EUDA
EUROPEAN UNION DRUGS AGENCY

EU Drug Market: New psychoactive substances — In-depth analysis

Table of contents

EU Drug Market: New psychoactive substances describes the European NPS market from production and trafficking to distribution and use. It details the processes, materials and players involved at various stages and levels of the market. The module takes a threat assessment approach, identifying key issues and defining recommendations for action at EU and Member State level.

This resource is a module of EU Drug Markets: In-depth analysis, the fourth comprehensive overview of illicit drug markets in the European Union by the EMCDDA and Europol.

Last update: *27 June 2024*

Table of contents

Introduction

New psychoactive substances (NPS) are a broad range of drugs that are not controlled by the United Nations Drug Control Conventions. They include stimulants, cannabinoids, opioids, benzodiazepines, hallucinogens and dissociatives. Many of these substances are intended to mimic the effects of internationally controlled drugs and are sold as 'legal' replacements for them. They may pose similar health and social risks to those drugs under international control. Since 2008, the NPS market has diversified, grown significantly and spread globally. New psychoactive substances are now recognised as a global policy issue and a public health threat. The NPS market is highly dynamic and resilient, and is characterised by a high turnover of cheap, available and replaceable substances. New psychoactive substances are also increasingly integrated with the controlled drug market. As new psychoactive substances are not monitored systematically in many parts of the world there is typically limited information about production, trafficking and supply, retail markets, use and harms. A three-step legal framework of early warning, risk assessment and control measures allows the EU to rapidly detect, assess and respond to threats caused by NPS.

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Key findings and threat assessment

New psychoactive substances affect regions, countries and localities in different ways. The specific types of new psychoactive substances that emerge and the threats they pose are shaped by global supply chains and local drug situations, both of which change over time. Between 2020 and 2022, record quantities of new psychoactive substances were seized in Europe. At the same time, there are signs that the number of previously unreported new psychoactive substances entering the market may be slowing.
Highly potent substances, such as synthetic opioids, continue to emerge. These are easy to conceal and traffic, as a few grams can make thousands of doses. Following the steep decline in fentanyl derivatives appearing in Europe since 2018, the equally potent nitazene opioids have replaced them. Since 2022, a new market in semi-synthetic cannabinoids has emerged. They appear to be made from naturally occurring cannabinoids, such as CBD, and are sold openly in a broad range of consumer product forms including vapes and edibles that may be particularly attractive to young people. An increasing number of 'old' new psychoactive substances have recently re-emerged in Europe. Some of these, such as the cathinones, have been seized in industrial quantities.

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Global context

Prior to 2008, the NPS market was characterised by a small number of new psychoactive substances and consumers. Since then, the number, type and availability of new psychoactive substances have expanded rapidly across the globe. Globalisation of the chemical and pharmaceutical industry and the internet have fuelled this market. This has allowed new psychoactive substances, their precursors and key equipment to be produced, sold and supplied on an industrial scale. During this period, highly potent substances from a wider set of chemical classes have also been introduced onto the market. The specific types of new psychoactive substances that emerge and the threats they pose are shaped by global supply chains and local drug situations. In North America, for example, new opioids are now an established element of the ongoing opioid epidemic. While the use of new psychoactive substances by people with high-risk patterns of drug use appears to have increased in some places, there is a limited understanding of the epidemiology of these drugs, as commonly used methods for studying drug use and estimating prevalence may not be suitable. These issues have left gaps in our understanding of the size and impact of the market.

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Overview of production

Most new psychoactive substances on the European drug market are synthetic substances that are produced in China and India, where production of these substances and their precursors can take place on an industrial scale. This has been driven by increasing expertise and capacity in the science and technology sector, limited regulatory oversight, low labour costs, the internet, and cheap and efficient shipping. The diversification of NPS production in India may partially reflect controls implemented in China, as well as greater oversight and scrutiny of companies in China and shipments from China to Europe. Once in Europe, these new psychoactive substances are processed and packaged into a range of products. To a lesser degree, some new psychoactive substances, particularly synthetic cathinones, are produced from precursors in Europe. Overall, an increasing number of laboratories involved in the synthesis of new psychoactive substances were dismantled in Europe between 2017 and 2021. As is the case with other synthetic drugs produced in Europe, the precursors may be sourced from China and India. Worryingly, there are also recent signals in 2023 of possible fentanyl production in Latvia.

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Distribution and supply in Europe

New psychoactive substances are sold as substances in their own right but they are also used to make a range of consumer products sold as ‘legal highs’. New psychoactive substances are sold openly in shops, vending machines and on the surface web and social media, as well as on the darknet. They are also sold on street-level drug markets, sometimes being mis-sold as or used to adulterate controlled drugs. A particularly risky example of this is the entry of highly potent synthetic opioids into the supply chain for heroin and other established opioids.

In 2022, more than 30.7 tonnes of new psychoactive substances were seized in Europe. A small number of large seizures at the external EU border accounted for the bulk of the quantity seized, with cathinones (26.5 tonnes), predominantly from India, representing 87 % of the total quantity seized. The broad range of new psychoactive substances and consumer products, combined with the dynamic nature of the market, gives rise to a complex picture across Europe. The capacity to detect and report new psychoactive substances also differs across Europe, meaning that there is both under-detection and under-reporting in some areas.

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Synthetic cathinones

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Synthetic cannabinoids

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Semi-synthetic cannabinoids

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New opioids

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Benzodiazepines

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Ketamine

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Actions to address current threats and increase preparedness

The analysis of the NPS market supports a number of conclusions with regard to the protection of public health and security. In particular, it is necessary to continue to support and strengthen the capacity of national and EU early warning systems to increase situational awareness, as well as strengthen preparedness planning and the development of response measures. There is also a need to increase the ability of forensic science and toxicology laboratories to identify new psychoactive substances as well as their precursors and metabolites. Enhanced international cooperation between the Member States, EU bodies and agencies, third countries and key international partners is needed.

Read more

All of the source data used in graphics and data tables may be found on each page as well as in our Data catalogue.

Methodology and references

Methodology: Read more about the methodology used to collect data in this analysis.

References: Consult the list of references used in this module.

Abbreviations: Consult the list of acronyms and other abbreviations used in EU Drug Markets: In-depth analysis.

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EU Drug Market: New psychoactive substances — Introduction

The term 'new psychoactive substances' (NPS) covers a broad range of substances that are not controlled under the United Nations drug conventions, although some may be subject to national controls and regulatory measures ([1]). They include stimulants, cannabinoids, opioids, benzodiazepines, dissociatives and hallucinogens. Many are intended to mimic the effects of controlled drugs and are traded as 'legal' replacements for them. They may pose similar health and social risks to those drugs under international control. As well as new psychoactive substances, this module includes substances that have been recently controlled internationally, for example, synthetic cathinones (such as 4-MMC and 4-CMC), synthetic cannabinoids (such as 4F-MDMB-BINACA), benzodiazepines (such as etizolam), and opioids (such as carfentanil and isotonitazene).

Since 2008, the NPS market has diversified, grown significantly and spread globally. New psychoactive substances are now recognised as a global policy issue and a public health threat.

This resource is part of EU Drug Market: New psychoactive substances — In-depth analysis by the EMCDDA and Europol.

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By the end of 2023, around 1 200 new psychoactive substances had been identified on the global drug markets over the last 15 years (UNODC, 2023). This growth has been driven by globalisation and the internet, and fuelled by the exploitation of loopholes in national drug laws and regulatory approaches. This has allowed new psychoactive substances and their precursors to be manufactured on an industrial scale, mainly in China and India, and sold, transported and supplied relatively freely. The market is highly dynamic and resilient, and is characterised by a high turnover of cheap, available and replaceable substances. New psychoactive substances are also increasingly integrated with the controlled drug market.

The public health risks have also grown during this time, with threats increased by the continual flow of new, potent substances and products, illicit production, easier ways to buy and use the new psychoactive substances, and new, broader groups of users. Risks also stem from the unregulated globalised supply chains, where new psychoactive substances can be mis-sold, adulterated or contaminated with a range of potentially dangerous and sometimes highly toxic substances.

While new psychoactive substances are sold as drugs in their own right, they are also used to make a range of products sold under the guise of being 'legal highs', 'research chemicals' and 'dietary supplements'. In other cases, they are mis-sold as or used to adulterate controlled drugs without consumers' knowledge. This includes using them to make fake medicines. An additional element of the market is the sale and use of psychoactive medicines that are not under international control. New psychoactive substances are sold openly in brick-and-mortar shops and on the surface web, but also on the darknet and on existing street-level drug markets.

New psychoactive substances affect regions, countries and localities in different ways. The specific types of new psychoactive substances that emerge and the threats they pose are shaped by global supply chains and local drug situations, both of which change over time. In some cases, new psychoactive substances are encountered only sporadically; in others, they may become more widespread but temporary; while in some cases they may become more prevalent, persistent and problematic.

Between 2020 and 2022, record quantities of new psychoactive substances were seized in Europe. Large seizures of a few substances, notably cathinone stimulants and ketamine, accounted for most of the quantity seized. At the same time, there are signs that the number of previously unreported new psychoactive substances entering the market may be slowing. While an average of 50 new psychoactive substances were reported for the first time each year between 2016 and 2022, this fell by almost 50 % in 2023, to 26. A similar downward trend has been reported at the global level in 2022. The reason for this apparent decline and its significance for the market is unclear and likely complex.

As new psychoactive substances are not monitored systematically in many parts of the world there is typically limited information about production, trafficking and supply, retail markets, use and harms.

In the European Union, legislation designed to rapidly detect and respond to the health and social risks of new psychoactive substances allows more systematic monitoring by the Member States and the EU Early Warning System on new psychoactive substances. However, the information available on new psychoactive substances is limited in comparison to that available on established controlled drugs (see Box Responding to new psychoactive substances in the EU).

Responding to new psychoactive substances in the EU

Since 1997, a three-step legal framework of early warning, risk assessment and control measures has allowed the European Union to rapidly detect, assess and respond to threats caused by new psychoactive substances. The European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) is responsible for the first two steps of this system, namely operating the EU Early Warning System on new psychoactive substances, in close cooperation with Europol, and conducting risk assessments through its Scientific Committee. The European Commission is responsible for proposing control measures.

Learn more about this work: EU Early Warning System

(1) In this module, the term ‘new psychoactive substances’ also includes substances originally monitored by the EMCDDA as new psychoactive substances but that have subsequently been placed under international control. 4-MTA, GHB and 2C-B were initially controlled in 2001 and a total of 78 new psychoactive substances have been controlled since 2015. They include synthetic cathinones (such as 4-MMC, 4-CMC, 3-MMC), synthetic cannabinoids (such as 4F-MDMB-BINACA), benzodiazepines (such as etizolam and flualprazolam), and opioids (such as carfentanil, isotonitazene, metonitazene and protonitazene).

References

Consult the list of references used in this module.

EU Drug Market: New psychoactive substances — Key findings and threat assessment

General

New psychoactive substances affect regions, countries and localities in different ways. The specific types of new psychoactive substances that emerge and the threats they pose are shaped by global supply chains and local drug situations, both of which change over time.

Record quantities of new psychoactive substances were seized in Europe between 2020 and 2022. Large seizures of a few substances, notably cathinone stimulants and ketamine, accounted for most of the seized material.

There are signs that the number of new psychoactive substances entering the market for the first time may be slowing. The reason for this apparent decline and its significance for the market is unclear and likely complex.

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Highly potent substances, such as synthetic opioids, continue to emerge. These are easy to conceal and traffic, as a few grams can make thousands of doses. As they are not controlled under drug legislation they can be manufactured, sold and transported relatively freely.

An increasing number of 'old' new psychoactive substances have recently re-emerged in Europe. Some of these, such as the cathinones, have been seized in industrial quantities. The re-emergence of substances appears to be linked to attempts to exploit differences in national drug laws and the spread of new psychoactive substances globally.

Production and precursors

China and India continue to be major suppliers of new psychoactive substances to Europe. Since 2019, production in India has diversified into synthetic cathinones, ketamine-like substances and, more recently, xylazine.

EU production of new psychoactive substances has expanded and is increasingly sophisticated and diversified. In particular, there has been a significant increase in the production of synthetic cathinones. Recent signals also suggest that synthetic cannabinoids are being synthetised in the European Union. This may be linked to the recent generic control of synthetic cannabinoids in China.

Few NPS precursors are controlled, except those for some fentanyl derivatives. This may explain, for example, the increase in cathinone production in Europe, as the precursors are sold openly by companies in China and India.

Since 2022, a new market in semi-synthetic cannabinoids has emerged. These substances are synthesised from cannabidiol (CBD), which is extracted from low-THC cannabis (hemp). While initially the supply of bulk quantities of semi-synthetic cannabinoids came from the United States, there are signs that they are also being produced in Europe.

Low-THC cannabis therefore has become a source of CBD for semi-synthetic cannabinoid production, but it is also used as a substrate for semi-synthetic cannabinoids and synthetic cannabinoids.

Substances

Cathinones

Until around 2019, most bulk quantities of synthetic cathinones seized at the external EU borders originated in China. However, since then, production has also spread to India, where they appear to be produced on a large scale. The quantity of synthetic cathinone seized in Europe rose sharply between 2020 and 2022, increasing to 26.5 tonnes in 2022. This increase was driven by a small number of large seizures by customs agencies in the Netherlands and Spain, originating in India. In addition, the production of synthetic cathinones in parts of Europe continues to grow.

There are signs that a small number of synthetic cathinones are becoming established in stimulant markets in Europe. Active monitoring is required to better assess the situation and identify and reduce potential health risks.

Cannabinoids

The number of new synthetic cannabinoids appearing on the market significantly increased in 2021 and 2022, probably due to efforts to circumvent the generic controls implemented in China in 2021. As a result, during this short time, producers innovated by introducing many new cannabinoids from new chemical groups onto the market. In 2023, this fell to five substances. The reason for this fall is unclear but it may relate to failed attempts to produce suitable replacement substances or be due to a drop in demand from suppliers in Europe.

Since 2020, low-THC cannabis adulterated with synthetic cannabinoids has been identified in at least 13 countries in Europe. In 2021, around 50 % of all seizures of herbal material containing synthetic cannabinoids were of low-THC cannabis adulterated with synthetic cannabinoids, but this proportion fell to 30 % in 2022.

Since 2021, products sold as cannabis or THC edibles but containing highly potent synthetic cannabinoids have been identified in Europe. These products may be particularly attractive to

young people. They pose a high risk to users' health, and cases of severe poisoning have been recorded in the European Union after the ingestion of sweets infused with synthetic cannabinoids.

Several semi-synthetic cannabinoids (e.g. hexahydrocannabinol, HHC) have emerged on the EU market in the last few years. They appear to be made from naturally occurring cannabinoids, such as CBD, and are sold openly in a broad range of consumer product forms. These include vapes and edibles that may be particularly attractive to young people.

Opioids

Following the steep decline in fentanyl derivatives appearing in Europe since 2018, the equally potent nitazene opioids have replaced them. Carfentanil, however, continues to be an issue in the Baltic region.

There are signs that synthetic opioids are being seen more often in some national drug markets, and concerns that they may become more prevalent in Europe. The reasons are not fully understood and may include a range of factors such as disruptions to supply.

While sporadic, the mis-selling or adulteration of heroin and other established opioids with synthetic opioids may be increasing in Europe. Such events increase the risk of life-threatening overdose for consumers, and can manifest as outbreaks that occur without warning.

Since 2021, synthetic opioids mixed with the animal sedative and analgesic xylazine ('tranq-dope') have been identified in Europe. More recently, the mixing of synthetic opioids with benzodiazepines ('benzo-dope') has been identified in Europe. There has also been an increase in identifications of xylazine during 2022-2023. The mixing of synthetic opioids with these substances appears to be copied from dealers in North America. Although the data are limited, concerns exist over fake medicines, particularly oxycodone, that contain new opioids.

Benzodiazepines

New benzodiazepines continue to be used to make fake versions of legitimate medicines, such as Xanax, and sold on the darknet and surface web. There are concerns that criminals could exploit restrictions on the prescription of benzodiazepine medicines, over concerns about their abuse, by supplying fake medicines to meet demand. In addition, similar to the use of synthetic cannabinoids, concerns also exist over the potential spread of new benzodiazepines to prisons in Europe.

References

Consult the list of references used in this module.

EU Drug Market: New psychoactive substances — Global context

Before 2008, the NPS market was characterised by a small number of new psychoactive substances and low numbers of consumers, typically in high-income countries. The substances were mostly stimulants and psychedelics, made in amateur and illicit laboratories in Europe. Certain new psychoactive substances were mis-sold as amphetamine or ecstasy, including PMMA, which was implicated in a number of fatalities in the early 2010s. They were popular at electronic dance music events and raves. Others were used by 'psychonauts' interested in exploring their effects. Few were seized in large amounts (EMCDDA, 2022a).

Since then, the number, type and availability of new psychoactive substances have expanded rapidly across the globe. Globalisation of the chemical and pharmaceutical industry and new technologies such as the internet have fuelled this market. This has allowed new psychoactive substances, their precursors and the equipment used to make and package them to be produced, sold and supplied on an industrial scale. In particular, during this period, more novel and sometimes highly potent substances from a wider set of chemical classes have been introduced onto the market. The use of new psychoactive substances by high-risk drug users and other marginalised and vulnerable populations also appears to have increased in some places (EMCDDA, 2022a).

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Between 2009 and 2022, a total of 139 countries and territories reported the emergence of 1 182 different new psychoactive substances to the United Nations Office on Drugs and Crime (UNODC), through the UNODC Early Warning Advisory on NPS (UNODC, 2022). This is almost four times the number of psychoactive substances that were under international control by 2023 (318). Meanwhile, in Europe, between 1997 and 2023, EU Member States reported the emergence of more than 960 different new psychoactive substances to the EU Early Warning System. Around 860 (90 %) of these have been detected since 2008, when the market began to expand rapidly (EMCDDA, 2022a). This growth is also reflected in the number of NPS seizures and the quantity seized by law enforcement agencies and in reports of poisonings and other harms.

New psychoactive substances affect regions, countries and localities in different ways. In some cases, new psychoactive substances are encountered only sporadically as one-off events; in others, they may become more widespread but temporary features; while in some they may re-shape drug markets, and become more prevalent, persistent and problematic. As new psychoactive substances are easily available, they can emerge, often rapidly, in any place. Importantly, the specific types of new psychoactive substances that emerge and the threats they pose are shaped by global supply chains and local drug situations, both of which can change over time.

In North America, for example, new opioids, benzodiazepines and now xylazine are established elements of the ongoing opioid epidemic. These substances are either mis-sold as or used to adulterate established drugs such as fentanyl that are driving the epidemic. In this case, consumers are unaware that they are using new psychoactive substances (Bowles et al., 2021; Friedman et al., 2022; Laing et al., 2021; Pardo, 2022; Reyes et al., 2022; Wong et al., 2008). More generally, in 2021, new psychoactive substances accounted for 7 (28 %) of the 25 most identified drugs reported to the US National Forensic Laboratory Information System (NFLIS), a drug surveillance programme that systematically collects data on drugs that are seized by law enforcement and submitted to and analysed by forensic laboratories.

In West Africa, an increased supply from India of fake tablets and capsules ('pills') containing tramadol – an opioid medicine – resulted in a recent increase in both use and harm (UNODC, 2021). This is fuelled by unapproved high-dose pills that are not available through the regulated medicine supply chain, which are imported and then distributed by criminal networks. The tramadol is concealed using various methods and imported by air and sea cargo. The criminals exploit states' vulnerabilities, including by using corruption to avoid control and seizure (UNODC, 2021). Following the control of tramadol in India in 2018, the supply has at least partially diversified into other substances, including tapentadol (UNODC, 2021).

