylendioxy-N-benzylcathinone (BMDP) + Eutilone (bk-EBDB) + Unknown substance	-	-	1	-	-	1
3-MMC	1	-	-	-	-	1
Alfa-PVP	1	-	-	-	-	1
Amphetamine Sulfate + Caffeine + Difenhidramina + Paracetamol	-	-	1	-	-	1
Amphetamine Sulfate + Caffeine + Theophylline	-	1	-	-	-	1
Amphetamine Sulfate + MDA	1	-	-	-	-	1
Caffeine + DOC	-	-	1	-	-	1
Caffeine + MDA	1	-	-	-	-	1
Phenethylamine	-	-	-	-	1	1
Methylclonazepam	-	-	1	-	-	1
Modafinil	-	1	-	-	-	1
Procaine	-	-	-	-	1	1

Appendix 5. Amphetamine purity

	2017	2018	2019	2020	2021	Total
Total analyzed samples (n)	**582**	**522**	**568**	**257**	**307**	**2.236**
% of average purity	37,8	38,6	40,0	38,4	39,5	38,9
Standard deviation	25,8	22,7	22,5	22,5	23,1	23,5
Powder speed (n)	382	375	453	213	259	1.682
% of average purity	37,9	39,2	39,8	38,5	39,5	39,0
Standard deviation	26,6	23,4	23,0	22,5	23,7	24,0
Paste speed (n)	197	143	108	44	46	538
% of average purity	37,7	37,2	41,7	38,0	40,1	38,6
Standard deviation	24,1	21,2	20,4	22,3	20,5	22,2
Non adulterated samples (n)	228	235	248	152	118	981
% of average purity	56,7	55,1	55,2	50,5	56,0	54,9
Standard deviation	23,7	18,2	18,2	17,9	19,8	19,8
Samples adulterated by addition (n)	351	283	313	105	187	1.239
% of average purity	25,6	24,9	28,2	20,9	29,2	26,3
Standard deviation	18,7	16,3	18,1	16,0	18,8	17,9

Appendix 6. Speed: Adulteration by addition						
	2017	**2018**	**2019**	**2020**	**2021**	**Total**
% of samples adulterated by addition	**57,0**	**51,1**	**54,4**	**39,6**	**59,8**	**53,3**
Number of identified adulterants	**10**	**8**	**6**	**2**	**8**	**18**
Caffeine	362	289	323	108	184	1.266
Paracetamol	9	2	5	-	1	17
Phenacetin	2	-	-	-	8	10
Cocaine HCL	4	2	1	-	-	7
Procaine	4	1	-	-	-	5
Creatinine	-	-	-	1	3	4
Ketamine	-	3	1	-	-	4
Unknown substance	-	1	-	-	3	4
Tetracaine	3	-	-	-	-	3
Phenethylamine	-	-	2	-	-	2
Ibuprofen	-	-	1	-	1	2
Levamisole	1	1	-	-	-	2
4-Fluoroamphetamine	1	-	-	-	-	1
Dibutylone (bk-MBDB)	-	1	-	-	-	1
Gabapentin	-	-	-	-	1	1
MDMA	1	-	-	-	-	1
Methamphetamine	-	-	-	-	1	1
Piracetam	1	-	-	-	-	1
Number of identified compositions	**12**	**9**	**7**	**2**	**10**	**26**
Amphetamine Sulfate + Caffeine	341	282	317	107	178	1.225
Amphetamine Sulfate + Caffeine + Paracetamol	8	2	3	-	-	13
Amphetamine Sulfate + Caffeine + Cocaine HCL	3	1	1	-	-	5
Amphetamine Sulfate + Caffeine + Phenacetin	2	-	-	-	2	4
Amphetamine Sulfate + Phenacetin	-	-	-	-	4	4
Amphetamine Sulfate + Caffeine + Creatinine	-	-	-	1	2	3
Amphetamine Sulfate + Caffeine + Ketamine	-	2	1	-	-	3
Amphetamine Sulfate + Caffeine + Procaine	2	1	-	-	-	3
Amphetamine Sulfate + Paracetamol	1	-	2	-	-	3
Amphetamine Sulfate + Caffeine + Procaine + Tetracaine	2	-	-	-	-	2
Amphetamine Sulfate + Phenacetin + Unknown substance	-	-	-	-	2	2
Amphetamine Sulfate + Phenethylamine	-	-	2	-	-	2
Amphetamine Sulfate + Unknown substance	-	1	-	-	1	2
Amphetamine Sulfate + 4-Fluoroamphetamine (4-FA) + Caffeine	1	-	-	-	-	1
Amphetamine Sulfate + Caffeine + Cocaine HCL + Levamisole	-	1	-	-	-	1
Amphetamine Sulfate + Caffeine + Ibuprofen	-	-	1	-	-	1
Amphetamine Sulfate + Caffeine + Ibuprofen + Paracetamol	-	-	-	-	1	1
Amphetamine Sulfate + Caffeine + Levamisole + Piracetam	1	-	-	-	-	1
Amphetamine Sulfate + Caffeine + MDMA	1	-	-	-	-	1
Amphetamine Sulfate + Caffeine + Methamphetamine	-	-	-	-	1	1
Amphetamine Sulfate + Caffeine + Tetracaine	1	-	-	-	-	1
Amphetamine Sulfate + Cocaine HCL	1	-	-	-	-	1
Amphetamine Sulfate + Creatinine	-	-	-	-	1	1
Amphetamine Sulfate + Dibutylone (BK-DMBDB)	-	1	-	-	-	1
Amphetamine Sulfate + Gabapentin	-	-	-	-	1	1
Amphetamine Sulfate + Ketamine	-	1	-	-	-	1