In China, recent reports from wastewater analysis and police seizures suggest an increase in the use of synthetic cannabinoids commonly found in Europe and the United States (Fan et al., 2022; Liu et al., 2022), while use of ketamine-like new psychoactive substances, such as 2-fluorodeschloroketamine, has also been reported (Shao et al., 2021). New benzodiazepines have been increasingly identified in fake medicines in Australia (Blakey et al., 2022; Syrjanen et al., 2023). In Australia and New Zealand, fake oxycodone tablets containing potent nitazene opioids have been identified (Australian Federal Police, 2023; Drug Information and Alerts Aotearoa New Zealand, 2022). In Brazil, similar to Europe, papers infused with synthetic cannabinoids and smuggled into prisons have been reported (Rodrigues et al., 2022). Smoking mixtures made of synthetic cannabinoids, controlled drugs and herbal material have also been reported recently in Egypt (Hussien et al., 2022). Meanwhile, in Argentina, the one-off adulteration of cocaine with carfentanil, an ultra-potent opioid, caused an outbreak of poisonings including deaths during 2022 (Di Nicola, 2022; Ministerio de Salud, 2022).

There is a limited understanding of the epidemiology of new psychoactive substances. Commonly used methods for studying drug use, including those for estimating prevalence, may not be suitable or appropriate for many new psychoactive substances. This may especially be the case for those substances that have recently appeared on the market, rapidly disappeared, have low levels of use or are mis-sold as or used to adulterate other drugs. Standard data collection tools do not account for such instances. These issues have left gaps in our understanding of the size, scale and impact of the market.

Prevalence

In Europe, the prevalence of new psychoactive substances use in the general population tends to be lower than that of established controlled drugs (see Box Prevalence of use of new psychoactive substances in Europe). There are some exceptions to this, such as ketamine, which has become established in some places. Nitrous oxide is an example of a new psychoactive substance that has recently emerged rapidly in some countries, such as the Netherlands, with relatively high levels of use among the general population, especially young people (see Box Recreational use of nitrous oxide: a growing concern for Europe).

In addition, the use of some new psychoactive substances, such as synthetic cathinones, synthetic cannabinoids, opioids and benzodiazepines, may be relatively common among high-risk drug users and other marginalised groups in some areas and settings. Despite what appear to be relatively low levels of use, some of these substances, in particular the synthetic opioids, have the potential to cause high levels of harm (see Section Distribution and supply in Europe: new opioids).

Prevalence of use of new psychoactive substances in Europe

National estimates of last year use of new psychoactive substances (excluding ketamine and GHB) among young adults (aged 15 to 34) range from 0.1 % in Latvia to 5.1 % in Romania. Among 15- to 16-year-old schoolchildren, the most recent European survey (ESPAD Group, 2020), from 2019, estimated that lifetime use of new psychoactive substances ranged from 0.9 % to 6.6 %, with lifetime use of synthetic cannabinoids ranging from 1.1 % to 5.2 % and synthetic cathinones from 0.2 % to 2.5 %.

Recent estimates of last year prevalence of ketamine use among young adults (15-34) range from 0.4 % in Denmark (2021, 16-34) to 0.8 % in Romania (2019). The Netherlands reported that ketamine use has recently increased among young people in nightlife settings.

In 2022, generally very low levels of ketamine residues were reported in municipal wastewater by 15 cities, with the highest mass loads being detected in cities in Denmark, Spain, Italy and Portugal.

Recreational use of nitrous oxide: a growing concern for Europe

Nitrous oxide, commonly known as laughing gas, is inhaled recreationally for its rapid but short-lived feelings of euphoria, relaxation, calmness and sense of detachment. While it has been used recreationally for almost 250 years, use of the substance has increased in some European countries since 2010. This became a particular concern around 2017-18, when small cartridges became available in more shops and in larger quantities. Since then, the availability of larger gas canisters intended for recreational use has also increased. The popularity of nitrous oxide is explained by its easy availability, low price, short-lived effects and the general perception by users

that it is a relatively safe and socially acceptable drug (EMCDDA, 2022d).

Seizure of over 59 000 nitrous oxide canisters worth over EUR 1.9 million in Ireland by Revenue in December 2021. Source: https://revenue.ie/, https://twitter.com/RevenueIE) ® Revenue

A recent EMCDDA review identified a number of EU Member States, including Denmark, Ireland, France, the Netherlands and Portugal, that have seen signs of an increase in the availability and recreational use of nitrous oxide. For example, in the Netherlands, the 2020 general population survey for adults aged 18 and older found that nitrous oxide use in the last 12 months was highest among young adults aged 18-19 years (14.5 %) and 20-24 years (12.1 %). This is six times higher than among the wider adult population (15-64 years; 2.1 %). Meanwhile, use by 12- to 16-year-olds in the last 12 months was 6.7 %, with 11.7 % of 15- to 16-year-olds using the gas.

The gas has been linked to various health problems, including short-lived adverse effects, burns, lung injuries and, in some cases of prolonged exposure, neurotoxicity. High-volume cylinders may also increase the risk of more prolonged use and injuries. In some European cities, discarded nitrous oxide gas cartridges and cylinders have become a relatively common sight, and their disposal has been identified as a drug-litter issue. Used cylinders pose a risk of explosion during waste processing if disposed of in general waste, and in some cases have caused damage to facilities.

Information on the source of nitrous oxide is limited. Alongside the use of small canisters of the gas intended for food preparation, typically bought from supermarkets and retailers, investigative journalism suggests that some of the high-volume cylinders originate from companies in China. In some cases, they may be deliberately mislabelled as being of EU origin (Arrling and Ziegerer, 2023).

Regulatory approaches to the sale and use of this substance vary between countries, with the gas being legally available for sale in some countries.

References

Consult the list of references used in this module.

EU Drug Market: New psychoactive substances — Overview of production

Most new psychoactive substances on the European drug market are synthetic substances that are produced in China and India. The growth in the market observed since around 2008 relates to the chemical and pharmaceutical companies operating in these countries, which are capable of making numerous new psychoactive substances and precursors on an industrial scale. This has been driven by increasing expertise and capacity in the science and technology sector, limited regulatory oversight, low labour costs, the internet, and cheap and efficient shipping.

The companies use the internet, including online marketplaces, to advertise and sell a diverse range of substances. Typically, these are supplied in powder form, in quantities that range from a few milligrams to tens or even hundreds of kilograms. Companies can also offer a custom synthesis service for customers looking to obtain a specific new psychoactive substance or precursor that is not currently available on the market.

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In some cases, apparently legitimate chemical and pharmaceutical companies also produce new psychoactive substances and precursors in the same factories as their regular products. In others, they may use makeshift factories on the outskirts of a city or in rural areas to produce substances for a limited time. Here, to avoid suspicion, the labourers and chemists may be brought in from outside the local area.

The substances are shipped to wholesalers, retailers, dealers and consumers in Europe using global logistics companies. Small amounts are typically shipped with express mail and courier services, while larger quantities are shipped by air and sea cargo. Consignments may be mislabelled and declared as common goods of low value, including chemical products (e.g. 'hot melt adhesive powder' or 'silicon dioxide'), foodstuffs and cosmetics, to conceal their identity and avoid interception. They may also be concealed using similar methods to those used for trafficking controlled drugs. Suppliers and importers may also deliberately route new psychoactive substances to specific air and seaports in Europe where the substances are not controlled, to reduce the chance of interception. The Netherlands and Spain appear to be two of the most important entry points for large shipments of new psychoactive substances from China and India.

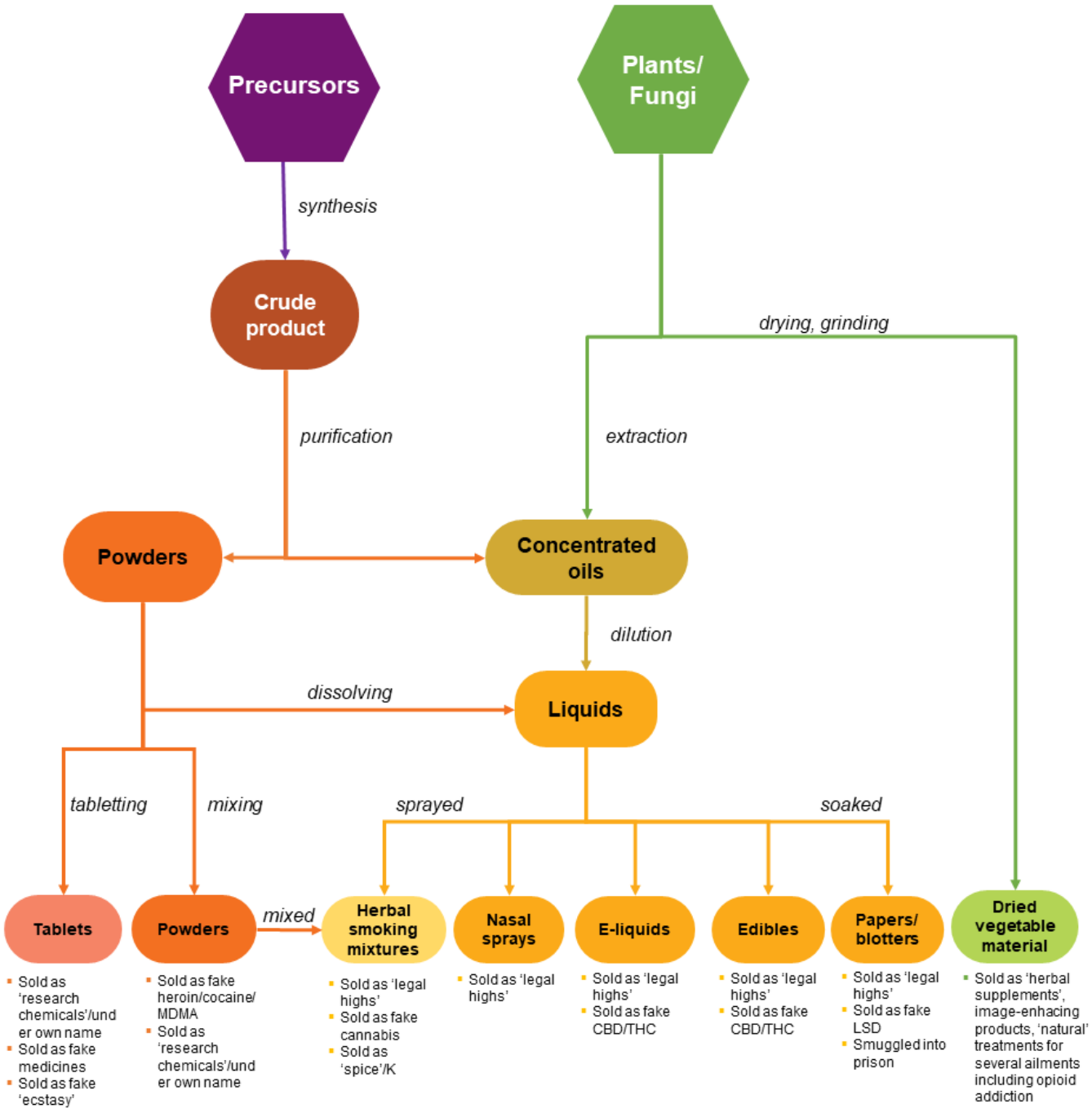
India has long been recognised as a source of non-controlled psychoactive medicines, such as tramadol and ketamine. This reflects a long-established and well-equipped chemical and pharmaceutical industry in the country, part of which was already producing these medicines. Since 2019, there are signs that production has diversified into other new psychoactive substances, especially synthetic cathinones and ketamine-like substances. More recently, India has also been a source of the veterinary medicine xylazine.

This diversification may partially reflect the control of an increasing number of new psychoactive substances in China, as well as greater oversight and scrutiny of companies in and shipments from China. Supply chain disruption during the COVID-19 pandemic may have also played at least a partial role in this diversification; however, it is unclear if this is a temporary or more permanent shift.

Once in Europe, new psychoactive substances are processed and packaged into a range of products (see Figure Principal types of consumer products that can be made from new psychoactive substances). This can occur at different levels of the supply chain. Depending on the type of substance, in some cases processing is minimal, and in others it is more substantial and sophisticated. It may simply involve repackaging powders, and perhaps adding diluents or adulterants. For example, cathinone stimulants may be packaged into smaller quantities and then sold on the street. In other cases, new synthetic opioid or benzodiazepine powders may be tableted to make fake versions of frequently misused medicines (such as oxycodone, diazepam and alprazolam) and sold on the surface web, darknet or at street-level. Some substances, such as synthetic cannabinoids, may be dissolved and used to soak paper (such as letters and photos) which is then smuggled, undetected, into prisons where the paper can be smoked. In more innovative operations, other new psychoactive substances, such as semi-synthetic cannabinoids, may be processed into a range of 'legal high' type products – such as smoking mixtures, edibles and vapes – with brightly coloured, professional-looking designs. These may be sold openly in shops, vending machines and online.

Similar to other drugs, the purity of new psychoactive substances, and the presence of adulterants and diluents, depends on factors such as when and where in the supply chain the substances are obtained, and why the substances are used. Limited representative information is currently available, which partly reflects differences in the level of analyses conducted on physical samples as well as reporting practices in Europe. Where reported, bulk quantities of new psychoactive substances, and particularly powders, imported from China and India have typically been described as 'pure'.

Principal types of consumer products that can be made from new psychoactive substances

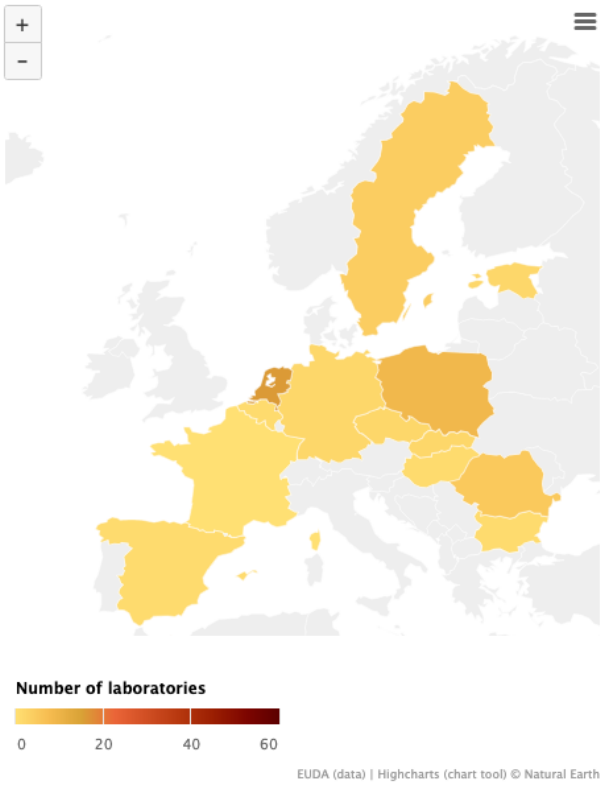


To a lesser degree, some new psychoactive substances, particularly synthetic cathinones, are produced from precursors in Europe. Until 2019, the processing and packaging of new psychoactive substances was commonly found in the European Union, but the synthesis of the drugs was rare (EMCDDA and Europol, 2019). This seems to be changing, with an increasing number of laboratories that synthetised new psychoactive substances being dismantled in Europe between 2017 and 2021.

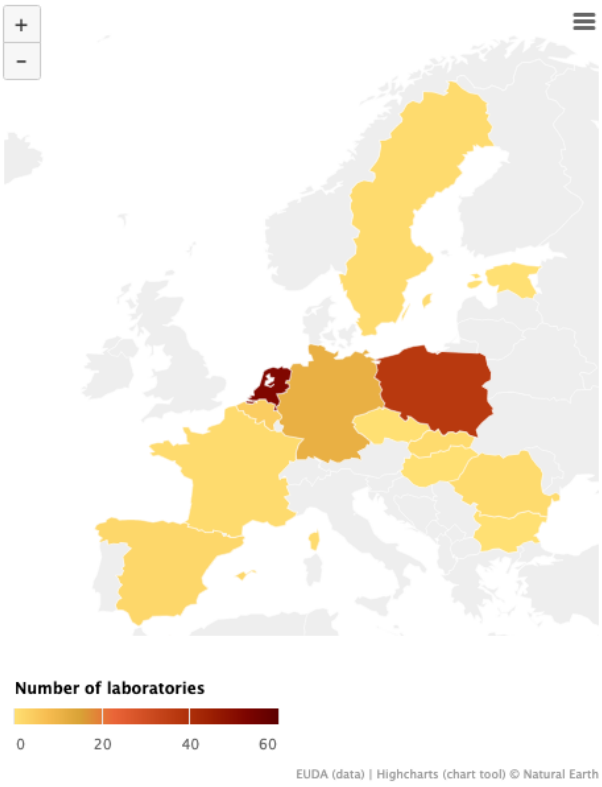
Data reported to the EMCDDA and Europol show that, in the period between 2013 and 2016, 46 NPS production sites were reported by 12 countries, while in the following period (between 2017 and 2021) the number increased to 110 production sites in 9 countries. The biggest increases were

observed in the Netherlands, from 16 sites between 2013 and 2016 to 55 sites between 2017 and 2021, and in Poland, where it increased from 9 to 40 sites in the same time frame (see Figures Number of laboratory sites associated with NPS production dismantled in Europe in 2013-2016 and 2017-2021). The majority of the dismantled sites produced either cathinones (47 sites or 40 %) (see Section Distribution and supply in Europe: synthetic cathinones) or GHB/GBL (34 sites or 29 %) (see Figure Number of laboratory sites associated with NPS production dismantled in Europe in 2017-2021, by category of new psychoactive substance produced and Box Production of GHB in Europe).

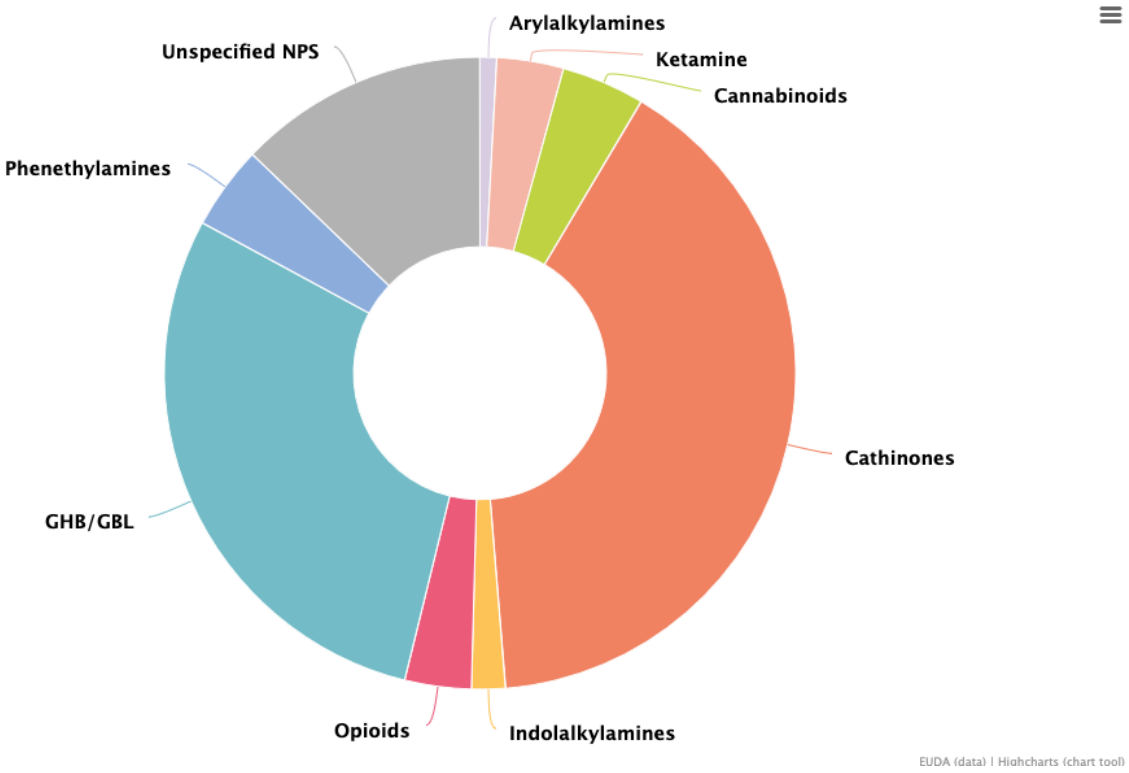
Number of laboratory sites associated with NPS production dismantled in Europe in 2013-2016



Number of laboratory sites associated with NPS production dismantled in Europe in 2017-2021



Number of laboratory sites associated with NPS production dismantled in Europe in 2017-2021, by category of new psychoactive substance produced



Note: As the same site can produce more than one substance, the numbers in this figure and figure Number of laboratory sites associated with NPS production dismantled in Europe in 2013-2016 and 2017-2021 do not match.

Production of GHB in Europe

Between 2017 and 2021, at least 34 facilities in Europe involved in the production of GHB were dismantled, compared with 12 between 2013 and 2016. The large majority of the facilities dismantled were located in the Netherlands (29 sites; 85 %), with production facilities also being reported by Belgium, France, Germany, Poland and Sweden.

Smaller 'kitchen-style' facilities may not always be reported to the central authorities, and instead seizures of GBL and/or GHB are recorded. Some of these facilities may be operating in Estonia and Austria (EMCDDA, unpublished).

Evidence suggests that the illicit manufacture of GHB is typically carried out by the hydrolysis of GBL (gamma-butyrolactone). The process is straightforward and only requires the addition of a base (e.g. sodium or potassium hydroxide) to an aqueous solution of GBL, which is commercially available. The resulting product may be isolated as a powder, partially dried to a paste or wet mass, concentrated or left in solution. Dangers associated with production relate to the fact that the hydrolysis reaction releases heat and the precursor GBL is flammable (EMCDDA, 2008).

As is the case with other synthetic drugs produced in Europe, the precursors may be sourced from China and India. To avoid interception, they may be shipped in mislabelled consignments or concealed using similar methods to those used for trafficking controlled drugs. Other chemicals and equipment required may be sourced from China, India or Europe.

Production may be carried out in Europe for several reasons: existing knowledge of, equipment for and experience in synthetic drug production; sufficient demand for a substance, making the venture economically attractive; control measures and law enforcement operations targeting laboratories in China and India, reducing availability at source; the lack of legal controls on precursors; the potential to make greater profits; risk diversification and building greater resilience into the supply chains; and to reduce the risks of detection by law enforcement agencies.

A few new psychoactive substances, such as the cathinone alpha-PVP and the synthetic opioid carfentanil, may be supplied from Russia and Ukraine to neighbouring EU countries, the latter especially to Estonia, Latvia and Lithuania. There are recent signals in 2023 of possible fentanyl production in Latvia (see Section Distribution and supply in Europe: new opioids).

In addition, since around 2021, European countries have identified the United States as a source of bulk quantities of semi-synthetic cannabinoids and consumer products containing these substances. Sold as replacements for cannabis and THC, substances such as hexahydrocannabinol (HHC) may be synthesised from cannabidiol (CBD) extracted from low-THC cannabis (hemp). During 2022 and 2023, there were also indications that European suppliers have copied this idea and started to synthesise some semi-synthetic cannabinoids in Europe (see Section Distribution and supply in Europe: semi-synthetic cannabinoids).

Further information on the production of synthetic cathinones, cannabinoids, opioids and ketamine, with a particular reference to European production, is provided in the section on Distribution and supply in Europe.

All of the source data used in graphics and data tables may be found in our Data catalogue.

References

Consult the list of references used in this module.

EU Drug Market: New psychoactive substances — Distribution and supply in Europe

Detailed information by substance category

This resource is part of EU Drug Market: New psychoactive substances — In-depth analysis by the EMCDDA and Europol.

Last update: *27 June 2024*

Background

New psychoactive substances are sold as substances in their own right and they are used to make a range of products sold as ‘legal highs’, ‘research chemicals’ and ‘dietary supplements’.

In other cases, they are mis-sold as or used to adulterate controlled drugs without consumers knowing. This may be a temporary or longer-term response to reduced supply or the increased costs of established drugs. Particularly risky examples of this are when highly potent synthetic opioids enter the supply chain for heroin and other established opioids, or when they are used to make fake tablets of opioid analgesic medicines, such as oxycodone. In both cases, this can cause outbreaks of poisonings.

An additional element of the market is the sale and use of psychoactive medicines not under international control, such as tramadol and pregabalin. These are diverted as medicines from the regulated market or sourced as bulk powders or fake medicines from other countries.

New psychoactive substances are sold openly in brick-and-mortar shops and on the surface web, but also on the darknet and on street-level drug markets.

The broad range of new psychoactive substances and products – combined with the dynamic nature of the market, strong links with the markets for controlled drugs and differences in local drug situations – gives rise to a complex picture across Europe. This is partly reflected in differences in the number of seizures and the quantity and types of new psychoactive substances seized in different countries.

The capacity to detect and report new psychoactive substances also differs across Europe, meaning that there is both under-detection and under-reporting in some areas.

Resilience in the supply of new psychoactive substances comes from continually circumventing new control measures by supplying non-controlled replacements, and from exploiting differences in national drug laws and regulatory approaches. For example, in 2019, Dutch Police noted that 264 kilograms of the cathinone stimulant 3-MMC seized by customs was later released to the owner as it was not a controlled drug.

The globalisation of the chemical and pharmaceutical industry and differences in national drug control measures also allow new psychoactive substances to re-emerge on the market after being absent for a period of time. As the NPS market has expanded globally, Europe has seen a relatively large number of new psychoactive substances that first emerged many years ago disappear from the market to a large extent, only to re-emerge years later, sometimes in industrial quantities. Examples include synthetic cathinones, such as 3-MMC, 3-CMC and alpha-PHiP (see Section Distribution and supply in Europe: synthetic cathinones). This phenomenon is linked to differences in national controls, including between China and India, where control in one country can lead production to switch to another country. In other cases, changes in international controls can also play a role.

The control of some new psychoactive substances at the international level adds an additional layer of complexity. In part, this is because there is significant variation between countries (including producer countries) in the time it takes to implement international controls into national legislation. In some cases, production and supply of a particularly prevalent new psychoactive substance may continue for some time following its international control.

The international control of the potent opioid isotonitazene led to suppliers switching to other members from this family of substances, such as metonitazene and protonitazene. Similarly, the control of the two main benzodiazepines on the market, etizolam and flualprazolam, at international level led to suppliers switching to replacements such as bromazolam.

Number and types of new psychoactive substances on the market

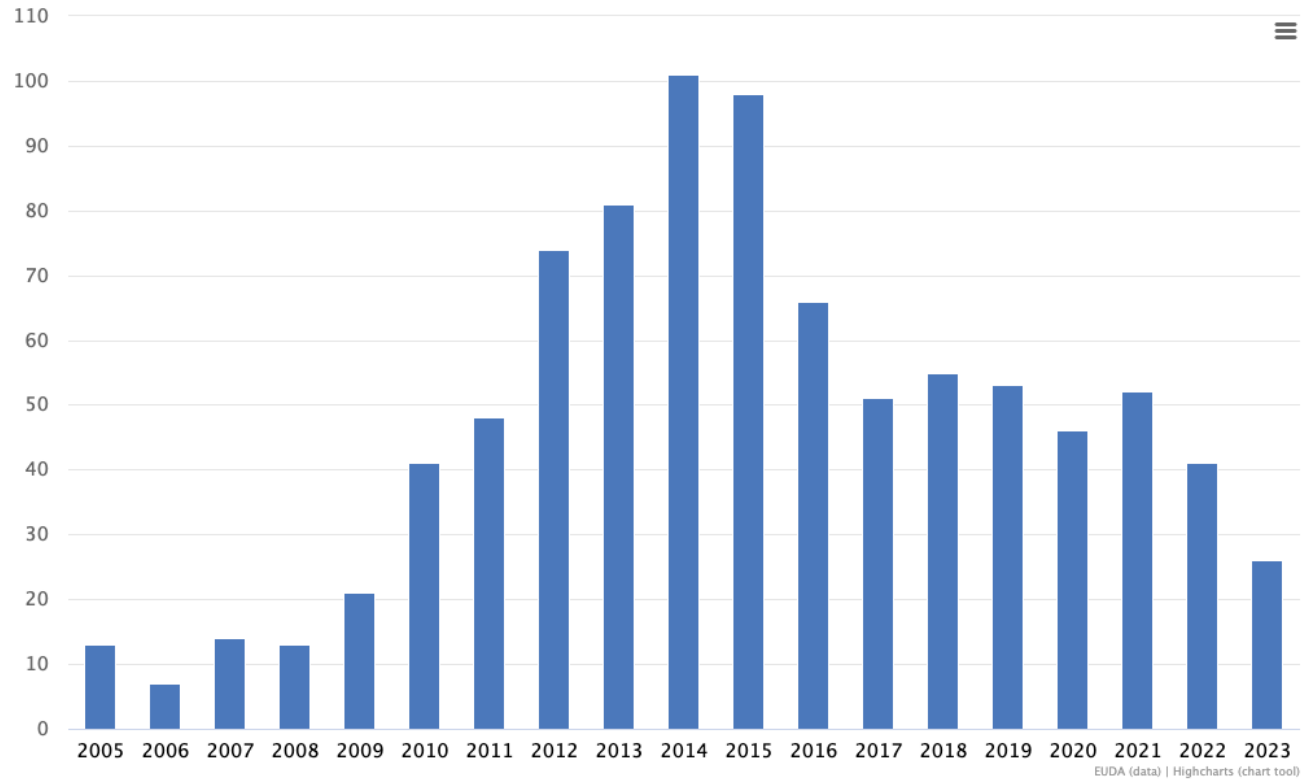
By the end of December 2023, the EMCDDA was monitoring more than 960 new psychoactive substances that had appeared on Europe's drug market since monitoring began in June 1997 (see Figures Number of new psychoactive substances notified to the EU Early Warning System for the first time, European Union, 2005-2023 and Number of new psychoactive substances notified to the EU Early Warning System for the first time by category, European Union, 2005-2023). This includes 26 substances that were reported for the first time in 2023. These newly notified substances include nine cannabinoids (five synthetic cannabinoids and four semi-synthetic cannabinoids, accounting for 35 % of the substances), seven opioids, three cathinones and a small number of other substances.

The number of new psychoactive substances notified in 2023 is a considerable reduction from the 50 or so substances reported each year between 2016 and 2022. It is also a significant decrease

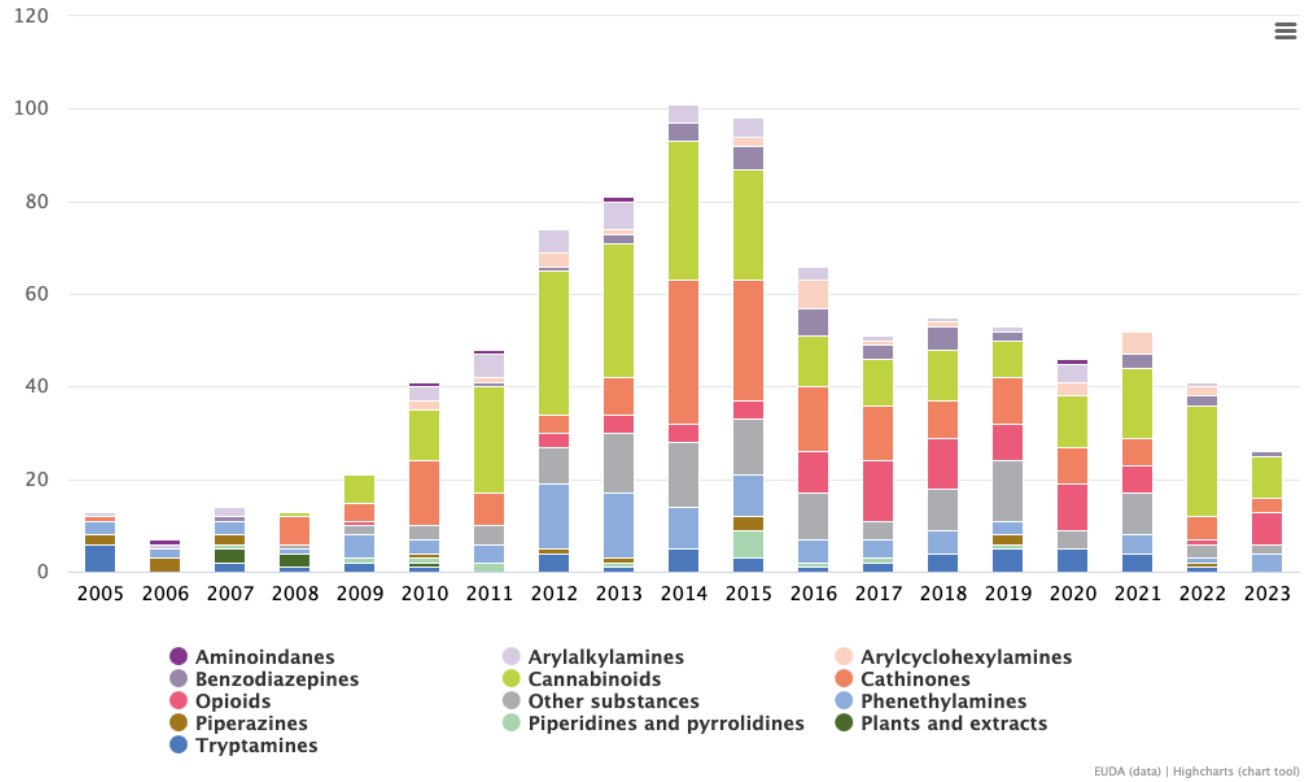
compared with the peak years of 2014 and 2015, when some 100 new psychoactive substances were identified each year.

Overall, the general downward trend in the number of new psychoactive substances notified may reflect sustained efforts to control and otherwise restrict the sale of these substances in Europe. It may also reflect control measures in source countries, such as China, aimed at restricting the production and trade of these substances. However, the reason for the steep decrease in 2023 – a 14-year low – compared with previous years is currently unclear.

Number of new psychoactive substances notified to the EU Early Warning System for the first time, European Union, 2005-2023

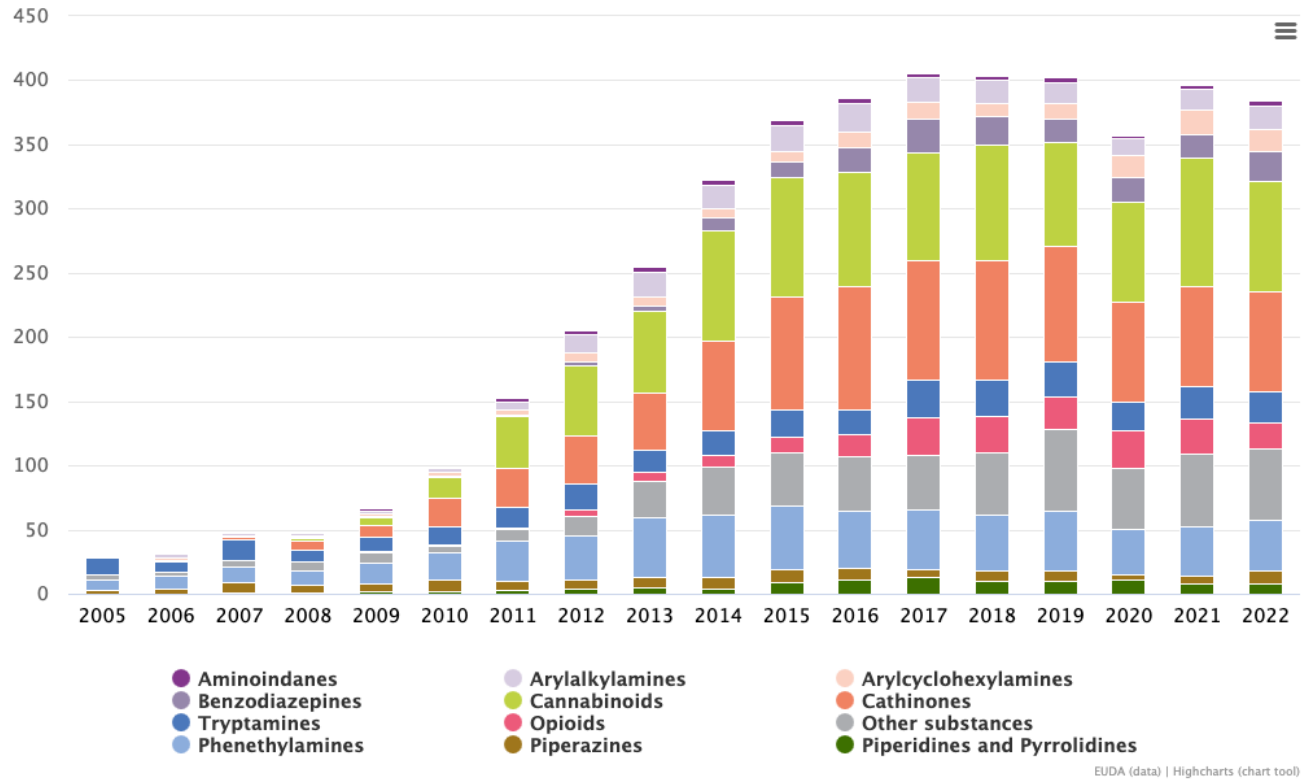


Number of new psychoactive substances notified to the EU Early Warning System for the first time by category, European Union, 2005–2023



Every year since 2015 (barring a dip in 2020, probably related to COVID-19), approximately 400 previously reported new psychoactive substances have been identified on the drug market in Europe (see Figure Numbers and categories of new psychoactive substances detected each year following their first identification, European Union, 2005-2022). This shows that many substances remain in circulation, albeit in varying amounts and mostly in small quantities.

Numbers and categories of new psychoactive substances detected each year following their first identification, European Union, 2005-2022



In 2022, for example, only around 40 (10 %) of the 400 substances were seized in quantities greater than five kilograms. In addition, these 40 substances accounted for 80 % of the total number of NPS seizures during the year. However, a substantial proportion of new psychoactive substances are highly potent substances, and small quantities can often be used to make thousands of street doses. For example, around 1 gram of the synthetic cannabinoid 5F-MDMB-PINACA may be sufficient to provide 1000 doses, while 1 gram of the fentanyl derivative carfentanil could provide many thousands of doses.

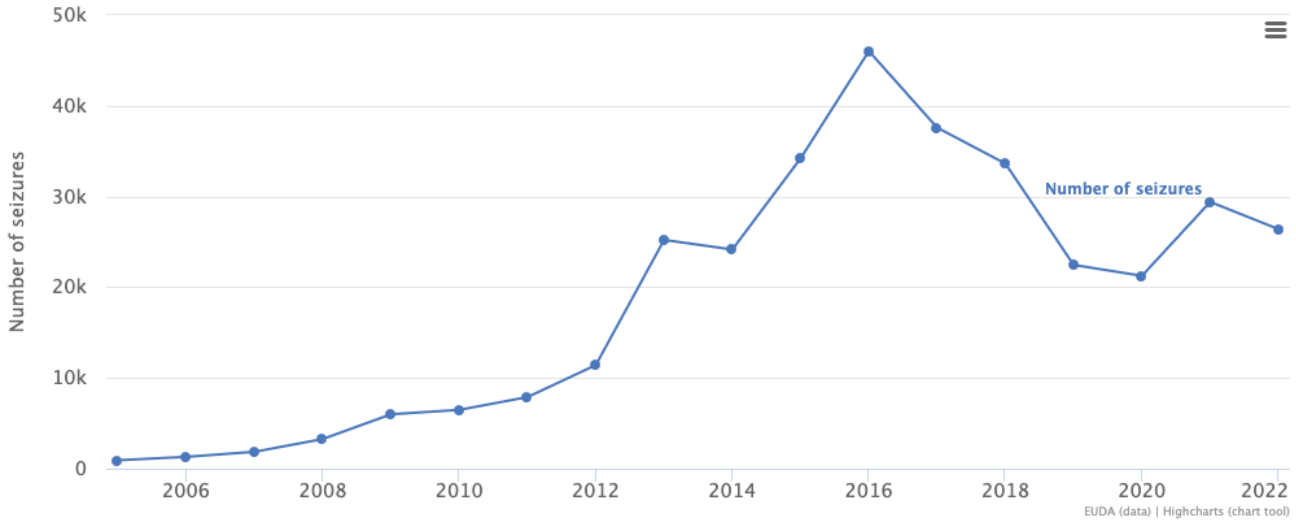
This general availability can increase the risk of new psychoactive substances being mis-sold as or used to adulterate other drugs, which can cause outbreaks of poisonings. In addition, the potential for substances to re-emerge on the market after periods of absence, adds to the number of substances that require monitoring.