Appendix 7. Speed: Adulteration by substitution						
	2017	**2018**	**2019**	**2020**	**2021**	**Total**
% of samples adulterated by substitution	**3,4**	**1,8**	**2,8**	**1,1**	**2,2**	**2,5**
Number of identified adulterants	**14**	**6**	**8**	**6**	**4**	**18**
Caffeine	10	4	9	1	5	29
Cocaine HCL	3	3	2	1	-	9
Ketamine	3	-	3	-	1	7
Methamphetamine	1	1	2	1	-	5
Unknown substance	2	1	2	-	-	5
Phenacetin	-	-	1	1	2	4
Ephedrine	3	-	-	-	-	3
Phenethylamine	1	1	1	-	-	3
MDMA	2	-	-	-	1	3
4-MMC (Mephedrone)	-	2	-	-	-	2
Deschloroketamine	2	-	-	-	-	2
Paracetamol	1	-	-	1	-	2
Chloroquine	1	-	-	-	-	1
Levamisole	-	-	-	1	-	1
Lidocaine	1	-	-	-	-	1
Methylphenidate	1	-	-	-	-	1
Methoxetamine	1	-	-	-	-	1
Morphine	-	-	1	-	-	1
Number of different compositions	**15**	**6**	**8**	**3**	**4**	**21**
Caffeine	4	2	7	-	3	16
Cocaine HCL	2	3	1	-	-	6
Ketamine	1	-	3	-	1	5
Methamphetamine	1	1	2	1	-	5
Caffeine + Unknown substance	1	1	1	-	-	3
Ephedrine	3	-	-	-	-	3
MDMA	2	-	-	-	1	3
4-MMC (Mephedrone)	-	2	-	-	-	2
Caffeine + Phenacetin	-	-	-	-	2	2
Caffeine + Phenethylamine	1	1	-	-	-	2
Unknown substance	1	-	1	-	-	2
Caffeine + Chloroquine + Paracetamol	1	-	-	-	-	1
Caffeine + Cocaine HCL	1	-	-	-	-	1
Caffeine + Cocaine HCL + Phenacetin + Phenethylamine	-	-	1	-	-	1
Caffeine + Cocaine HCL + Phenacetin + Levamisole	-	-	-	1	-	1
Caffeine + Deschloroketamine + Ketamine + Methoxetamine	1	-	-	-	-	1
Caffeine + Lidocaine	1	-	-	-	-	1
Deschloroketamine + Ketamine	1	-	-	-	-	1
Methylphenidate	1	-	-	-	-	1
Morphine	-	-	1	-	-	1
Paracetamol	-	-	-	1	-	1

Appendix 8. Cocaine purity

	2014	2015	2016	2017	2018	2019	2020	2021	Total
Total analyzed (n)	**426**	**756**	**669**	**861**	**903**	**993**	**306**	**260**	**5.174**
% of average purity	48,2	54,7	61,8	63,2	65,1	64,6	61,7	61,0	60,9
Standard deviation	24,9	24,9	23,7	19,8	18,3	21,1	18,7	18,5	22,1
Non adulterated (n)	87	134	219	430	627	589	170	139	2.395
% of average purity	68,8	77,0	77,6	74,4	72,8	75,1	71,4	69,9	73,9
Standard deviation	20,3	14,6	14,5	11,8	11,2	12,7	11,2	12,0	12,8
Adult. by addition (n)	339	622	450	431	276	404	136	121	2.779
% of average purity	42,9	49,9	54,1	52,0	47,7	49,2	49,6	50,7	49,8
Standard deviation	23,2	24,1	23,5	19,9	19,2	21,6	19,2	19,3	22,2

Appendix 9. Cocaine: Adulteration by addition

	2014	2015	2016	2017	2018	2019	2020	2021	Total
Number of samples adulterated by addition	**340**	**625**	**470**	**440**	**280**	**414**	**180**	**146**	**2.895**
Number of identified adulterants	**17**	**18**	**21**	**19**	**18**	**20**	**15**	**12**	**34**
Levamisole	243	531	391	333	127	195	104	86	2010
Caffeine	168	238	165	181	149	208	84	63	1256
Phenacetin	132	228	150	140	109	142	65	50	1016
Lidocaine	64	97	61	68	50	55	29	19	443
Tetracaine	49	114	75	76	48	27	8	5	402
Procaine	37	49	49	36	21	22	21	14	249
Paracetamol	5	9	7	7	6	13	7	5	59
Piracetam	6	9	5	9	7	4	1	1	42
Benzocaine	10	7	-	2	2	4	-	4	29
Phenethylamine	-	1	1	1	5	8	6	-	22
Ibuprofen	2	11	2	-	2	3	2	-	22
Unknown substance	7	3	1	1	2	-	1	-	15
Amphetamine Sulfate	1	-	2	2	1	2	2	2	12
Metamizol	-	1	4	1	1	3	-	-	10
Ketamine	1	1	-	2	2	1	-	2	9
Aminophenazone	-	1	4	1	1	-	-	-	7
MDMA	-	-	-	-	-	3	2	1	6
Hydroxyzine	1	-	4	-	-	-	-	-	5
Theophylline	1	-	-	2	1	1	-	-	5
Dextromethorphan	2	-	1	1	-	-	-	-	4
Diltiazem	-	-	2	-	-	1	-	-	3
Methylphenidate	-	-	1	-	-	-	2	-	3
Diphenidine	-	2	-	-	-	-	-	-	2
Ephedrine	-	1	-	-	1	-	-	-	2
Heroin	1	-	-	1	-	-	-	-	2
Acetylsalicylic acid	-	-	-	-	-	-	1	-	1
Alfa-PVP	-	-	-	1	-	-	-	-	1
Creatinine	-	-	1	-	-	-	-	-	1
Furcarbanil	-	-	-	-	-	1	-	-	1
Methylsalicylate	-	-	-	-	-	1	-	-	1
Niacinamide	-	1	-	-	-	-	-	-	1
Pregabalin	-	-	-	-	-	1	-	-	1
Isopropylphenidate	-	-	1	-	-	-	-	-	1
Tadafil	-	-	1	-	-	-	-	-	1
Number of different compositions	**68**	**73**	**66**	**62**	**51**	**63**	**42**	**35**	**179**
Cocaine HCL + Levamisole	111	269	216	183	70	119	56	50	1074

Cocaine HCL + Caffeine	15	12	10	25	32	62	16	10	182
Cocaine HCL + Caffeine + Phenacetin + Levamisole	23	29	17	16	7	20	11	6	129
Cocaine HCL + Caffeine + Phenacetin	18	10	6	14	27	33	12	7	127
Cocaine HCL + Caffeine + Levamisole	17	23	23	17	14	19	6	6	125
Cocaine HCL + Caffeine + Phenacetin + Levamisole + Tetracaine	16	43	19	25	6	-	1	1	111
Cocaine HCL + Phenacetin	5	8	17	12	11	27	6	14	100
Cocaine HCL + Phenacetin + Levamisole	9	30	13	10	4	8	3	6	83
Cocaine HCL + Caffeine + Phenacetin + Levamisole + Lidocaine	9	24	14	12	7	6	6	2	80
Cocaine HCL + Caffeine + Phenacetin + Lidocaine	5	8	7	4	7	14	11	3	59
Cocaine HCL + Caffeine + Phenacetin + Tetracaine	6	8	5	9	13	15	2	1	59
Cocaine HCL + Levamisole + Procaine	6	8	9	13	2	3	5	3	49
Cocaine HCL + Caffeine + Levamisole + Lidocaine	3	9	7	9	1	6	1	4	40
Cocaine HCL + Procaine	2	1	6	4	7	7	5	5	37
Cocaine HCL + Caffeine + Lidocaine	7	-	3	2	7	9	1	4	33
Cocaine HCL + Caffeine + Phenacetin + Levamisole + Lidocaine + Tetracaine	1	7	10	4	3	1	-	1	27
Cocaine HCL + Caffeine + Levamisole + Tetracaine	2	10	5	7	1	-	-	1	26
Cocaine HCL + Phenacetin + Levamisole + Tetracaine	6	5	8	3	2	1	-	-	25
Cocaine HCL + Paracetamol	1	-	2	4	3	9	4	1	24
Cocaine HCL + Caffeine + Phenacetin + Levamisole + Lidocaine + Procaine	7	5	3	-	-	1	1	1	18
Cocaine HCL + Caffeine + Phenacetin + Lidocaine + Tetracaine	2	5	-	2	6	2	1	-	18
Cocaine HCL + Caffeine + Tetracaine	4	5	2	2	3	1	-	1	18
Cocaine HCL + Levamisole + Lidocaine	2	4	3	6	2	-	-	-	17
Cocaine HCL + Lidocaine	3	6	1	1	2	1	2	1	17
Cocaine HCL + Phenacetin + Levamisole + Lidocaine	1	5	3	4	-	1	-	-	14
Cocaine HCL + Caffeine + Phenacetin + Levamisole + Procaine	2	3	2	2	1	1	2	-	13
Cocaine HCL + Caffeine + Phenacetin + Levamisole + Lidocaine + Procaine + Tetracaine	1	1	3	4	1	1	1	-	12
Cocaine HCL + Caffeine + Levamisole + Procaine	3	4	3	-	-	1	1	-	12
Cocaine HCL + Phenethylamine	-	-	-	-	3	5	4	-	12
Cocaine HCL + Levamisole + Paracetamol	2	5	3	1	-	-	1	-	12
Cocaine HCL + Piracetam	2	1	1	3	3	2	-	-	12
Cocaine HCL + Caffeine + Phenacetin + Procaine	3	-	1	-	1	2	2	2	11
Cocaine HCL + Phenacetin + Tetracaine	1	5	-	4	1	-	-	-	11
Cocaine HCL + Caffeine + Phenacetin + Levamisole + Procaine + Tetracaine	-	4	6	-	-	-	-	-	10
Cocaine HCL + Benzocaína	4	1	-	-	2	2	-	-	9
Cocaine HCL + Phenacetin + Lidocaine	-	4	-	-	5	-	-	-	9
Cocaine HCL + Ibuprofen + Levamisole	1	6	1	-	-	-	1	-	9
Cocaine HCL + Phenacetin + Levamisole + Lidocaine + Tetracaine	1	4	1	1	-	1	-	-	8

Cocaine HCL + Levamisole + Tetracaine	-	3	2	1	1	-	1	-	8
Cocaine HCL + Caffeine + Procaine	1	1	1	-	-	2	2	1	8
Cocaine HCL + Caffeine + Phenacetin + Lidocaine + Procaine	2	1	-	2	-	-	-	1	6
Cocaine HCL + Caffeine + Phenacetin + Lidocaine + Procaine + Tetracaine	-	1	-	2	2	1	-	-	6
Cocaine HCL + Caffeine + Levamisole + Lidocaine + Procaine	3	3	-	-	-	-	-	-	6
Cocaine HCL + Caffeine + Levamisole + Procaine + Tetracaine	-	4	2	-	-	-	-	-	6
Cocaine HCL + Phenacetin + Levamisole + Procaine	1	2	1	-	-	-	1	1	6
Cocaine HCL + Phenacetin + Lidocaine + Tetracaine	1	-	1	1	-	2	1	-	6
Cocaine HCL + Levamisole + Piracetam	1	2	1	-	2	-	-	-	6
Cocaine HCL + Caffeine + Procaine + Tetracaine	-	1	1	1	3	-	-	-	6
Cocaine HCL + Caffeine + Lidocaine + Tetracaine	1	1	-	3	-	-	-	-	5
Cocaine HCL + Phenacetin + Procaine	-	2	2	-	1	-	-	-	5
Cocaine HCL + Ketamine	-	1	-	-	2	1	-	1	5
Cocaine HCL + Amphetamine Sulfate	-	-	1	1	-	1	1	-	4
Cocaine HCL + Caffeine + Hidroxyzine	1	-	3	-	-	-	-	-	4
Cocaine HCL + Caffeine + Levamisole + Lidocaine + Tetracaine	-	1	-	1	1	1	-	-	4
Cocaine HCL + Caffeine + Lidocaine + Procaine	1	-	-	2	-	1	-	-	4
Cocaine HCL + Levamisole + Procaine + Tetracaine	1	1	2	-	-	-	-	-	4
Cocaine HCL + Lidocaine + Procaine	1	-	-	-	2	1	-	-	4
Cocaine HCL + Amphetamine Sulfate + Caffeine	-	-	-	1	-	1	1	-	3
Cocaine HCL + Benzocaína + Levamisole	2	1	-	-	-	-	-	-	3
Cocaine HCL + Caffeine + Benzocaine	-	-	-	-	-	1	-	2	3
Cocaine HCL + Caffeine + Phenacetin + Levamisole + Lidocaine + Piracetam + Procaine	-	3	-	-	-	-	-	-	3
Cocaine HCL + Caffeine + Phenacetin + Levamisole + Lidocaine + Unknown substance	3	-	-	-	-	-	-	-	3
Cocaine HCL + Caffeine + Phenacetin + Procaine + Tetracaine	1	-	1	1	-	-	-	-	3
Cocaine HCL + Caffeine + Levamisole + Paracetamol	-	1	-	-	-	-	-	2	3
Cocaine HCL + Caffeine + Paracetamol	-	-	-	1	1	1	-	-	3
Cocaine HCL + Ibuprofen	-	2	-	-	-	1	-	-	3
Cocaine HCL + Unknown substance	1	1	-	-	-	-	1	-	3
Cocaine HCL + Aminophenazone + Levamisole + Metamizol	-	-	2	-	-	-	-	-	2
Cocaine HCL + Amphetamine Sulfate + Caffeine + Phenacetin	-	-	-	-	-	-	-	2	2
Cocaine HCL + Amphetamine Sulfate + Caffeine + Levamisole	-	-	1	-	1	-	-	-	2
Cocaine HCL + Benzocaine + Phenacetin	-	1	-	-	-	1	-	-	2
Cocaine HCL + Benzocaine + Phenacetin + Levamisole + Lidocaine	1	-	-	1	-	-	-	-	2
Cocaine HCL + Benzocaine + Phenacetin + Levamisole + Tetracaine	1	1	-	-	-	-	-	-	2
Cocaine HCL + Caffeine + Diphenidine + Lidocaine + Paracetamol	-	2	-	-	-	-	-	-	2
Cocaine HCL + Caffeine + Phenacetin + Phenethylamine + Lidocaine	-	1	-	-	-	1	-	-	2