Overview of law enforcement seizures of new psychoactive substances

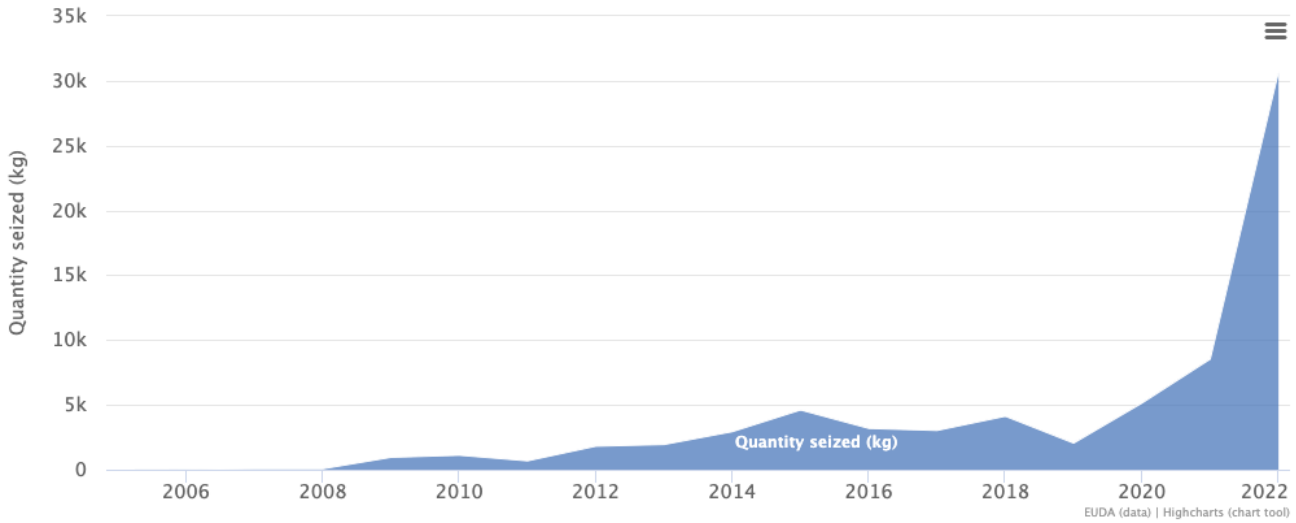
In 2022, the EMCDDA received reports of just over 26 390 seizures of new psychoactive substances from EU Member States. Information on the weight of the seized substances was provided for just under 18 700 of the seizures, amounting to 30.7 tonnes, most of which was seized in powder form (30.1 tonnes) (see Figure Seizures of new psychoactive substances reported to the EU Early Warning System: total number of seizures and quantity of material seized for all forms reported in weight, European Union, 2005-2022). New psychoactive substances were also found in tablets and

capsules (4 893 cases, approximately 580 000 units), papers (892 cases, 8 370 units) and liquids (1 962 cases, 1 472 litres). Some of these liquids were sold as e-liquids for vaping or as nasal sprays. This amounts to record quantities of new psychoactive substances seized in 2022. A small number of large seizures of powders of synthetic cathinones, ketamine and synthetic cannabinoids by customs agencies at the external EU border accounted for 97 % of the quantity seized. Of these, 87 % were cathinones (26.5 tonnes), mainly imported from India to Europe. This included 19.4 tonnes of 3-CMC (63 %), 2.85 tonnes of 3-MMC (9 %) and 1.5 tonnes of 2-MMC (5 %). Arylcyclohexylamines, almost exclusively ketamine, accounted for 2.79 tonnes of the new psychoactive substances seized (9 % of the total). In addition, the synthetic cannabinoid JWH-210 accounted for 467 kilograms (2 %) of the total quantity (see Figure Seizures of new psychoactive substances reported to the EU Early Warning System: total number of seizures and quantity of material seized for all forms reported in weight, European Union, 2005-2022).

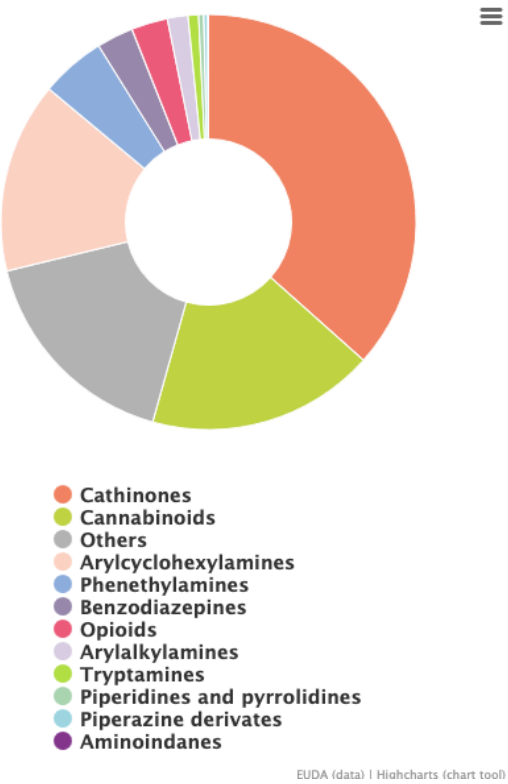
Seizures of new psychoactive substances reported to the EU Early Warning System: total number of seizures, European Union, 2005-2022



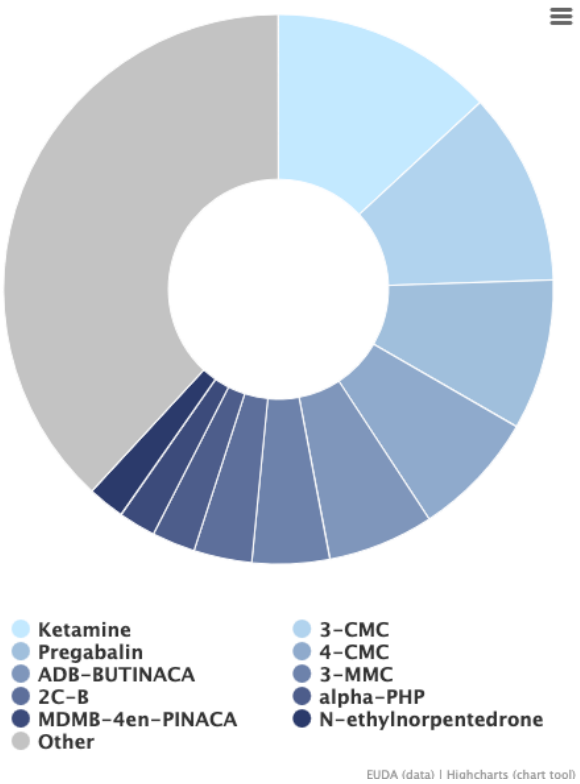
Seizures of new psychoactive substances reported to the EU Early Warning System: quantity of material seized for all forms reported in weight, European Union, 2005-2022



Seizures of new psychoactive substances reported to the EU Early Warning System: total number of seizures by category, European Union, 2022 (26 390 seizures total)

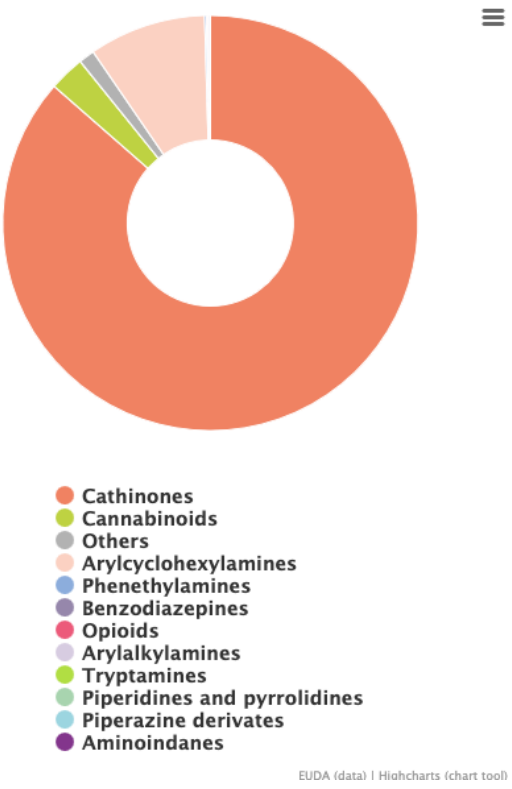


Seizures of new psychoactive substances reported to the EU Early Warning System: total number of seizures, by substance, European Union, 2022 (26 390 seizures total)

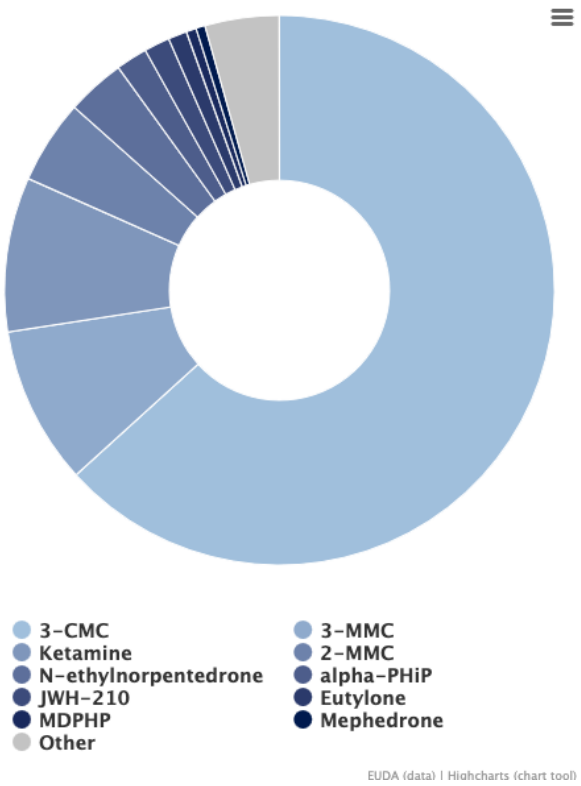


Seizures of new psychoactive substances reported to the EU Early Warning System: quantity of material seized, by category, for all forms reported in weight, European

Union, 2022 (30.7 tonnes total)



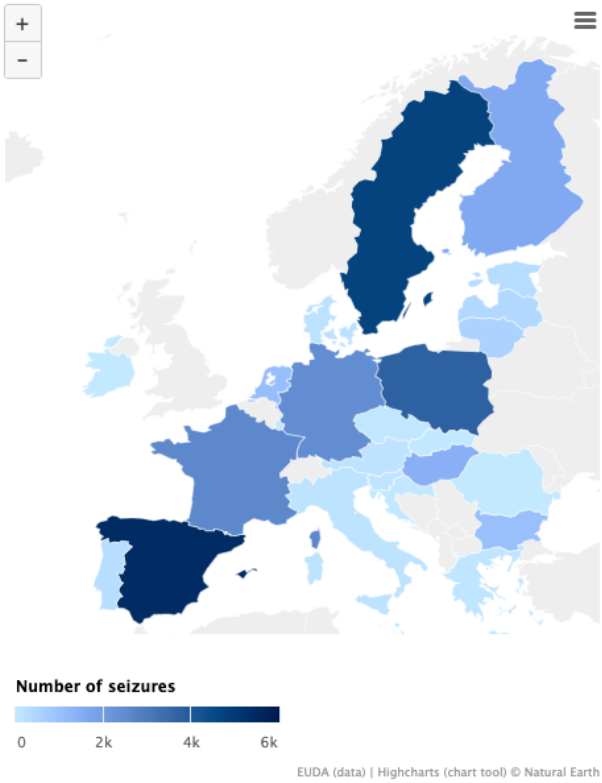
Seizures of new psychoactive substances reported to the EU Early Warning System: quantity of material seized, by substance, for all forms reported in weight, European Union, 2022 (30.7 tonnes total)



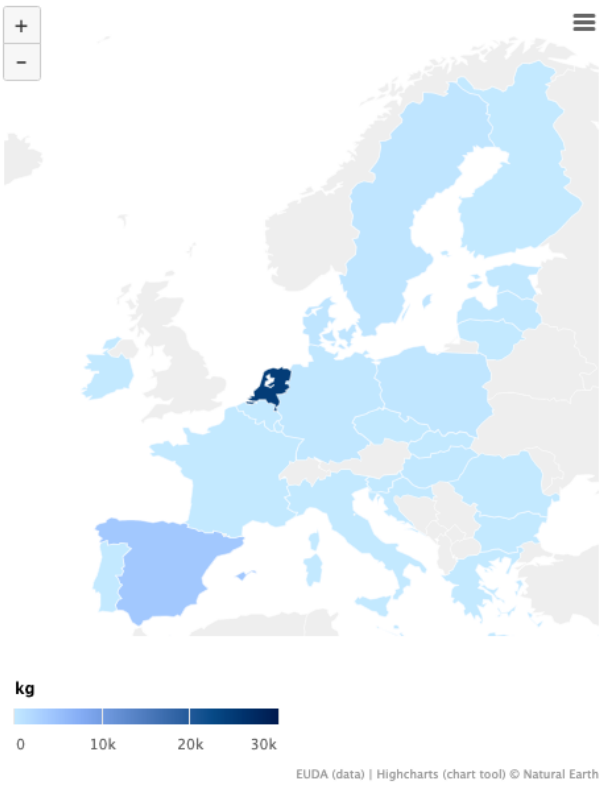
The number of NPS seizures and the quantity seized varies between countries in Europe, reflecting differences in the local drug situation (see Figure Seizures of new psychoactive substances reported to the EU Early Warning System by country: numbers of seizures and quantity of material seized for all forms reported in weight, European Union, 2022).

Seizures of new psychoactive substances reported to the EU Early Warning System by country: numbers of seizures, European

Union, 2022



Seizures of new psychoactive substances reported to the EU Early Warning System by country: quantity of material seized for all forms reported in weight, European Union, 2022(kg)



Although a broad range of new psychoactive substances are monitored by the EU Early Warning System, here we focus on several categories of substances that are of specific concern due to important recent changes. These changes include large-scale seizures, recent emergence on the drug market, increases in reported harms and links with problematic use.

All of the source data used in graphics and data tables may be found in our Data catalogue.

References

Consult the list of references used in this module.

EU Drug Market: New psychoactive substances — Distribution and supply in Europe: Benzodiazepines

This resource is part of EU Drug Market: New psychoactive substances — In-depth analysis by the EMCDDA and Europol.

Last update: *27 June 2024*

Background

First developed in the 1950s, benzodiazepines such as diazepam (Valium) and alprazolam (Xanax) are one of the most important groups of medicines that specifically produce sedation and sleep (Sternbach, 1978; EMCDDA, 2021b). They are the most widely prescribed group of medicines in the world, and are used to treat anxiety, insomnia, epilepsy and alcohol withdrawal. However, there is a high risk of abuse, and they can rapidly cause tolerance and dependence. This can lead to severe, and sometimes life-threatening, withdrawal symptoms. Because of this public health risk, there are often strict restrictions on prescribing them.

Given the high demand for commonly prescribed benzodiazepines, they are a major target for criminal groups that divert legitimate products from the market, sell unlicensed products or make fake versions of legitimate medicines. In the latter case, this includes using both controlled and new benzodiazepines and, potentially, other unrelated substances. Fake diazepam and alprazolam tablets are particularly common. Information about the market for new benzodiazepines in Europe, including supply chains, is limited. However, an important source of fake medicines containing these substances appears to be vendors on darknet markets and the surface web.

Many new benzodiazepines are potent substances (EMCDDA, 2021b; El Balkhi, 2020). The dose used in fake medicines can also be significantly higher than those used in legitimate licensed medicines. Increasingly, new benzodiazepines are involved in acute poisonings and deaths, particularly in parts of northern Europe (Essink et al., 2022; Kriikku et al., 2020; Rice et al., 2021), where many of the deaths linked to new benzodiazepines involve high-risk drug users who also use opioids and other central nervous system depressants (Kriikku et al., 2020; Rice et al., 2021; McAuley, 2022). Of note, the imposition of restrictions on prescribing benzodiazepine medicines over concerns of their abuse has been associated with an increase in the availability and use of new benzodiazepines in some places, including Scotland (the United Kingdom) and the United States (McAuley, 2022).

New benzodiazepines are also sold as substances in their own right for recreational use, to enhance or prolong the effects of other drugs (such as opioids), and to self-medicate (EMCDDA, 2021b). In a similar way to synthetic cannabinoids, new benzodiazepines infused into paper and clothing can be smuggled into prisons, and cases have been reported in the United Kingdom. This poses a high risk of overdose and, given the popularity of benzodiazepines in prisons in Europe, requires active surveillance (Daly, 2022; Ford et al., 2018).

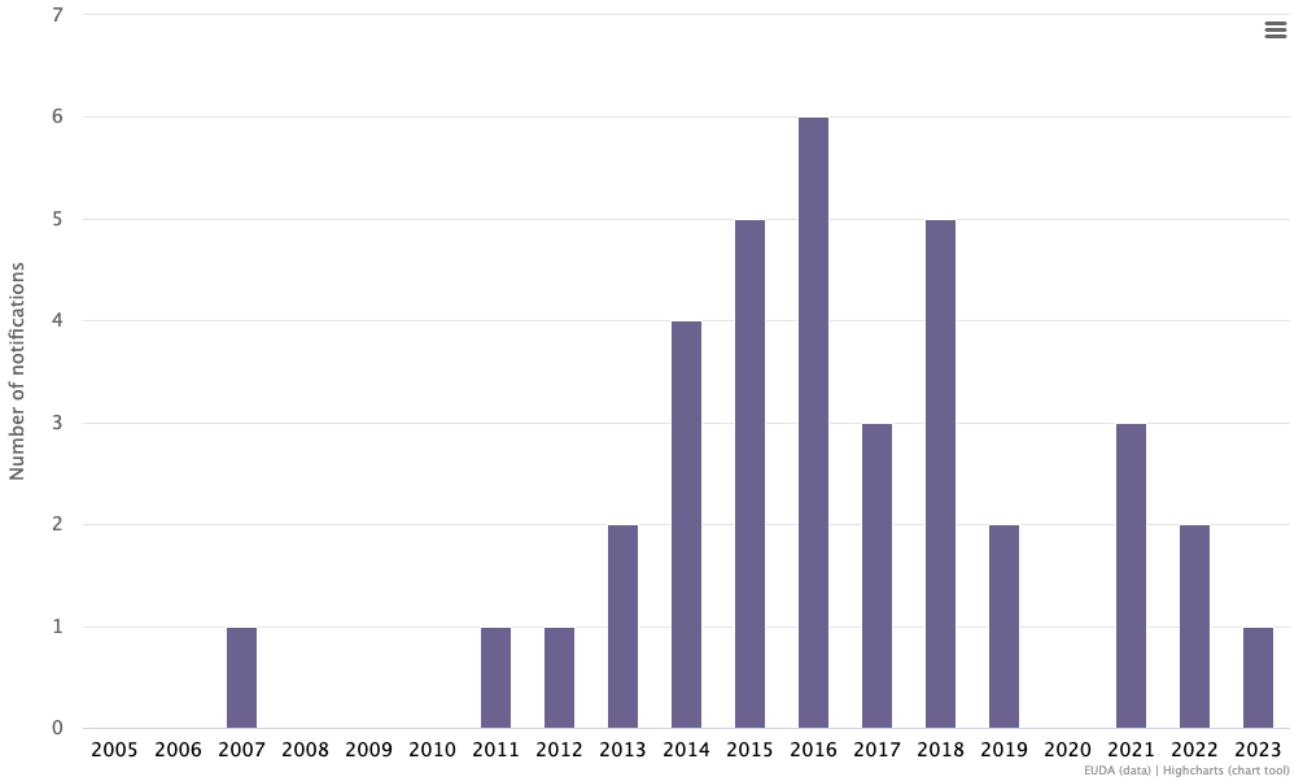
Production

Most bulk quantities of new benzodiazepines are sourced from China as powders. To a lesser degree, etizolam tablets are sourced from India. In Europe, the powders are typically made into tablets, including fake diazepam and alprazolam tablets (EMCDDA and Europol, 2019).