Cocaine HCL + Caffeine + Phenacetin + Levamisole + Lidocaine + Piracetam + Procaine + Tetracaine	-	-	1	-	-	-	1	-	2
Cocaine HCL + Caffeine + Phenacetin + Levamisole + Paracetamol	-	-	1	-	-	-	1	-	2
Cocaine HCL + Caffeine + Phenethylamine + Lidocaine	-	-	-	-	-	1	1	-	2
Cocaine HCL + Phenacetin + Levamisole + Unknown substance	1	1	-	-	-	-	-	-	2
Cocaine HCL + Ibuprofen + Paracetamol	-	1	-	-	1	-	-	-	2
Cocaine HCL + Levamisole + Lidocaine + Procaine	1	-	-	1	-	-	-	-	2
Cocaine HCL + Levamisole + Paracetamol + Piracetam	-	-	-	1	-	1	-	-	2
Cocaine HCL + MDMA	-	-	-	-	-	2	-	-	2
Cocaine HCL + Methylphenidate	-	-	-	-	-	-	2	-	2
Cocaine HCL + Tetracaine	-	1	1	-	-	-	-	-	2
Cocaine HCL + Acetylsalicylic acid + Caffeine + Levamisole + Lidocaine	-	-	-	-	-	-	1	-	1
Cocaine HCL + Alfa-PVP + Caffeine + Levamisole + Lidocaine	-	-	-	1	-	-	-	-	1
Cocaine HCL + Aminophenazone + Caffeine + Phenacetin + Levamisole + Lidocaine + Metamizol	-	-	1	-	-	-	-	-	1
Cocaine HCL + Aminophenazone + Caffeine + Metamizol	-	-	-	1	-	-	-	-	1
Cocaine HCL + Aminophenazone + Phenacetin + Levamisole + Metamizol	-	1	-	-	-	-	-	-	1
Cocaine HCL + Aminophenazone + Levamisole + Metamizol + Unknown substance	-	-	-	-	1	-	-	-	1
Cocaine HCL + Aminophenazone + Metamizol	-	-	1	-	-	-	-	-	1
Cocaine HCL + Amphetamine Sulfate + Levamisole	1	-	-	-	-	-	-	-	1
Cocaine HCL + Benzocaine + Caffeine + Dextromethorphan + Phenacetin + Ketamine + Lidocaine + Tetracaine	1	-	-	-	-	-	-	-	1
Cocaine HCL + Benzocaine + Caffeine + Phenacetin + Levamisole	-	-	-	1	-	-	-	-	1
Cocaine HCL + Benzocaine + Caffeine + Phenacetin + Levamisole + Lidocaine	-	1	-	-	-	-	-	-	1
Cocaine HCL + Benzocaine + Caffeine + Phenacetin + Lidocaine + Tetracaine	1	-	-	-	-	-	-	-	1
Cocaine HCL + Benzocaine + Caffeine + Levamisole	-	1	-	-	-	-	-	-	1
Cocaine HCL + Benzocaine + Caffeine + Levamisole + Lidocaine + Paracetamol	-	-	-	-	-	-	-	1	1
Cocaine HCL + Benzocaine + Caffeine + Levamisole + Procaine	-	1	-	-	-	-	-	-	1
Cocaine HCL + Benzocaine + Caffeine + Lidocaine	-	-	-	-	-	-	-	1	1
Cocaine HCL + Caffeine + Dextromethorphan + Phenacetin + Levamisole	-	-	1	-	-	-	-	-	1
Cocaine HCL + Caffeine + Dextromethorphan + Heroin	1	-	-	-	-	-	-	-	1
Cocaine HCL + Caffeine + Dextromethorphan + Heroin + Piracetam	-	-	-	1	-	-	-	-	1
Cocaine HCL + Caffeine + Diltiazem + Phenacetin + Propan-2-yl 2-phenyl-2-(piperidin-2-yl)acetate + Tetracaine	-	-	1	-	-	-	-	-	1
Cocaine HCL + Caffeine + Ephedrine + Tetracaine	-	-	-	-	1	-	-	-	1
Cocaine HCL + Caffeine + Phenacetin + Phenethylamine	-	-	-	-	-	1	-	-	1
Cocaine HCL + Caffeine + Phenacetin + Phenethylamine + Levamisole + Lidocaine + Tetracaine	-	-	1	-	-	-	-	-	1