Situation

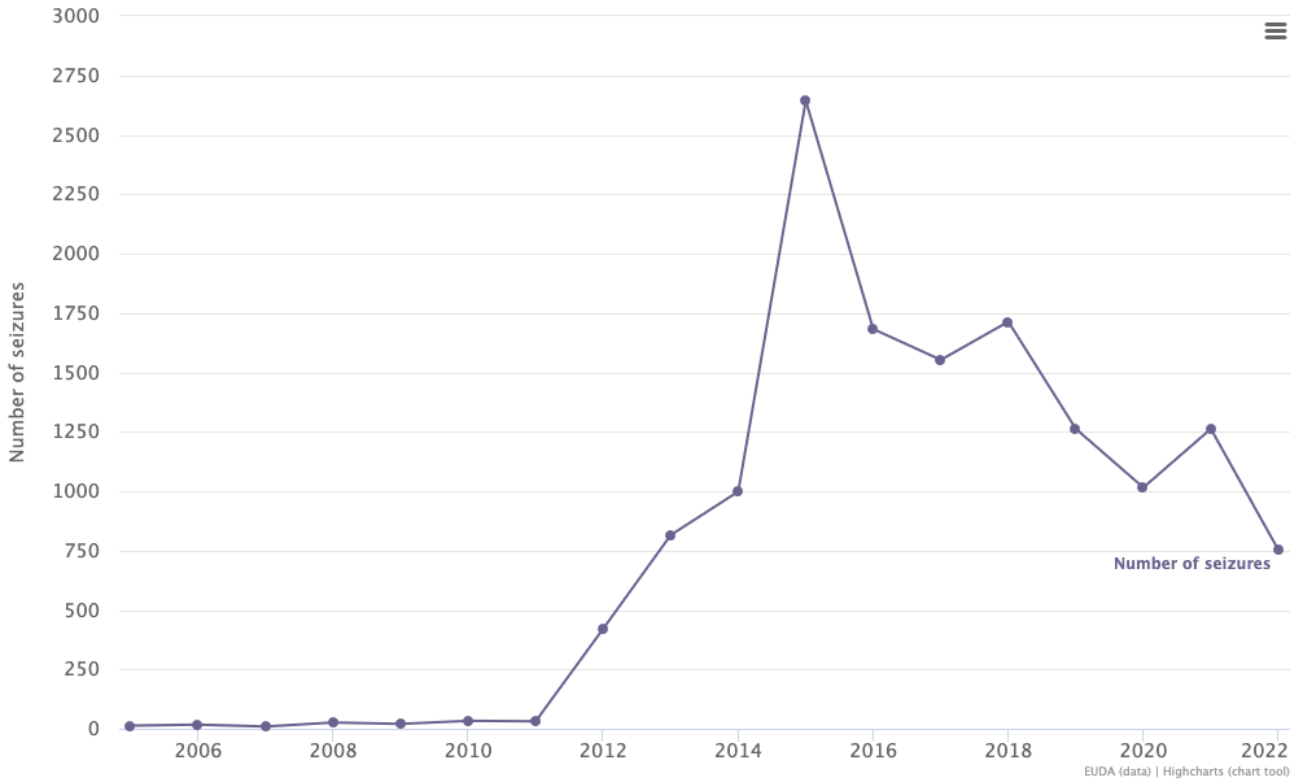
As of 31 December 2023, the EMCDDA was monitoring 36 new benzodiazepines, including one that was reported in 2023 (see Figure Number of new benzodiazepines reported for the first time in Europe, European Union, 2005-2023).

Number of new benzodiazepines reported for the first time in Europe, European Union, 2005-2023

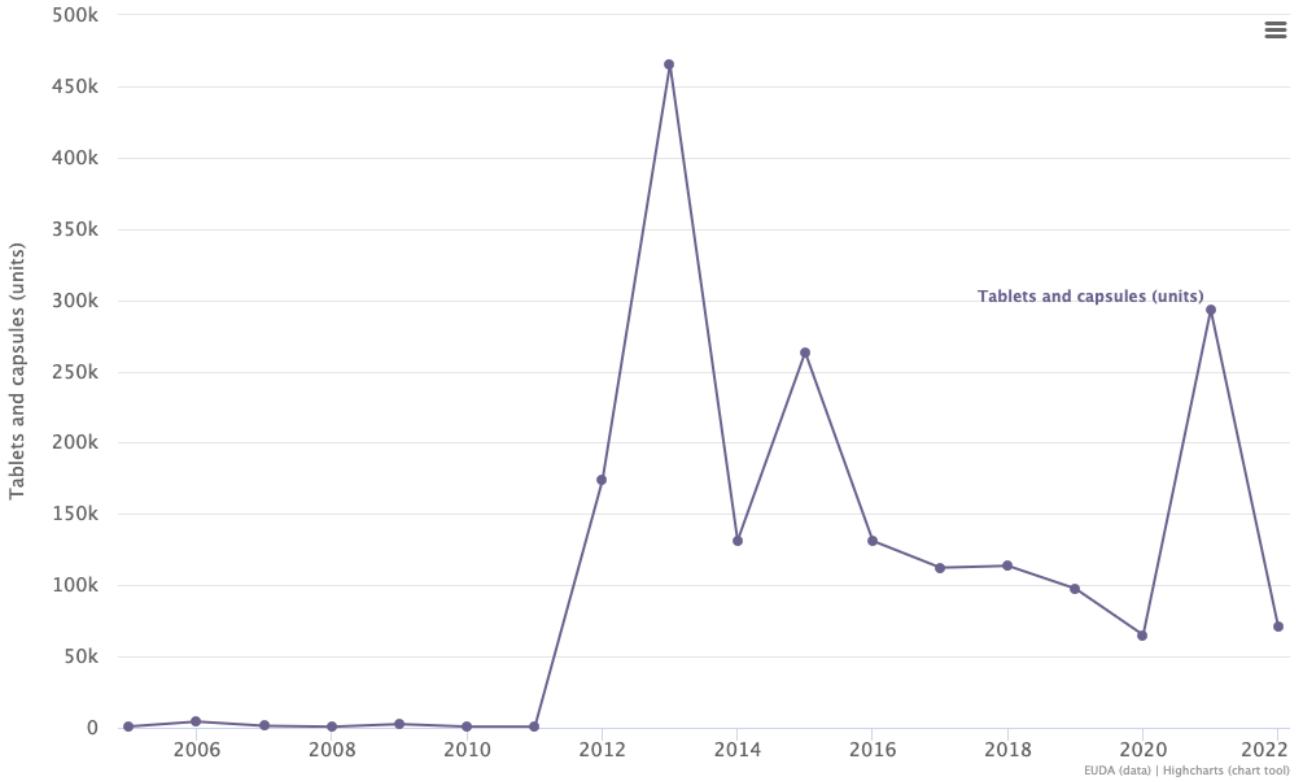


In 2022, 752 seizures of new benzodiazepines were reported to the EU Early Warning System by the Member States, representing around 3 % of the total number of seizures of new psychoactive substances, similar to the number of seizures of new opioids. This amounted to approximately 4.2 kilograms of material, 70 617 tablets and capsules, and 17.3 litres of liquids (see Figures Seizures of new benzodiazepines reported to the EU Early Warning System: trends in number of seizures and number of tablets and capsules seized, European Union, 2005-2022).

Seizures of new benzodiazepines reported to the EU Early Warning System: trends in number of seizures, European Union, 2005-2022

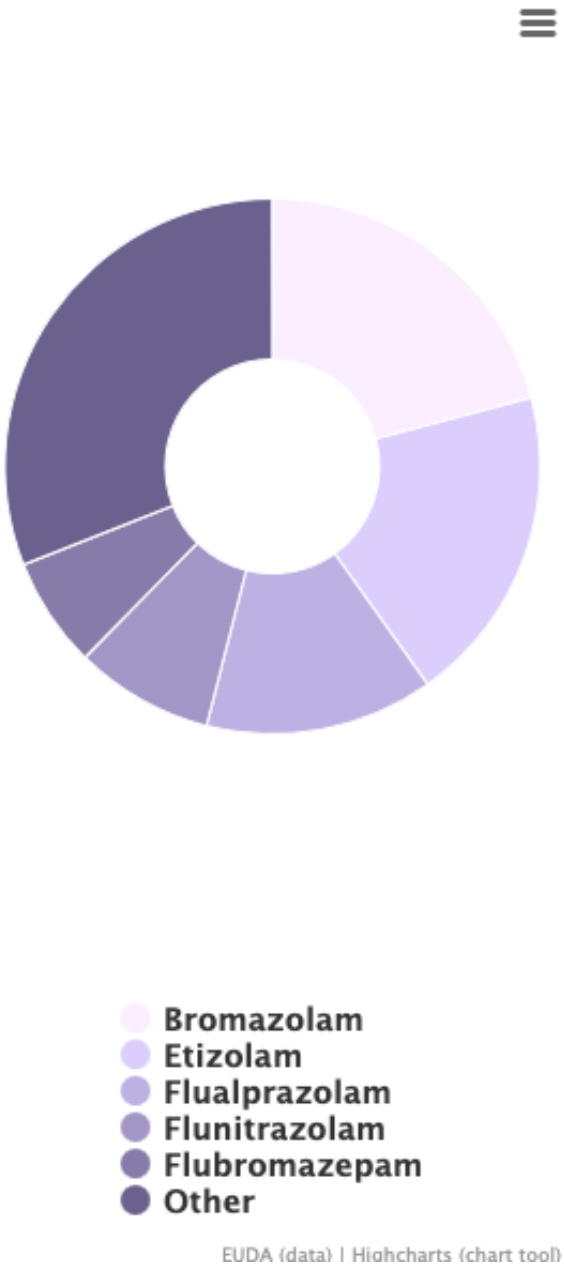


Seizures of new benzodiazepines reported to the EU Early Warning System: number of tablets and capsules seized, European Union, 2005-2022

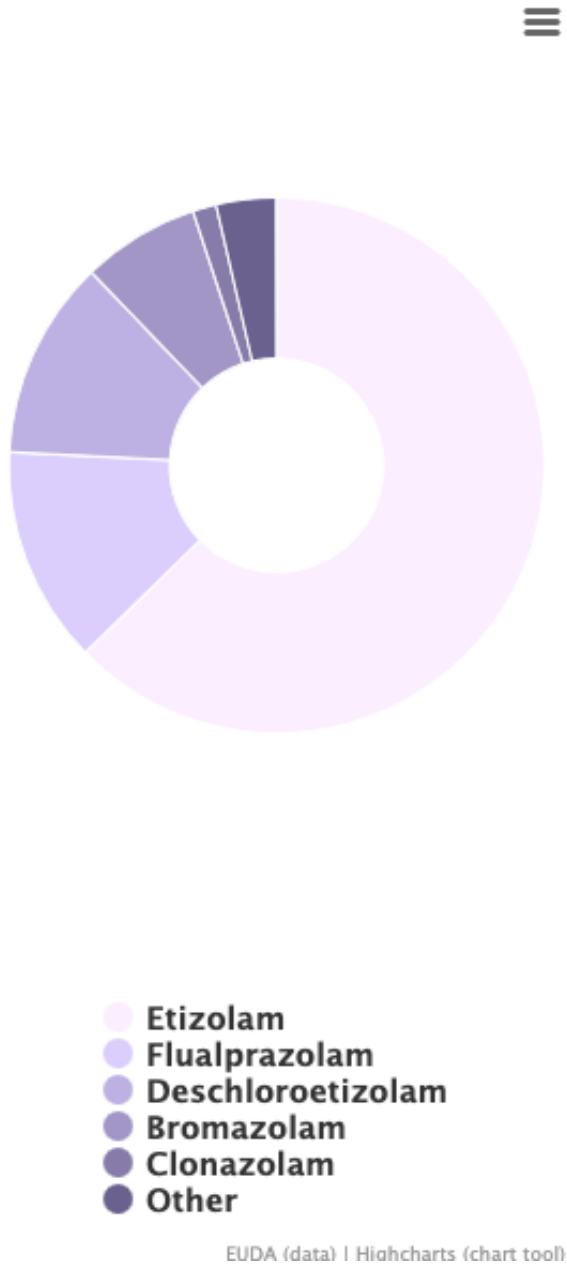


Despite the relatively large number of new benzodiazepines appearing in Europe, in 2022 the market continued to be dominated by a small number of substances (see Figures Seizures of new benzodiazepines reported to the EU Early Warning System: number of seizures, quantity of material seized for all forms reported in weight and quantity of tablets and capsules, European Union, 2022).

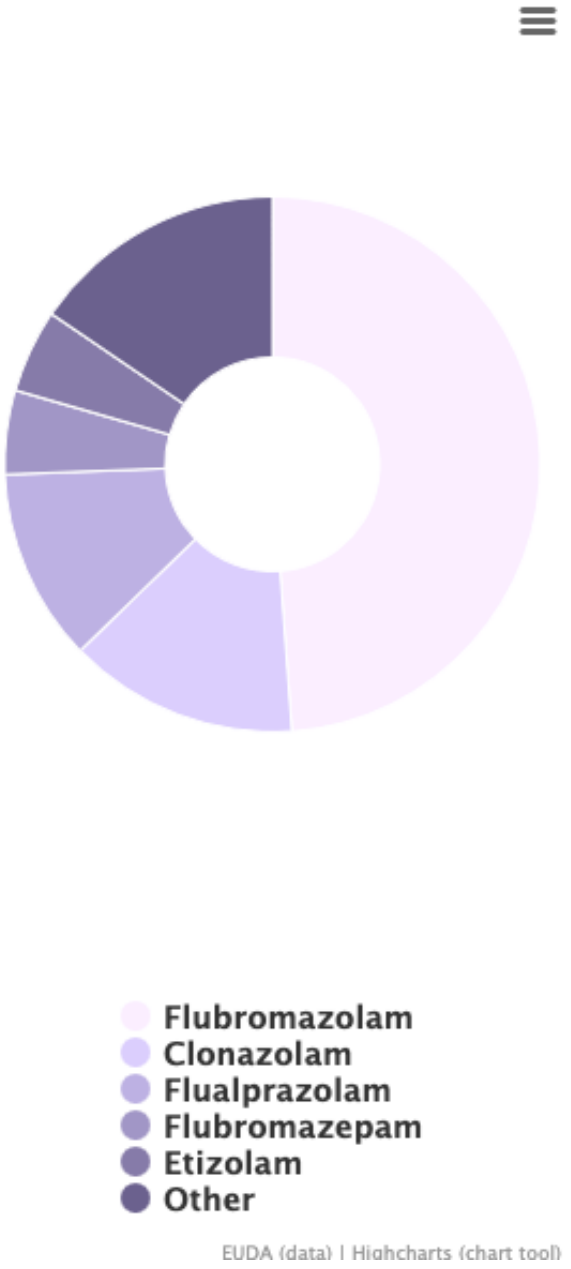
Seizures of new benzodiazepines reported to the EU Early Warning System: number of seizures, European Union, 2022



Seizures of new benzodiazepines reported to the EU Early Warning System: quantity seized for all forms reported in weight, European Union, 2022

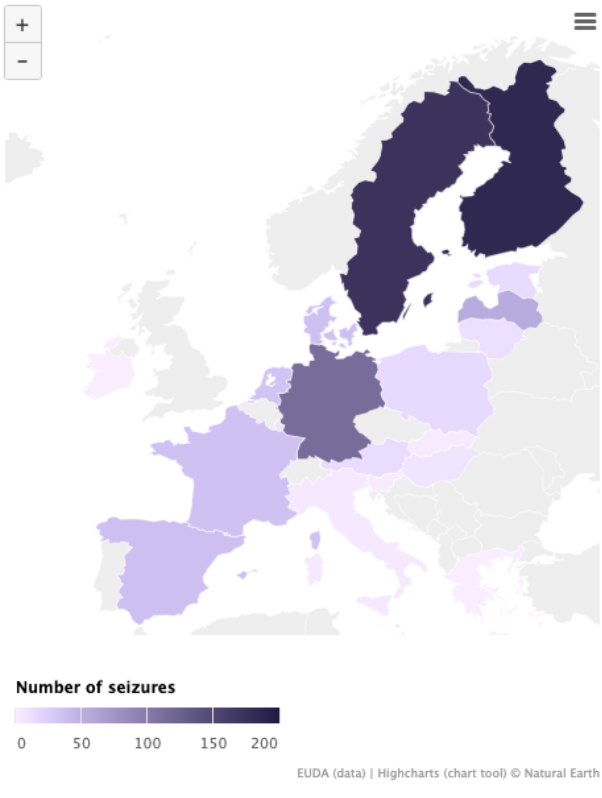


Seizures of new benzodiazepines reported to the EU Early Warning System: quantity of tablets and capsules, European Union, 2022

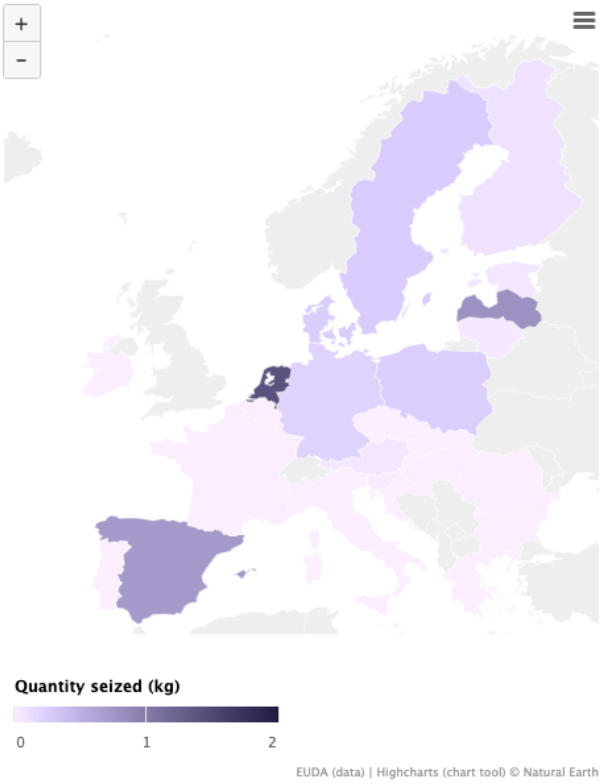


The number of new benzodiazepines seizures and the quantity seized vary between countries in Europe, with most of seizures taking place in northern Europe (see Figures Seizures of new benzodiazepines reported to the EU Early Warning System by country: numbers of seizures, quantity of material seized for all forms reported in weight, and quantity of tablets and capsules, European Union, 2022).

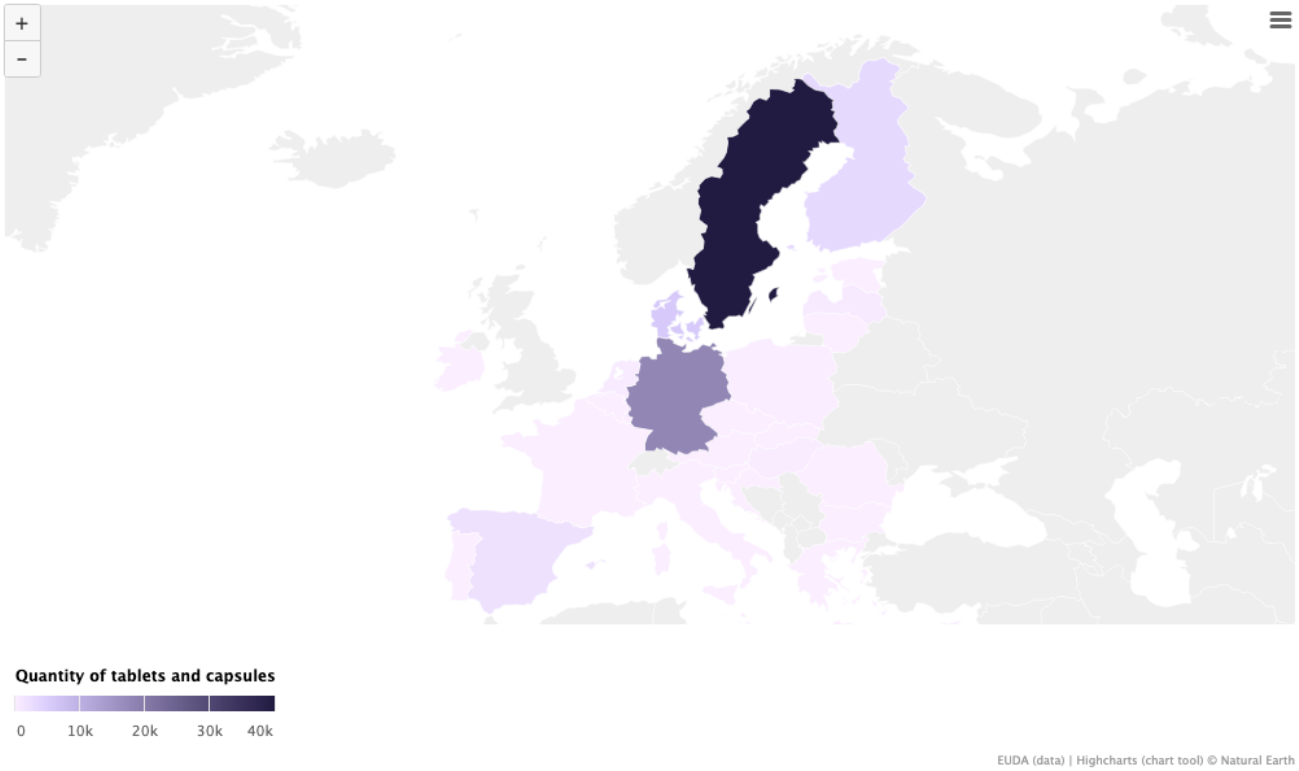
Seizures of new benzodiazepines reported to the EU Early Warning System by country: number of seizures, European Union, 2022



Seizures of new benzodiazepines reported to the EU Early Warning System by country: quantity of material seized for all forms reported in weight, European Union, 2022



Seizures of new benzodiazepines reported to the EU Early Warning System by country: quantity of tablets and capsules, European Union, 2022



Following the international control of etizolam and flualprazolam, which came into force in November 2020 (CND, 2020a, b), producers and distributors appeared to switch to other new benzodiazepines, such as flubromazolam, clonazolam and bromazolam. Subsequently, flubromazolam and clonazolam were internationally controlled in 2021 (CND, 2021b, c). As a result, it is likely that these substances will be replaced by others, such as bromazolam, as countries, particularly producer countries, implement control measures. In 2023, there were signs in both Europe and the United States of an increase in detections of bromazolam (CFSRE, 2022; Drug Enforcement Administration, 2022).