Cocaine HCL + Caffeine + Phenacetin + Phenethylamine + Lidocaine + Tetracaine	-	-	-	-	1	-	-	-	1
Cocaine HCL + Caffeine + Phenacetin + Ibuprofen	1	-	-	-	-	-	-	-	1
Cocaine HCL + Caffeine + Phenacetin + Ibuprofen + Levamisole + Paracetamol	-	-	1	-	-	-	-	-	1
Cocaine HCL + Caffeine + Phenacetin + Ketamine + Levamisole + Lidocaine + Tetracaine	-	-	-	1	-	-	-	-	1
Cocaine HCL + Caffeine + Phenacetin + Levamisole + Lidocaine + Paracetamol	-	-	-	-	-	1	-	-	1
Cocaine HCL + Caffeine + Phenacetin + Levamisole + Lidocaine + Piracetam	-	-	1	-	-	-	-	-	1
Cocaine HCL + Caffeine + Phenacetin + Levamisole + MDMA	-	-	-	-	-	-	1	-	1
Cocaine HCL + Caffeine + Phenacetin + Levamisole + Piracetam + Procaine	-	1	-	-	-	-	-	-	1
Cocaine HCL + Caffeine + Phenacetin + Levamisole + Piracetam + Tetracaine	-	-	-	1	-	-	-	-	1
Cocaine HCL + Caffeine + Phenacetin + Levamisole + Procaine + Unknown substance + Tetracaine	-	-	1	-	-	-	-	-	1
Cocaine HCL + Caffeine + Phenacetin + Levamisole + Unknown substance + Tetracaine	-	1	-	-	-	-	-	-	1
Cocaine HCL + Caffeine + Phenacetin + Lidocaine + MDMA	-	-	-	-	-	-	1	-	1
Cocaine HCL + Caffeine + Phenacetin + Lidocaine + Piracetam	-	-	-	1	-	-	-	-	1
Cocaine HCL + Caffeine + Phenacetin + Lidocaine + Piracetam + Tetracaine	-	-	-	-	1	-	-	-	1
Cocaine HCL + Caffeine + Phenacetin + Lidocaine + Unknown substance	1	-	-	-	-	-	-	-	1
Cocaine HCL + Caffeine + Phenacetin + Niacinamide + Procaine + Tetracaine	-	1	-	-	-	-	-	-	1
Cocaine HCL + Caffeine + Phenacetin + Paracetamol	-	-	-	-	-	-	-	1	1
Cocaine HCL + Caffeine + Phenacetin + Piracetam	-	1	-	-	-	-	-	-	1
Cocaine HCL + Caffeine + Phenacetin + Unknown substance	1	-	-	-	-	-	-	-	1
Cocaine HCL + Caffeine + Phenethylamine	-	-	-	1	-	-	-	-	1
Cocaine HCL + Caffeine + Ibuprofen + Levamisole	-	1	-	-	-	-	-	-	1
Cocaine HCL + Caffeine + Ketamine	-	-	-	-	-	-	-	1	1
Cocaine HCL + Caffeine + Ketamine + Levamisole	-	-	-	1	-	-	-	-	1
Cocaine HCL + Caffeine + Levamisole + Lidocaine + Paracetamol	1	-	-	-	-	-	-	-	1
Cocaine HCL + Caffeine + Levamisole + Lidocaine + Paracetamol + Procaine + Tetracaine	1	-	-	-	-	-	-	-	1
Cocaine HCL + Caffeine + Levamisole + Lidocaine + Piracetam	1	-	-	-	-	-	-	-	1
Cocaine HCL + Caffeine + Levamisole + Lidocaine + Procaine + Tetracaine	-	-	-	1	-	-	-	-	1
Cocaine HCL + Caffeine + Levamisole + MDMA	-	-	-	-	-	-	-	1	1
Cocaine HCL + Caffeine + Levamisole + Procaine + Theophylline + Tetracaine	-	-	-	1	-	-	-	-	1
Cocaine HCL + Caffeine + Levamisole + Theophylline	1	-	-	-	-	-	-	-	1
Cocaine HCL + Caffeine + Levamisole + Theophylline + Tetracaine	-	-	-	1	-	-	-	-	1
Cocaine HCL + Caffeine + Lidocaine + Methylphenidate + Procaine	-	-	1	-	-	-	-	-	1

Cocaine HCL + Caffeine + Lidocaine + Piracetam	1	-	-	-	-	-	-	-	1
Cocaine HCL + Caffeine + Metamizol	-	-	-	-	-	1	-	-	1
Cocaine HCL + Caffeine + Piracetam	-	-	-	1	-	-	-	-	1
Cocaine HCL + Caffeine + Unknown substance + Theophylline	-	-	-	-	1	-	-	-	1
Cocaine HCL + Caffeine + Theophylline	-	-	-	-	-	1	-	-	1
Cocaine HCL + Creatinine + Levamisole	-	-	1	-	-	-	-	-	1
Cocaine HCL + Diltiazem	-	-	1	-	-	-	-	-	1
Cocaine HCL + Diltiazem + Levamisole	-	-	-	-	-	1	-	-	1
Cocaine HCL + Ephedrine	-	1	-	-	-	-	-	-	1
Cocaine HCL + Phenacetin + Levamisole + Lidocaine + Procaine	-	-	-	1	-	-	-	-	1
Cocaine HCL + Phenacetin + Levamisole + Piracetam	-	1	-	-	-	-	-	-	1
Cocaine HCL + Phenacetin + Levamisole + Piracetam + Unknown substance	-	-	-	1	-	-	-	-	1
Cocaine HCL + Phenacetin + Levamisole + Procaine + Tetracaine	-	-	1	-	-	-	-	-	1
Cocaine HCL + Phenacetin + Lidocaine + Piracetam	-	-	-	-	1	-	-	-	1
Cocaine HCL + Phenacetin + Lidocaine + Procaine	-	-	-	1	-	-	-	-	1
Cocaine HCL + Phenacetin + Lidocaine + Procaine + Tetracaine	-	-	-	-	1	-	-	-	1
Cocaine HCL + Phenacetin + MDMA	-	-	-	-	-	1	-	-	1
Cocaine HCL + Phenacetin + Piracetam	-	-	-	-	-	-	-	1	1
Cocaine HCL + Phenethylamine + Ibuprofen	-	-	-	-	1	-	-	-	1
Cocaine HCL + Phenethylamine + Levamisole	-	-	-	-	-	-	1	-	1
Cocaine HCL + Furcarbanil + Metamizol	-	-	-	-	-	1	-	-	1
Cocaine HCL + Hydroxyzine	-	-	1	-	-	-	-	-	1
Cocaine HCL + Ibuprofen + Levamisole + Lidocaine	-	-	-	-	-	1	-	-	1
Cocaine HCL + Ibuprofen + Levamisole + Paracetamol	-	-	-	-	-	-	1	-	1
Cocaine HCL + Ibuprofen + Levamisole + Procaine	-	1	-	-	-	-	-	-	1
Cocaine HCL + Ibuprofen + Piracetam	-	-	-	-	-	1	-	-	1
Cocaine HCL + Levamisole + Levamisole	-	-	-	1	-	-	-	-	1
Cocaine HCL + Levamisole + Lidocaine + Procaine + Tetracaine	-	-	-	-	-	1	-	-	1
Cocaine HCL + Levamisole + Lidocaine + Tetracaine	-	1	-	-	-	-	-	-	1
Cocaine HCL + Levamisole + Piracetam + Procaine	-	-	1	-	-	-	-	-	1
Cocaine HCL + Lidocaine + Paracetamol	-	-	-	-	-	1	-	-	1
Cocaine HCL + Lidocaine + Tetracaine	1	-	-	-	-	-	-	-	1
Cocaine HCL + Metamizol	-	-	-	-	-	1	-	-	1
Cocaine HCL + Methylsalicylate	-	-	-	-	-	1	-	-	1
Cocaine HCL + Paracetamol + Tetracaine	-	-	-	-	1	-	-	-	1
Cocaine HCL + Piracetam	1	-	-	-	-	-	-	-	1
Cocaine HCL + Pregabalin	-	-	-	-	-	1	-	-	1
Cocaine HCL + Tadafil	-	-	1	-	-	-	-	-	1
Cocaine HCL + Procaine + Tetracaine	-	-	1	-	-	-	-	-	1

Appendix 10. Cocaine: Adulteration by substitution

	2014	2015	2016	2017	2018	2019	2020	2021	Total
Number of samples adulterated by substitution	**22**	**9**	**20**	**27**	**20**	**25**	**14**	**9**	**146**
Number of identified samples	**13**	**8**	**18**	**18**	**13**	**17**	**13**	**12**	**37**
Caffeine	12	5	5	11	8	8	3	2	54
Lidocaine	6	2	5	4	1	4	-	1	23
Phenacetin	7	3	1	3	1	2	3	1	21
Amphetamine Sulfate	2	-	1	4	6	2	3	1	19
Paracetamol	-	-	3	1	3	4	4	3	18
Ketamine	1	1	1	3	3	5	-	2	16
Procaine	5	2	2	2	-	2	1	1	15
Tetracaine	4	2	3	2	-	-	1	1	13
Levamisole	5	-	3	3	-	-	1	-	12
MDMA	-	2	2	-	2	2	-	1	9
Piracetam	-	-	-	5	-	1	1	-	7
Phenethylamine	-	-	1	2	1	2	-	-	6
Metamizol	-	-	-	1	2	3	-	-	6
Heroin	1	-	-	2	-	1	1	-	5
Methamphetamine	-	1	1	1	-	2	-	-	5
Ibuprofen	-	-	1	2	-	1	-	-	4
Unknown substance	2	-	-	1	-	1	-	-	4
Benzocaine	-	-	-	-	-	-	1	1	2
Mirtazapine	-	-	2	-	-	-	-	-	2
N-Ethyl-Hexedrone (Hex-En)	-	-	1	-	1	-	-	-	2
Tramadol	-	-	-	-	-	1	-	1	2
Zonisamide	-	-	2	-	-	-	-	-	2
3-MMC	-	-	-	-	-	1	-	-	1
4-CL-PVP	-	-	-	-	1	-	-	-	1
4-Fluoroethylphenidate	-	-	-	-	1	-	-	-	1
Aminophenazone	-	-	-	1	-	-	-	-	1
Creatinine	-	-	-	1	-	-	-	-	1
Dextromethorphan	1	-	-	-	-	-	-	-	1
Diazepam	-	-	-	-	-	-	1	-	1
Diltiazem	-	-	-	-	-	-	1	-	1
Ethylphenidate	-	-	1	-	-	-	-	-	1
Gabapentin	-	-	-	-	-	-	1	-	1
Methylphenidate	-	-	1	-	-	-	-	-	1
Methoxetamine	1	-	-	-	-	-	-	-	1
N-Etil-nor-Pentedrona (NEP)	-	-	-	-	1	-	-	-	1