All of the source data used in graphics and data tables may be found in our Data catalogue.

References

Consult the list of references used in this module.

EU Drug Market: New psychoactive substances — Distribution and supply in Europe: Ketamine

This resource is part of EU Drug Market: New psychoactive substances — In-depth analysis by the EMCDDA and Europol.

Last update: *27 June 2024*

Background

Ketamine was one of the first new psychoactive substances to emerge in Europe during the 1990s. Since then, it has become an established feature of the drug market in some countries.

Ketamine is commonly snorted, but can also be injected, and has been linked to various dose-dependent acute and chronic harms, including neurological and cardiovascular toxicity, mental health problems, such as depression, and urological complications, such as bladder damage from intensive use or the presence of adulterants.

Ketamine may also be added to other drug mixtures, including MDMA powders and tablets, although 2021 data from drug checking services show that these are generally less adulterated than other illicit drugs.

It can also be found in mixtures sold as ‘pink cocaine’ or ‘tucibi’, which are more likely to contain ketamine and stimulant drugs, particularly MDMA.

Production

The available information suggests that most ketamine seized in Europe is imported from India and, to a lesser degree, Pakistan and China. It transits through countries including the Netherlands and Belgium and is distributed outside and to a lesser extent within the European Union (National Police of the Netherlands, 2022). Shell companies may be used to import the substance via pharmaceutical companies in Europe. For example, in Austria, legitimate needs by licensed pharmaceutical companies should not exceed 25 to 50 kilograms of ketamine, yet shipments are frequently in the order of hundreds of kilograms (EMCDDA, unpublished). The Belgian Police estimates that about 28 tonnes of ketamine may have been diverted between 2019 and 2021 (EMCDDA, unpublished). Substitution of ketamine shipments with sugar or salt before further transit appears to be one of the methods used to avoid detection.

In Europe, evidence of illicit production of ketamine is limited to a small number of seizures of precursors and a few dismantled production sites in the Netherlands and Belgium. At least four ketamine production sites were dismantled between 2017 and 2021 (excluding storage sites). All findings occurred in the Netherlands, with the exception of one production site, which was discovered in Belgium in 2020. In these facilities, manufacturing processes included extraction of medicinal products (evaporation of commercial pharmaceutical solutions of ketamine) and

crystallisation of ketamine (as ketamine 'needles', or small crystals, are a highly valued product in the illicit market) (National Police of the Netherlands, 2022). In one of the dismantled facilities, approximately 500 kilograms of ketamine hydrochloride was recovered.

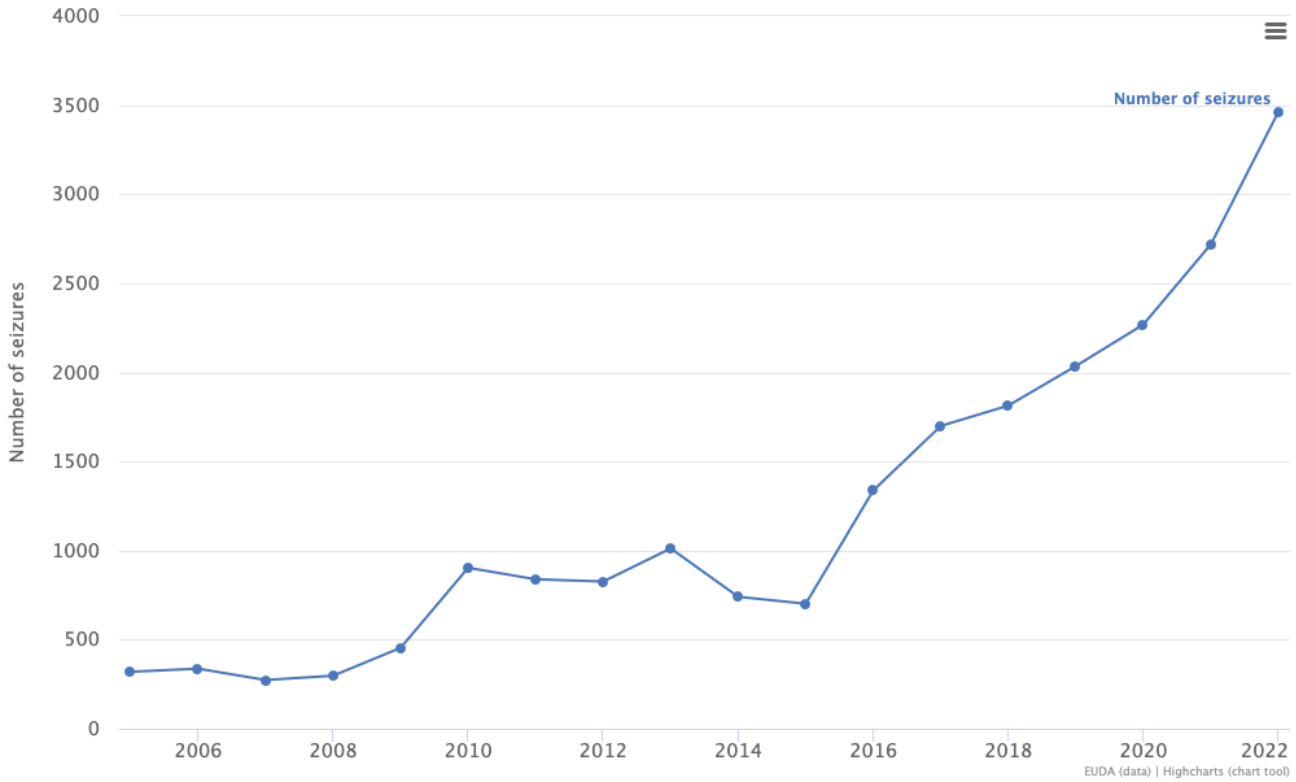
Though apparently rare, synthetic production of ketamine in the European Union has been documented. Ketamine hydroxylimine (an important intermediary in the synthesis of the medicine) was seized from two production sites in 2019 and 2020, both in the Netherlands. In the 2020 case, approximately 50 kilograms of the precursor was seized from a warehouse where large-scale production of ketamine was taking place. Such cases appear to occur whenever pharmaceutical ketamine becomes hard to obtain (National Police of the Netherlands, 2022).

Situation

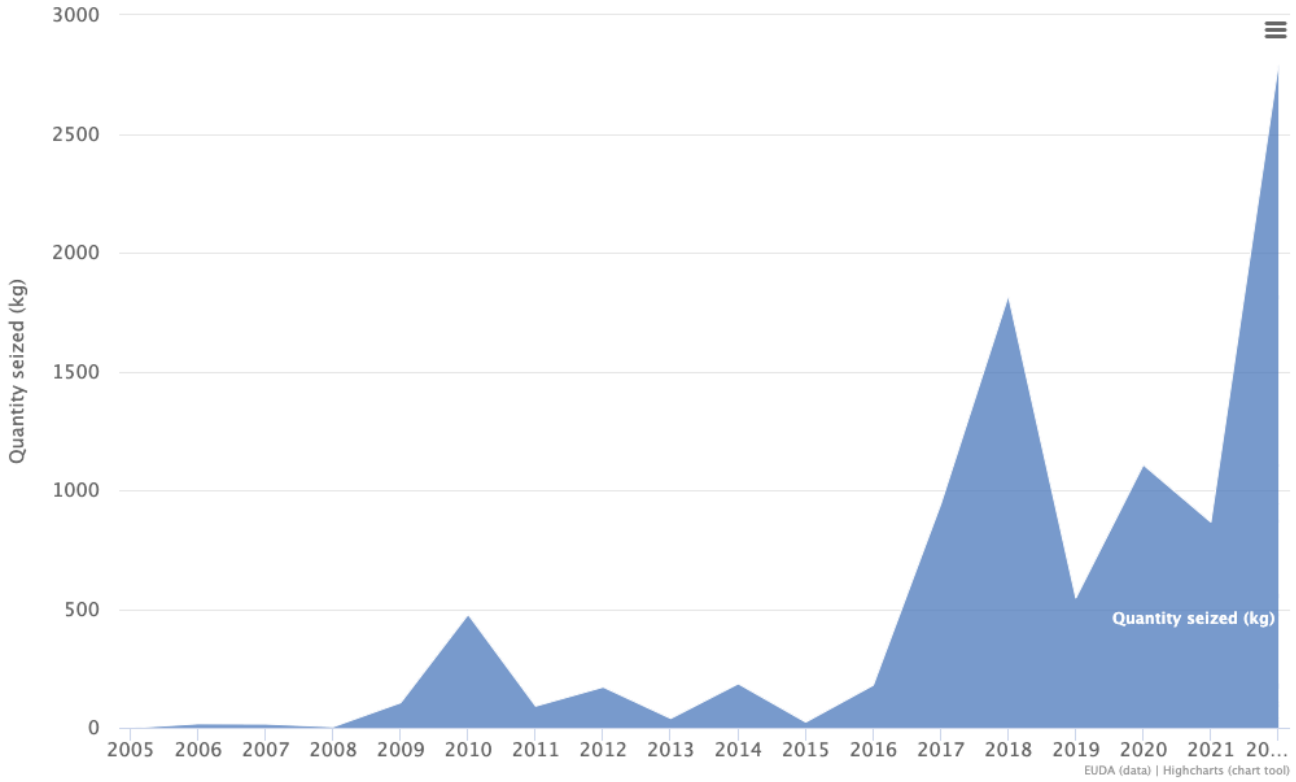
The quantity of ketamine seized and reported to the EU Early Warning System has varied over time, but has remained at relatively high levels in recent years, suggesting that this drug is likely to be consistently available in some national drug markets and may have become an established drug of choice in some settings. In addition, Europe is an important transit and distribution hub.

In 2022, 2 985 seizures amounting to 2.79 tonnes of ketamine were made in Europe (see Figures Seizures of ketamine reported to the EU Early Warning System: trends in numbers of seizures and quantities seized for all forms reported in weight, European Union, 2005-2022). This includes a single seizure of 0.5 tonnes by Danish customs, 0.27 tonnes in a single seizure by Spain, and two seizures amounting to 1.59 tonnes by Dutch customs, imported from Georgia.

Seizures of ketamine reported to the EU Early Warning System: trends in numbers of seizures, European Union, 2005-2022



Seizures of ketamine reported to the EU Early Warning System: quantities seized for all forms reported in weight, European Union, 2005-2022



Systematic information on the price of ketamine is not available in Europe. An indication of the price of retail and street-level ketamine in the Netherlands is provided in the table Price of ketamine in the Netherlands, 2022.

Price of ketamine in the Netherlands, 2022

Product	Location in the supply chain	Price
Ketamine powder/sugar/needles	Retail trade	EUR 2 373 per kilogram
Ketamine chunks/lumps	Retail trade	EUR 3 900 per kilogram
Ketamine	Consumer price (street-level)	EUR 21.80 per gram

Source: Central Criminal Investigations Division, Dutch Police, Netherlands.

All of the source data used in graphics and data tables may be found in our Data catalogue.

References

Consult the list of references used in this module.

EU Drug Market: New psychoactive substances — Distribution and supply in Europe: New opioids

This resource is part of EU Drug Market: New psychoactive substances — In-depth analysis by the EMCDDA and Europol.

Last update: *27 June 2024*

Background

New opioids are sold as substances in their own right and as replacements for controlled opioids. They are also mis-sold as or used to adulterate heroin and other controlled opioids for unsuspecting consumers. In some cases, they are used to make fake tablets of opioid analgesic medicines, such as oxycodone. Recent signs of the emergence in Europe of mixtures of benzodiazepines and xylazine with new opioids – seemingly copied from North America – also raise concerns. Occasionally, new opioids are found in non-opioid controlled drugs, such as cocaine.

New opioids are typically found as powders and, to a lesser degree, tablets and capsules. Other physical forms, such as liquids, are also reported but are far less common.

Most use of new opioids is by high-risk drug users, including those who inject heroin and other opioids. A smaller number of people use them recreationally. In the latter case, this includes substances such as tramadol.

New opioids play a relatively small role in the drug market in most parts of Europe. However, many are highly potent and are a particular concern for public health because of the high risk of life-threatening poisoning from respiratory depression. Timely use of the antidote naloxone and supportive care are essential to treat overdoses.

While new opioids started to appear on the NPS market 15 years ago, since then they have been identified more often in some countries and may become more widespread in Europe. Related to this, while sporadic, cases of new opioids mis-sold as or used to adulterate heroin and other established opioids may be increasing. The use of synthetic opioids increases the risk of life-threatening poisoning for consumers, and can manifest as outbreaks that occur without warning.

In most cases, changes in the opioid market are driven by supply-side factors. Important factors leading to the use of new opioids include ease of production, lower price, higher potency, ease of transportation and smuggling compared with established opioids, and perhaps especially because the production of heroin is both labour- and time-intensive and reliant on many other factors (Zagorski et al., 2020). In addition, as many new opioids are not controlled under drug legislation, they can be manufactured, sold and transported relatively freely. In some cases, the use of new opioids may be a temporary response to reduced supply or increased costs of heroin and other established opioids.

Production

The new opioids currently on the market in Europe, such as the nitazene opioids, are thought to be produced in China. Notably, however, carfentanil is thought to come from Russia, while India appears to be an important supplier of tramadol.

The production of synthetic opioids in the European Union has been reported infrequently, and this mostly concerns fentanyl and methadone, rather than new opioids (see Section Synthetic opioid production in Europe: a marginal phenomenon, in EU Drug Market: Heroin and other opioids — Production of opioids).

However, between 2017 and 2021, four sites associated with the production of new opioids were dismantled in the European Union and reported to the EMCDDA. All sites were 'mixing and packaging' facilities, where synthesis of the substances did not appear to take place. Two of these sites processed U-47700 (one in 2017 in Belgium and one in 2018 in Spain), one mixed and packaged 'difluoromethylfentanyl' (sic) (dismantled in 2018 in Germany), and the remaining site is reported to have produced 'fentanyl and analogues' (dismantled in 2019 in Germany). The processing of other new psychoactive substances (namely synthetic cannabinoids) was reported in at least two of the dismantled sites.

Data reported to the EMCDDA revealed one additional site dismantled in Latvia in 2020. This was a small-scale facility where isotonitazene was processed and packaged for sale in the domestic market (EMCDDA, unpublished; UNODC, 2022). Approximately 1.1 kilograms of isotonitazene was seized, with an estimated market value of EUR 110 000 (Latvian Ministry of Interior, 2020).

More recently, in 2023, a Latvian site was dismantled wherefentanyl may have been produced. The discovery was made in a rented garage, and the laboratory was already in the process of being dismantled and packed up by the criminals. Almost 2 kg of fentanyl were seized, along with various precursors and chemicals essential for the production of this substance, and firearms. Information suggests that the drug was intended for the local market and that there may have been issues with manufacturing or distribution (see Photo Dismantled laboratory in Latvia where fentanyl was seized, March 2023) (Latvian Police, 2023).


Dismantled laboratory in Latvia where fentanyl was seized, March 2023. Source: Latvian Police.

While fentanyl derivatives can be produced by relatively well-established methods that are available in the scientific literature (including 'one-pot' procedures that occur at room temperature), the production of carfentanil is generally considered to be more complex, requiring knowledge of chemistry (EMCDDA and Europol, 2018). Common to all synthetic opioids, one of the main risks is accidental exposure from handling solutions and powders containing the final products.

Despite the relatively few detections of facilities producing synthetic opioids in Europe, the production of these substances constitutes a major public health and security threat to Europe (see Box Factors that could increase the threat of synthetic opioid production in Europe in EU Drug Market: Heroin and other opioids — Production of opioids). Not only are there established access routes for precursor chemicals (including controlled precursors), there is also well-established infrastructure for the production of synthetic drugs in Europe, managed by trained illicit laboratory operators. Recent and historical cases of production of fentanyl and its derivatives in Europe, dating back to at least 1995, highlight the possibility of these substances being produced within the European Union. In light of this, signals of possible fentanyl production in the Netherlands are particularly concerning (see Box Signals of possible fentanyl production in the Netherlands in EU Drug Market: Heroin and other opioids — Production of opioids). Similarly, historical occurrences of etonitazene on the drug market, first in Italy in 1966 and then in Germany in 1987, as well as in other countries outside Europe, also suggest the potential for illicit production of nitazene opioids (EMCDDA, 2020). Global demand and high profits may therefore motivate already operational

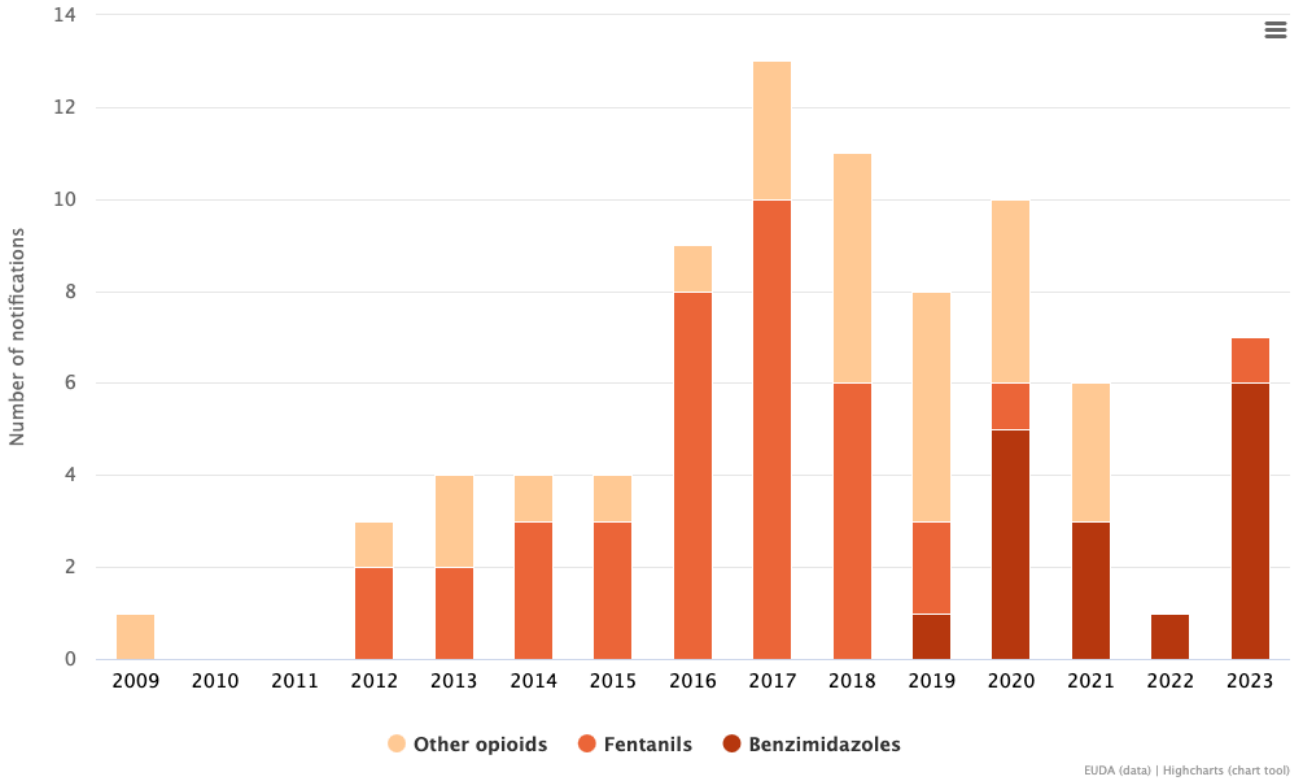
criminal networks to expand their drug production activities to new synthetic opioids.

Situation

The EMCDDA currently monitors 81 new opioids, making them the fourth-largest group of substances monitored (excluding the 'others' group). This number includes seven substances that were reported for the first time during 2023 (see Figure Number and types of new opioids notified to the EU Early Warning System for the first time, 2005-2023).

In 2023, the shift away from new fentanyl derivatives appearing on the market (that started in around 2018-2019) continued with the emergence of the 'nitazenes' (chemical derivatives of 2-benzyl benzimidazole). During the year, six new nitazenes were notified, bringing the total number monitored to 16. Overall, the nitazenes account for 20 % of the total number of opioids monitored by the EU Early Warning System. Of concern is that many of the nitazenes are as potent as fentanyl, if not more so (Ujváry et al., 2021).

Number and types of new opioids notified to the EU Early Warning System for the first time, 2005-2023



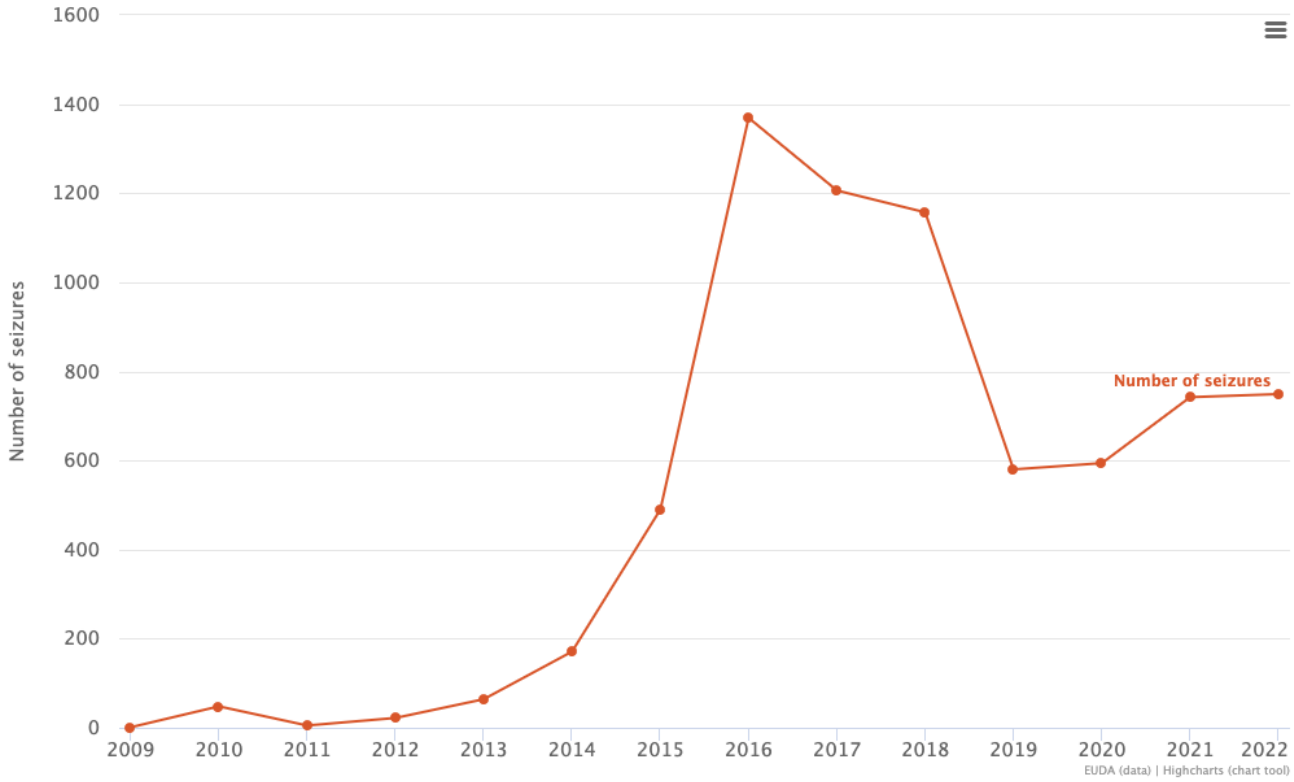
In 2022, almost 750 seizures of new opioids were reported to the EU Early Warning System by Member States, representing around 3 % of the total number of seizures of new psychoactive substances. This amounted to approximately 16.6 kilograms of material (see Figure Seizures of new opioids reported to the EU Early Warning System: trends in numbers of seizures and quantities seized for all forms reported in weight, by type of opioid, European Union, 2005-2022). In total, 302 (40 %) of the seizures and 8.2 kilograms (49 %) of the material was carfentanil.

Reflecting changes in the market and a decline in fentanyl derivatives other than carfentanil, 253 (34 %) of these seizures and 3 kilograms (18 %) of the material seized were nitazenes.

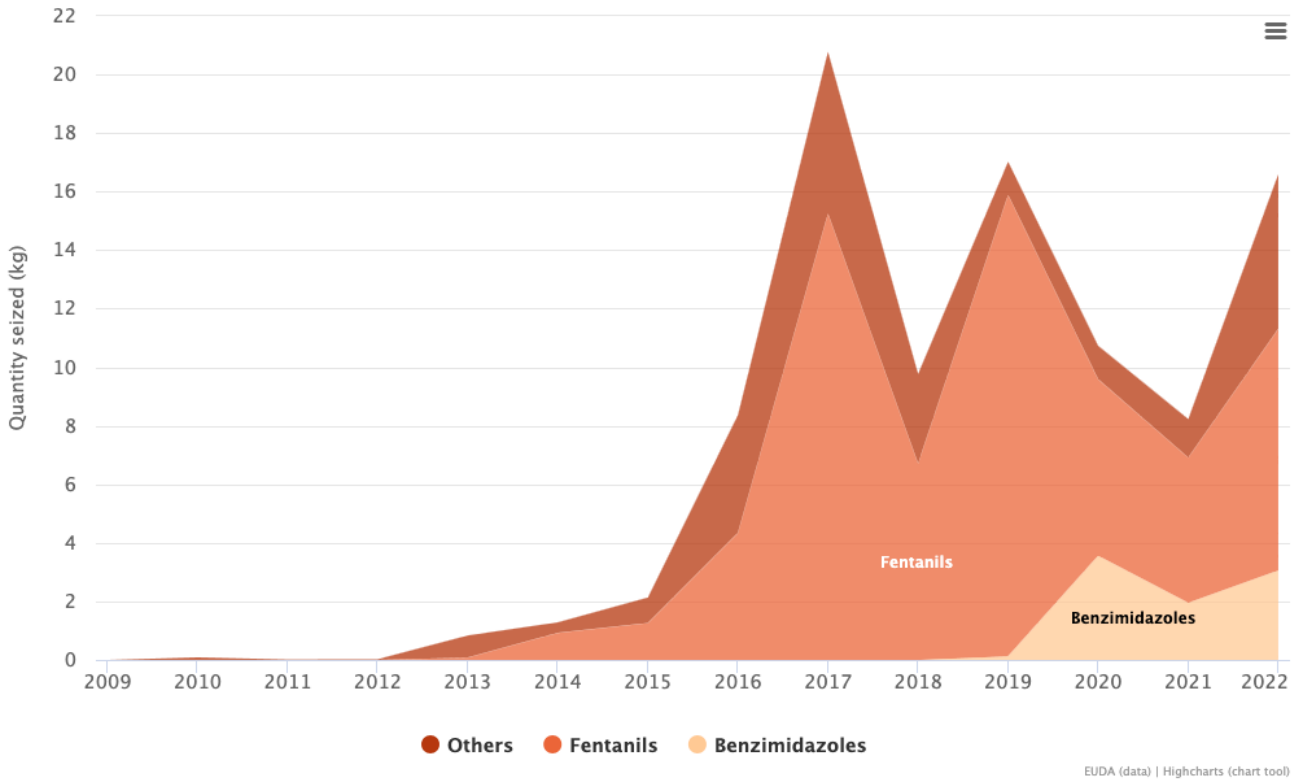
Most of the seizures occurred in northern Europe, particularly the Baltic States. Latvia, Lithuania and Estonia reported 563 (75 %) of the seizures and 10.6 kilograms (64 %) of the material seized (see Figure Seizures of new opioids reported to the EU Early Warning System by country: numbers of seizures and quantity seized for all forms reported in weight, European Union, 2022).

With the exception of carfentanil, and reflecting a general decrease in the number of countries reporting seizures of fentanyl derivatives since 2019, during 2022 no other seizures of powders containing fentanyl derivatives were reported (separately, almost 6 800 tablets containing the derivative furanylfentanyl were reported in three cases).

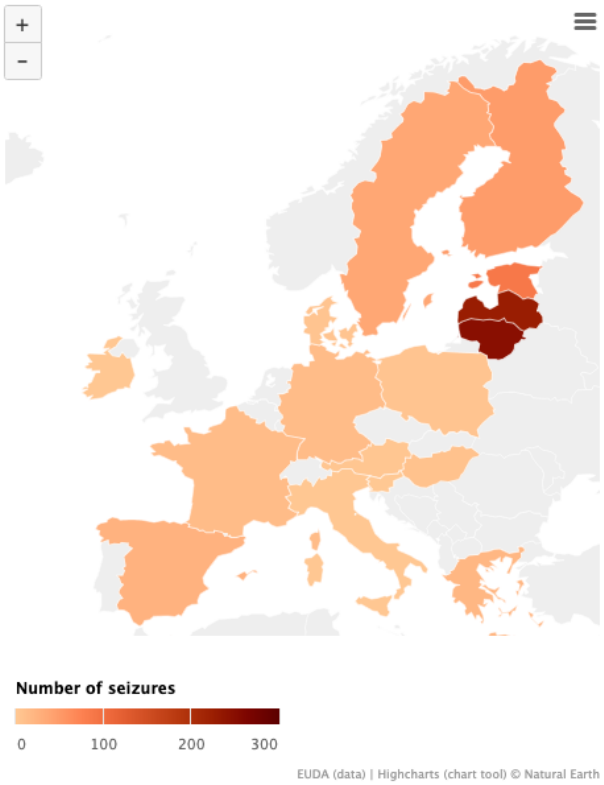
Seizures of new opioids reported to the EU Early Warning System: trends in numbers of seizures, European Union, 2005-2022



Seizures of new opioids reported to the EU Early Warning System: quantities seized for all forms reported in weight, by type of opioid, European Union, 2005-2022

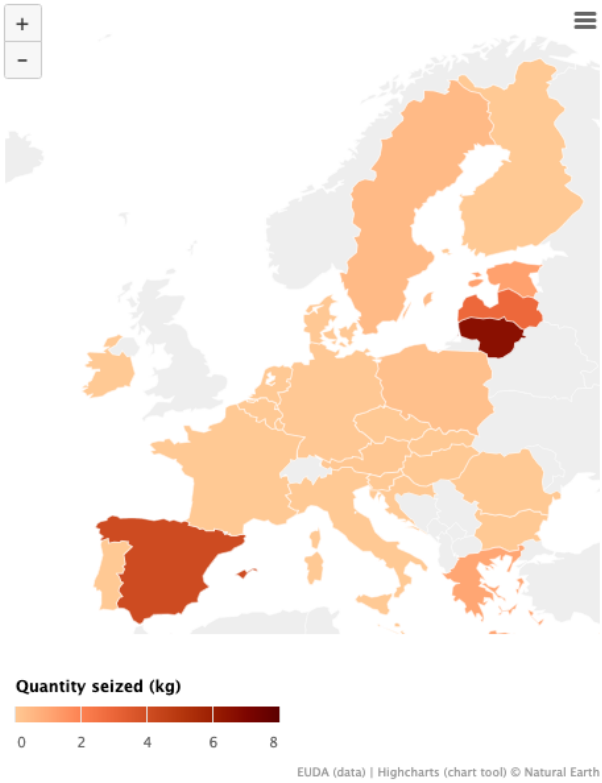


Seizures of new opioids reported to the EU Early Warning System by country: numbers of seizures, European Union, 2022



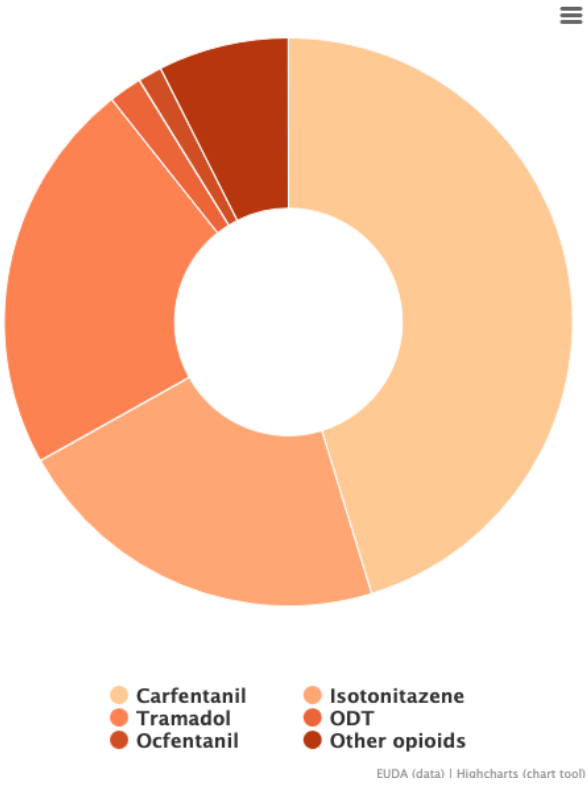
Seizures of new opioids reported to the EU Early Warning System by country: quantity seized for all forms reported in weight,

European Union, 2022

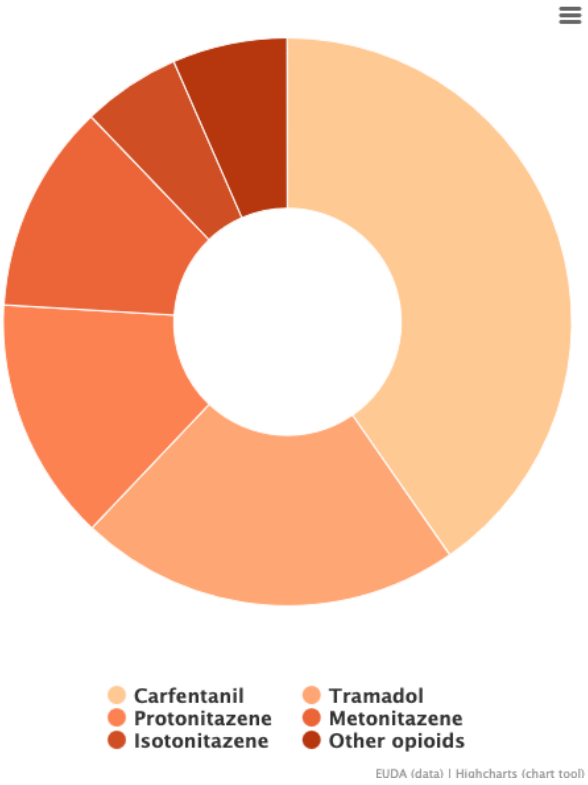


While the number of seizures of carfentanil was similar in 2021 and 2022, the quantity seized effectively doubled in 2022. Regarding the nitazenes, the number isotonitazene seizures and the quantity seized fell in 2022 compared with 2021, possibly reflecting the international control of this substance, which came into effect in November 2021 (CND, 2021a). Notably, seizures of the replacement substances metonitazene and protonitazene increased in 2022 (see Figures Top five new opioids seized by number of seizures and quantity seized reported to the EU Early Warning System, European Union, 2021 vs 2022). Following the control of these two substances in 2022 (CND, 2022) and 2023 (CND, 2023), respectively, it is expected that producers and suppliers will switch to other non-controlled nitazenes in due course. The second most commonly seized new opioid in 2023 was tramadol, with around 5 kilograms of material seized.

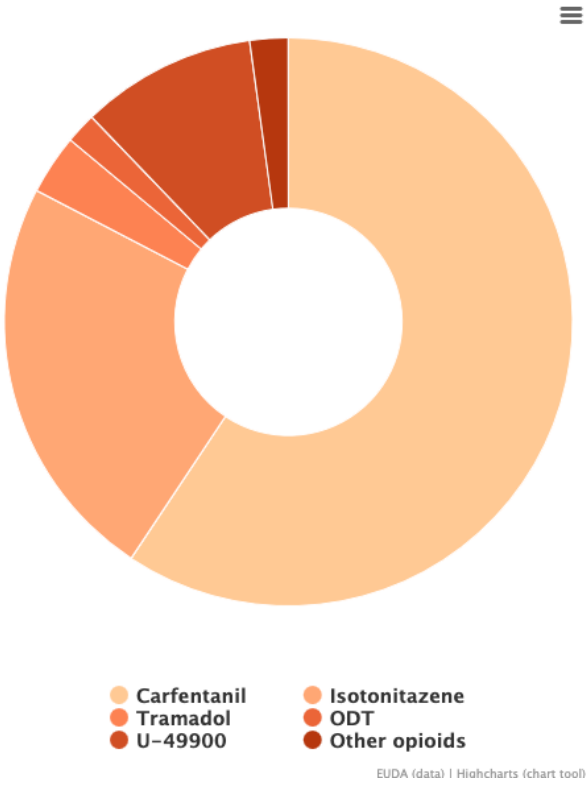
Top five new opioids seized by number of seizures reported to the EU Early Warning System, European Union, 2021 (740 seizures)



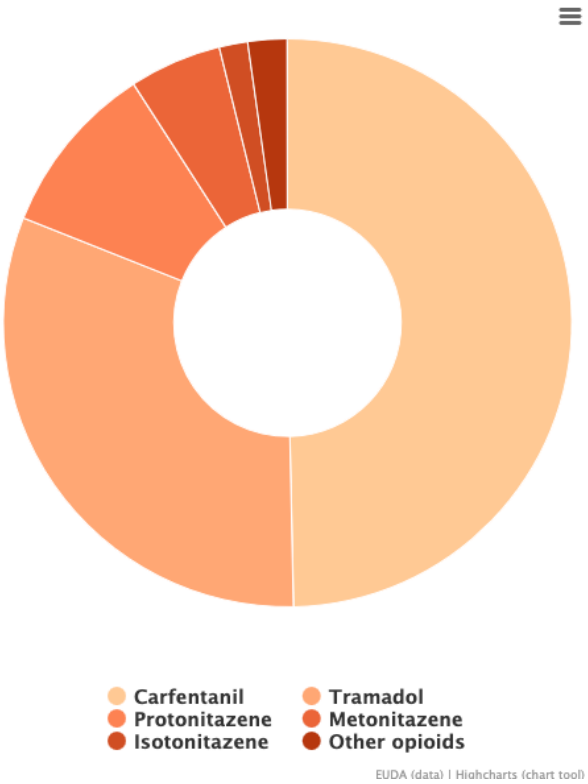
Top five new opioids seized by number of seizures reported to the EU Early Warning System, European Union, 2022 (749 seizures)



Top five new opioids seized by quantity seized reported to the EU Early Warning System, European Union, 2021 (8.2 kg seized)



Top five new opioids seized by quantity seized reported to the EU Early Warning System, European Union, 2022 (16.6 kg seized)



Despite the relatively small quantities of new opioids seized overall, the high potency of many of these substances means that even small quantities could produce many thousands of street doses.