Olanzapine	-	-	-	-	-	-	-	1	1
Theophylline	1	-	-	-	-	-	-	-	1
Number of different compositions	**15**	**8**	**17**	**20**	**11**	**20**	**10**	**7**	**64**
Paracetamol	-	-	3	1	3	2	4	2	15
Ketamine	-	1	1	3	1	3	-	2	11
Amphetamine Sulfate + Caffeine	2	-	1	3	4	1	1	1	13
Levamisole	3	-	1	2	-	-	1	-	7
MDMA	-	1	1	-	2	-	-	1	5
Metamizole	-	-	-	-	2	3	-	-	5
Amphetamine Sulfate	-	-	-	1	2	-	1	-	4
Caffeine + Phenacetin	-	2	-	2	-	-	-	-	4
Phenethylamine	-	-	1	1	1	1	-	-	4
Ibuprofen	-	-	1	2	-	1	-	-	4
Lidocaine	2	-	1	-	-	1	-	-	4
Procaine	3	-	1	-	-	-	-	-	4
Caffeine	-	-	-	1	2	-	-	-	3
Phenacetin	-	-	-	1	-	-	2	-	3
Caffeine + Lidocaine	1	1	-	-	-	1	-	-	3
Caffeine + Phenacetin + Levamisole + Tetracaine	2	-	-	-	-	-	-	-	2
Caffeine + Phenacetin + Lidocaine	1	-	-	-	-	1	-	-	2
Caffeine + Heroin + Piracetam	-	-	-	1	-	-	1	-	2
Lidocaine + Procaine	-	-	1	-	-	1	-	-	2
Methamphetamine	-	1	-	-	-	1	-	-	2
Mirtazapine + Zonisamide	-	-	2	-	-	-	-	-	2
Unknown substance	-	-	-	1	-	1	-	-	2
Paracetamol + Tramadol	-	-	-	-	-	1	-	1	2
3-MMC + Methamphetamine	-	-	-	-	-	1	-	-	1
4'-fluoro-ethylphenidate + 4-CL-PVP + N-Ethyl-Hexedrone (Hex-en) + N-Etil-nor-pentedrona (NEP)	-	-	-	-	1	-	-	-	1
Aminofenazona + Metamizol	-	-	-	1	-	-	-	-	1
Amphetamine Sulfate + Benzocaine	-	-	-	-	-	-	1	-	1
Amphetamine Sulfate + Ketamine	-	-	-	-	-	1	-	-	1
Benzocaine + Caffeine + Phenacetin + Lidocaine + Procaine + Tetracaine	-	-	-	-	-	-	-	1	1
Caffeine + Dextromethorphan + Heroin	1	-	-	-	-	-	-	-	1
Caffeine + Diltiazem + Phenacetin + Procaine + Tetracaine	-	-	-	-	-	-	1	-	1
Caffeine + Phenacetin + Phenethylamine + Piracetam + Procaine	-	-	-	-	-	1	-	-	1
Caffeine + Phenacetin + Ketamine + Lidocaine	-	-	-	-	1	-	-	-	1
Caffeine + Phenacetin + Levamisole + Methamphetamine + Tetracaine	-	-	1	-	-	-	-	-	1

Caffeine + Phenacetin + Procaine	1	-	-	-	-	-	-	-	1
Caffeine + Phenacetin + Procaine + Tetracaine	-	1	-	-	-	-	-	-	1
Caffeine + Phenacetin + Tetracaine	1	-	-	-	-	-	-	-	1
Caffeine + Phenethylamine + Methamphetamine + Piracetam + Procaine + Tetracaine	-	-	-	1	-	-	-	-	1
Caffeine + Heroin	-	-	-	-	-	1	-	-	1
Caffeine + Ketamine	-	-	-	-	1	-	-	-	1
Caffeine + Ketamine + MDMA	-	-	-	-	-	1	-	-	1
Caffeine + Ketamine + Methoxetamine	1	-	-	-	-	-	-	-	1
Caffeine + Levamisole + Lidocaine	-	-	-	1	-	-	-	-	1
Caffeine + Levamisole + Lidocaine + Tetracaine	-	-	1	-	-	-	-	-	1
Caffeine + Lidocaine + MDMA	-	-	1	-	-	-	-	-	1
Caffeine + Lidocaine + Procaine	-	-	-	1	-	-	-	-	1
Caffeine + Lidocaine + Unknown substance	1	-	-	-	-	-	-	-	1
Caffeine + Lidocaine + Tetracaine	-	-	-	1	-	-	-	-	1
Caffeine + MDMA	-	-	-	-	-	1	-	-	1
Caffeine + Paracetamol	-	-	-	-	-	1	-	-	1
Caffeine + Procaine + Tetracaine	-	1	-	-	-	-	-	-	1
Caffeine + Unknown substance + Theophylline	1	-	-	-	-	-	-	-	1
Caffeine + Tetracaine	-	-	1	-	-	-	-	-	1
Creatinine + Lidocaine + Piracetam	-	-	-	1	-	-	-	-	1
Diazepam	-	-	-	-	-	-	1	-	1
Ethylphenidate + Methylphenidate	-	-	1	-	-	-	-	-	1
Phenacetin + Lidocaine	1	-	-	-	-	-	-	-	1
Phenacetin + Procaine + Tetracaine	1	-	-	-	-	-	-	-	1
Gabapentin	-	-	-	-	-	-	1	-	1
Heroin + Piracetam	-	-	-	1	-	-	-	-	1
Lidocaine + MDMA	-	1	-	-	-	-	-	-	1
Lidocaine + N-Ethyl-Hexedrone (Hex-en)	-	-	1	-	-	-	-	-	1
Olanzapine	-	-	-	-	-	-	-	1	1
Piracetam	-	-	-	1	-	-	-	-	1

GLOSSARY

2,3-DCPP	2,3-Dichlorophenylpiperazine. New substance of the piperazine class.
2-CB (Nexus)	4-Bromo-2,5-dimethoxyphenethylamine. Psychedelic of the phenethylamine class synthesized by Alexander Shulgin in 1974.
3,4-EDMA	3,4-Ethylenedioxy-N-methylamphetamine. Entactogen of the metamphetamine class, similar to MDMA.
BMDP (Benzylone)	3,4-Methylenedioxy-N-benzylcathinone. Stimulant of the cathinone class.
3-CEC	3-Chloroethcathinone. , 1-(3-chlorophenyl)-2-(ethylamino)propan-1-one. Stimulant of the cathinone class.
3-MMC	3-Methylmethcathinone. (RS)-2-(Methylamino)-1-(3-methylphenyl)-1-propanone. Stimulant of the cathinone class with similar effects as cocaine or amphetamine.
4-AcO-DMT	4-Acetoxy-N,N-dimethyltryptamine. 3-[2-(Dimethylamino)ethyl]-1H-indol-4-yl acetate. Psychedelic of the tryptamine class. Psilocin prodrug.
4-CEC	4-Chloroethcathinone. 1-(4-chlorophenyl)-2-(ethylamino)-1-propanone. Stimulant of the cathinone class.
4-CL-PVP	4-Chloro-alpha-pyrrolidinovalerophenone. 1-(4-chlorophenyl)-2-(1-pyrrolidinyl)-1-pentanone. Stimualnt of the cathinone class, structurally related to alpha-PVP.
4-CMC (Clephedrone)	4-Chloromethcathinone. 1-(4-chlorophenyl)-2-(methylamino)-1-propanone. Stimulant of the cathinone class.
4-FA	4-Fluoroamphetamine. Stimulant of the substituted amphetamine class.
4F-EPH	4-Fluoroethylphenidate. Ethyl 2-(4-fluorophenyl)-2-(piperidin-2-yl)acetate. Stimulant similar to methylphenidate.
4-FMC (Flephedrone)	4-fluoromethcathinone. 1-(4-fluorophenyl)-2-(methylamino)propan-1-one. Stimulant of the cathinone class.
4-HO-DMT (Psilocin)	3-[2-(Dimethylamino)ethyl]-1H-indol-4-ol. Naturally-occurring psychedelic of the tryptamine class, the primary psychoactive in certain species of mushrooms.
4-MEC	4-Methylethcathinone. (RS)-2-Ethylamino-1-(4-methylphenyl)propan-1-one. Stimulant of the cathinone class.
4-MMC (Mephedrone)	4-Methylmethcathinone. (RS)-2-Methylamino-1-(4-methylphenyl)propan-1-one. Stimulant of the cathinone class.
5-MAPB	(1-(benzofuran-5-yl)-N-methylpropan-2-amine). Entactogen of the benzofuran class.

5-Meo-MiPT (Moxy)	5-Methoxy-N-methyl-N-isopropyltryptamine. Psychedelic of the tryptamine class.
Alpha-PVP	Alpha-Pyrrolidinovalerophenone. (RS)-1-Phenyl-2-(1-pyrrolidinyl)-1-pentanone. Stimulant of the cathinone class. Structurally related to pyrovalerone.
Aminophenazone	Analgesic, antipyrietic and anti-inflammatory medication.
Benzocaine	Local anesthetic.
Biperiden	Anticholinergic medication used to treat Parkinson disease.
BK-DMBDB (Dibutylone)	1-(Benzo[d][1,3]dioxol-5-yl)-2-(dimethylamino)butan-1-one. Stimulant of the cathinone class.
BK-MDDMA (Dimethylone)	Stimulant of the cathinone class.
BZP	Benzylpiperazine. Stimulant of the piperazine class.
Chloroquine	Medication used to treat malaria, amebiasis and rheumatic disease.
Creatine	Food supplement.
Deschloroketamine	DXE, DCK, 2'-Oxo-PCM. Dissociative anesthetic.
DXM (Dextrometorphan)	Opioid medication used as a cough suppressant.
Diazepam	Valium. Benzodiazepine medication used to treat anxiety.
Diclofenac	Nonsteroidal anti-inflammatory drug.
Diphenidine	1-(1,2-diphenylethyl)piperidine. Dissociative anesthetic with similar effects as ketamine.
Diltiazed	Medication used to treat high blood pressure and certain heart arrhythmias.
DOC	4-Chloro-2,5-dimethoxyamphetamine. Psychedelic drug of the phenethylamine class synthesized by Alexander Shulgin.
Ephedrine	Stimulant medication used to prevent low blood pressure during anesthesia and asthma.
Etylphenidate	Stimulant of the piperidine class similar to methylphenidate used as a medication for ADHD and narcolepsy.
Bk-EBDB (Eutylone)	Stimulant drug of the cathinone class.

Phenacetin	Old pain-relieving and antipyretic medication withdrawn from medical use as dangerous from the 1970s. Commonly used as an adulterant in cocaine.
Gabapentin	Anticonvulsant medication used to treat partial seizures and neuropathic pain.
Hydroxyzine	Antihistamine medication used in the treatment of itchiness, imsomnia, anxiety and as a pre-anesthetic.
Levamisole	Medication used to treat parasitic worm infections, commonly used as an adulterant in cocaine.
Lidocaine	Local anesthetic.
mCPP	Meta-Chlorophenylpiperazine. Stimulant drug of the phenylpiperazine class.
Melclonazepam	Medication of the benzodiazepine class similar to clonazepam.
Methylphenidate	Stimulant of the piperidine class used as a medication for ADHD and narcolepsy.
Methoxyetamine (MXE)	3-MeO-2-oxo-PCE. Belongs to the arylcyclohexylamine class, with similar effects as ketamine.
Mirtazapine	Antidepressant tetracyclic medication.
Modafinil	Stimulant medication used to treat sleepiness due to narcolepsy in adults.
Hex-en	N-Ethylhexedrone, NEH. Stimulant of the cathinone class.
BK-EBDP	Ephylone. Stimulant of the cathinone class.
NEP	N-ethyl-nor-pentadrone. Stimulant of the cathinone class.
Niacinamide	Nicotinamide (NAM). A form of vitamin B3 found in food, used as a dietary supplement and meditacion.
Olanzapine	Antipsychotic medication used to treat schizophrenia and bipolar disorder.
Piracetam	Nootropic medication used to treat dementia in older subjects with cognitive impairment.
Pregabalin	Anticonvulsant, analgesic and anxiolytic medication.
Procaine	Local anesthetic.
Isopropylphenidate	Stimulant of the piperidine class, related to methylphenidate. Used as a medication for ADHD and narcolepsy.

Sildenafil	Viagra. Medication used to treat erectile dysfunction.
Tadalafil	Cialis. Medication used to treat erectile dysfunction.
Teophylline	Medication used in therapy for respiratory diseases. Also present in tea and cocoa.
Tetracaine	Amethocaine. Local anesthetic.
TFMPP	1-[3-(trifluoromethyl)phenyl]piperazine. Stimulant of the piperazine class.
Tramadol	Opioid pain medication.
Zonisamide	Medication used to treat the symptoms off epilepsy and Parkinson's disease.

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