While most seizures of nitazenes are in northern Europe, their presence on drug markets is probably more widespread, as 21 (78%) of the 27 EU Member States and Norway have reported the identification of one or more nitazene opioids in either seizures, biological samples or collected samples since 2019 (see Figure Countries in Europe reporting identifications of nitazene opioids, 2019-2023 (all types of identification)).

Countries in Europe reporting identifications of nitazene opioids, 2019-2023 (all types of identification)

Recent changes to the new opioid market in Europe

In 2022 and 2023, signals from northern Europe, and especially the Baltic countries, have suggested increasing availability of new opioids and a greater number of poisonings, including deaths, associated with these substances – particularly the nitazenes and carfentanil. In Estonia, the nitazenes now account for a significant proportion of overdose deaths, while preliminary data from Latvia in 2023 also suggest that deaths linked to nitazenes are being increasingly detected. In Lithuania, seizures of carfentanil have increased and the drug accounts for a significant proportion of overdose deaths.

In 2022, the Estonian Police reported seizing powders of metonitazene mixed with bromazolam, a new benzodiazepine. They have also reported seizing mixtures containing protonitazene, metonitazene and the animal sedative and analgesic xylazine. These mixtures, known respectively as ‘benzo-dope’ and ‘tranq-dope’, have been a feature of the opioid epidemics in North America for the past few years, and are linked to increases in harms, including poisonings.

The reason for mixing benzodiazepines or xylazine with opioids is unclear. However, it appears that suppliers, rather than consumers, are adding these substances, and they may be copying similar trends in North America. It has been suggested that they are added to prolong or otherwise alter the effects of the opioids or because they are cheap and easily available, as they are not controlled in most countries. Nonetheless, the true purpose of adding benzodiazepines and xylazine remains unknown.

So far, seizures of benzo-dope have been reported by Estonia and Latvia. In both countries, the same mixtures have also been identified in residues from used syringes.

Overall, the adulteration of opioids with xylazine has been detected in four EU Member States so far. Most detections are in Estonia and Latvia, including in residues from used injecting equipment and in toxicological reports following deaths. In addition, in 2023, 1 kilogram of xylazine powder that originated in Germany was intercepted by Swedish customs.

In 2023, outbreaks of poisonings, including deaths, caused by nitazene opioids were reported in France, Ireland and the United Kingdom. In France and Ireland, it appears that the nitazenes were mis-sold as heroin. The outbreak in France was limited, but involved a small number of non-fatal overdoses and one death. The outbreaks in Ireland occurred in Dublin in November 2023 and Cork in December 2023. These were more extensive than the outbreak in France, and suspected to involve 57 and 8 non-fatal overdoses in Dublin and Cork, respectively (it is unknown whether the outbreaks involved deaths).

In the United Kingdom, alongside many suspected non-fatal overdoses, at least 65 deaths have been confirmed. In these outbreaks, heroin adulterated with nitazene opioids and fake opioid (oxycodone) and benzodiazepine (Xanax and Valium) medicines containing nitazenes were implicated (see Box 150 000 tablets containing nitazene opioids seized in the United Kingdom, October 2023). These outbreaks follow a similar outbreak in southern England in 2021, which was linked to the adulteration of heroin with isotonitazene and the possible contamination of cocaine with this potent opioid (Advisory Committee on the Misuse of Drugs, 2022; De Baerdemaeker et al., 2023).

150 000 tablets containing an unspecified nitazene opioid seized in the United Kingdom, October 2023

Since July 2023, the United Kingdom has experienced several outbreaks of overdoses, including deaths, involving nitazene opioids. These have been linked to the adulteration of heroin as well as fake oxycodone tablets containing these potent opioids.

In October 2023, police and border force raided several addresses in London as part of a national UK law enforcement effort to investigate the increase in availability of synthetic opioids in the drug supply (Metropolitan Police, 2023). They recovered approximately 150 000 tablets containing an unspecified nitazene at a processing site. A pill-pressing machine, as well as a substantial amount of controlled drugs, a firearm, and over GBP 60 000 in cash and GBP 8 000 in cryptocurrency stored on various hard drives were also seized, along with a large quantity of mobile phones and laptops. It is suspected the tablets were sold via the darknet, using encrypted chat applications

and social media. Eleven people were arrested between 21 August and 21 November.

Tablets containing an unspecified nitazene opioid, along with other drugs and chemicals, a mixing machine and a pill-pressing machine, seized by police in the United Kingdom in October 2023. Source: Metropolitan Police, United Kingdom.

Tablets containing new opioids pose a high risk of poisoning because they are highly potent substances, can contain a high dose, and are often presented as fake medicines such as oxycodone without consumers knowing their real content.

So far, six EU Member States and Norway have reported seizures of tablets or capsules containing nitazene opioids. In 2022, a total of 430 tablets and capsules were seized, compared with 189 seized in 2021. In the majority of reported cases, there is no contextual information available on whether these tablets were fake medicines or not.

Despite this lack of information, fake oxycodone tablets containing metonitazene, etonitazepyne and the related substance brorphine have been reported in at least four countries (Ireland, Slovenia, Sweden, Norway) between 2021 and 2023.

In some cases, these fakes were sold on the darknet and were advertised as containing oxycodone. In the cases reported by customs in Ireland and Norway, the reported country of origin was the United Kingdom. In two recent cases from 2023, reported by Swedish customs, fake oxycodone tablets were seized from individuals travelling from Poland (see Photos Fake oxycodone tablets containing metonitazene, seized in Sweden in 2023).

Fake oxycodone tablets containing metonitazene, seized in Sweden in 2023. Source: Swedish Customs Laboratory.

Also in 2023, the Finnish Police reported the seizure of fake Subutex (buprenorphine) tablets containing metonitazene (see Photo Fake Subutex tablets containing metonitazene, seized in Finland in 2023).

Fake Subutex tablets containing metonitazene, seized in Finland in 2023. Source: Elisa Kohtamäki, National Bureau of Investigation, Finland

Cases of poisonings involving such fakes have been reported in Europe. The prevalence of fake oxycodone and buprenorphine tablets containing nitazene opioids in Europe is unknown. Given the nature of the international supply chains for such fakes, such as sales on the darknet, their availability elsewhere in Europe cannot be ruled out.

All of the source data used in graphics and data tables may be found in our Data catalogue.

References

Consult the list of references used in this module.

EU Drug Market: New psychoactive substances — Distribution and supply in Europe: Semi-synthetic cannabinoids

This resource is part of EU Drug Market: New psychoactive substances — In-depth analysis by the EMCDDA and Europol.

Last update: *27 June 2024*

Overview

Unlike synthetic cannabinoids, the semi-synthetic cannabinoids are mostly produced from cannabidiol extracted from low-THC cannabis (hemp) – the production and availability of which has proliferated in recent years in the United States and Europe.

In 2022, semi-synthetic cannabinoids, which are not controlled under the international drug conventions, started to appear on the European drug market. The first was hexahydrocannabinol (HHC) in May. Five other semi-synthetic cannabinoids, HHC acetate (HHC-O), hexahydrocannabiphorol (HHC-P), tetrahydrocannabidiol (H4-CBD), tetrahydrocannabiphorol (THC-P) and hexahydrocannabihexol (HHCH) have also been identified.

HHC appears to have first been sold in the United States in or around September 2021, although the precise date is unknown. HHC is one of a number of semi-synthetic cannabinoids that have recently been sold openly in the US as legal replacements for cannabis and delta-9-THC, beginning with delta-8-tetrahydrocannabinol (delta-8-THC) in 2019. This new market is associated with:

- the legalisation of hemp cultivation in the US in 2018;
- subsequent abundant or surplus supply of hemp and hemp-derived cannabidiol (CBD), which can be used as a precursor for semi-synthetic cannabinoids;
- the interpretation by producers that cannabinoids derived from hemp are not controlled under the US Federal Controlled Substances Act, so long as the final product does not contain more than 0.3 % delta-9-THC by dry weight.

Since then, these products have also begun to proliferate in Europe. At least initially, bulk quantities of HHC and some other semi-synthetic cannabinoids, in the form of oils or distillates, as well as consumer products were imported into Europe.

These substances are sold openly as legal replacements for THC and cannabis in a range of highly attractive branded and unbranded products – some of which are sold as ‘legal highs’. These products include hemp sprayed or mixed with semi-synthetic cannabinoids – which looks and smells like genuine herbal cannabis – as well as vapes and edibles. The marketing and advertising of these products often make direct comparison to the effects of THC and cannabis.

The size and scale of the retail market for semi-synthetic cannabinoids is unknown. Products are sold openly in a range of brick-and-mortar and online shops, particularly those specialised in selling low-THC cannabis and CBD products, as well as vaping products (‘smoke shops’). Initial

indications from surface web monitoring in early 2023 suggest that retailers can be found in, or ship to, most EU Member States. However, the control of some semi-synthetic cannabinoids recently in some countries may have changed the situation. Producers, retailers and consumers may also buy bulk oils and finished products from suppliers in the United States and import them into Europe.

Concerns exist that, potentially, there could be high demand for semi-synthetic cannabinoid products. This includes from existing cannabis users and new consumers attracted to its effects and legal status – some of them young or otherwise inexperienced in drug use. In some cases, ease of access to products, such as from vending machines and high street CBD and vape shops, may promote use (see Photos HHC disposable vapes sold in a vending machine alongside nicotine-containing vaping products in Künzelsau, Baden-Württemberg, Germany, November 2022).

HHC disposable vapes sold in a vending machine alongside nicotine-containing vaping products in Künzelsau, Baden-Württemberg, Germany, November 2022. The HHC vapes were labelled s 'ACAN Mango Kush' and sold for EUR 40 per pen. Source: Landeskriminalamt Baden-Württemberg (State Criminal Police Office Baden-Wuerttemberg), Germany.

Consumers may also be attracted to the different effects that semi-synthetic cannabinoids are claimed to have compared with cannabis and other THC products. While the accuracy of these claims have not been assessed, in the case of HHC they include assertions that it is 'less intoxicating', which has led to it being described sometimes as 'cannabis lite' (not to be confused with the low-THC 'cannabis light' marketed primarily in Italy since about 2018). In addition, vapes and edibles are an easy and discreet way to use HHC, especially in public settings. Vape cartridges

are also supplied using the standard connectors that fit many electronic cigarettes on the market.

Information on the retail prices of semi-synthetic cannabinoid products is currently limited. However, based on test purchases and internet monitoring, they appear to be comparable with at least some illicit cannabis products. For example, low-THC cannabis flower containing HHC sells for approximately EUR 6-10 per gram (depending on the reported strength of the product), which is similar to the average cost of illicit cannabis herb in Europe.

The effects of semi-synthetic cannabinoids in humans have not been studied, but anecdotal consumer reports suggest they may be subjectively similar to those of cannabis. However, some products are available in forms that may deliver high doses, raising concerns about the possible public health implications of the availability of these substances.

These developments appear to mark the first major new changes in the market for 'legal' replacements for cannabis since Spice products containing synthetic cannabinoids emerged in Europe over 15 years ago.

Production

Some bulk quantities of oils or distillates, as well as consumer products containing HHC and other semi-synthetic cannabinoids, are imported from the United States. It is presumed that the bulk quantities are used to make consumer products in Europe. More recently, there are indications that bulk quantities of some semi-synthetic cannabinoids may also be produced in Europe from CBD extracted from low-THC cannabis (see Box Production of semi-synthetic cannabinoid products in Europe: Operation 'Dream Factory').

Production of semi-synthetic cannabinoid products in Europe: Operation 'Dream Factory'

In 2023, the Romanian Police dismantled a criminal network that imported, exported, produced and manufactured electronic vaping devices and 'edible' products (jellies, cookies and dragées) containing HHC, HHC-P, HHC-O, H4-CBD, THC-P and, in some cases, THC. The group appeared to be led by a Canadian citizen and is thought to have distributed close to 100 000 electronic vaping devices containing these substances between October 2022 and September 2023. As a result of the 121 house searches carried out, 81 102 vapes, 3 237 lollipops and thousands of boxes and bags of jellies were seized. Approximately 40 tonnes of industrial hemp and hundreds of containers of cannabis plant material and seeds were seized.

'Dream Factory' operation. Source: DIICOT – Iasi Territorial Service.

Detailed information on the production of HHC and a number of other semi-synthetic cannabinoids can be found in a recent EMCDDA technical report (EMCDDA, 2023).

Situation

The EMCDDA currently monitors six semi-synthetic cannabinoids. This includes four that were reported for the first time in 2023 (see Table Number of countries reporting detections of semi-synthetic cannabinoids, as notified to the EU Early Warning System, 2022-2023).

Number of countries reporting detections of semi-synthetic cannabinoids, as notified to the EU Early Warning System, 2022-2023

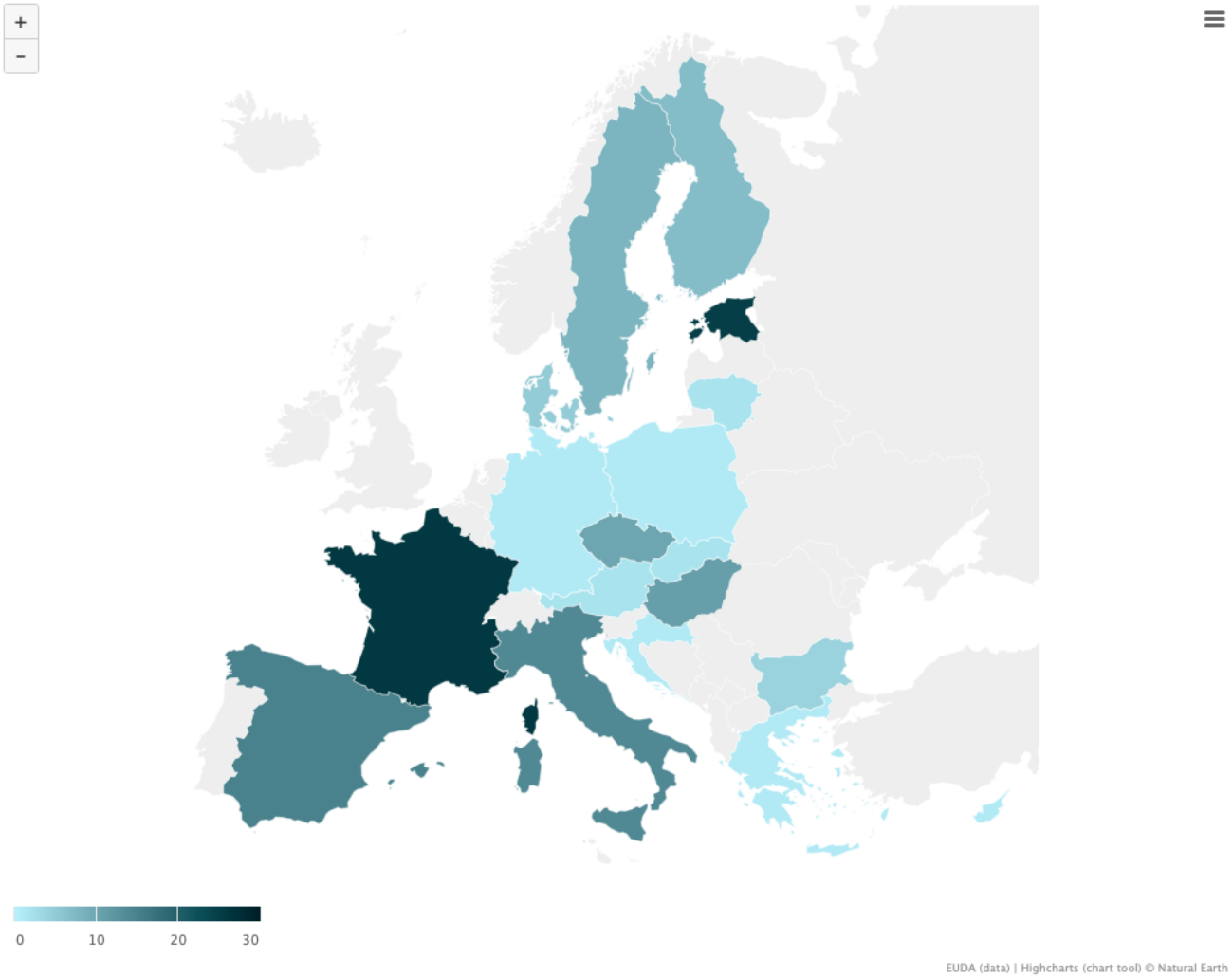
Substance	Date first identified	Number of countries reporting identifications
HHC	May 2022	24
HHC-O	August 2022	10

Substance	Date first identified	Number of countries reporting identifications
HHC-P	November 2022	8
H4-CBD	December 2022	9
THC-P	March 2023	5
HHCH	June 2023	1

There is limited information on this group of substances, given their recent emergence on the drug market.

In 2022, the vast majority of seizures of semi-synthetic cannabinoids reported by EU Member States to the EU Early Warning System were of HHC (see Figure Number of seizures of HHC (all forms) reported to the EU Early Warning System, European Union, 2022). These included 47.1 kilograms of herbal material – typically consistent with low-THC cannabis – containing HHC and 96 litres of liquids, mostly bulk oils used to create consumer products. Seizures of consumer products, particularly disposable vapes, were also reported.

Number of seizures of HHC (all forms) reported to the EU Early Warning System, European Union, 2022



Most of the seizures were relatively small, but at least three seizures were indicative of a potentially larger trade involving the production of finished products in Europe.

- In August 2022, Italian authorities seized just over 33 kilograms of material containing HHC, consisting of low-THC cannabis flower and resin and bulk quantities of oils or distillates. In addition, 68 kilograms of illicit herbal cannabis containing delta-9-THC (and no HHC) was found.
- In December 2022, Polish authorities seized 95 litres of HHC oil that originated from the United States (see Photo One-litre bottle of HHC oil seized at Warsaw Chopin Airport, Warsaw, Poland, December 2022). Laboratory analysis identified HHC and delta-8-THC in the oil, which was presumably intended to produce consumer products.
- In February 2023, German customs seized 10 kilograms of HHC liquid en route to Italy from the Netherlands. The liquid was reported to have originated from the United States.

One-litre bottle of HHC oil seized at Warsaw Chopin Airport, Warsaw, Poland, December 2022. Source: Polish Police

A range of branded and unbranded products containing HHC are available in Europe. They include:

- low-THC cannabis flower and resin that has been sprayed or mixed with HHC (see Photo 'Purple Haze' product consisting of low-THC cannabis flower containing HHC);
- ready-to-use disposable vape pens, e-liquids and e-liquid cartridges for use in electronic cigarettes (see Photo 'Imperial Garden' 1-ml blueberry flavour HHC vape cartridge, seized by Swiss customs in October 2022);
- edibles, especially flavoured sweets (gummies and marshmallows) (see Photo 'HHC Gummies Cola taste' containing teddy bear-shaped HHC-infused gummies, seized by Swiss customs in October 2022) and tinctures resembling food supplements;
- HHC oils.

Low-THC cannabis products containing HHC are marketed in a range of sophisticated, attractive, brightly coloured designs. In some cases, these are advertised as not for human consumption. In other cases, they may be sold as unbranded products. Low-THC cannabis flower containing HHC is also marketed using the names of popular cannabis strains such as Afghan Kush, Amnesia, BubbleGum Kush, Strawberry Kush, Pineapple Express and Purple Haze, or mention or allude to the same effects as these strains.

'Purple Haze' product consisting of low-THC cannabis flower containing HHC. Source: State General Laboratory, Cyprus

'Imperial Garden' 1-ml blueberry flavour HHC vape cartridge, seized by Swiss customs in October 2022. Source: Christian Bissig, Zurich Forensic Science Institute, Switzerland.

HHC Gummies Cola taste' containing teddy bear-shaped HHC-infused gummies, seized by Swiss customs in October 2022. Source: Christian Bissig, Zurich Forensic Science Institute, Switzerland.

Some seizures of HHC-O and HHC-P were also reported in 2022. The most notable was a seizure of 1 kilogram of HHC-O liquid that originated from the United States.

All of the source data used in graphics and data tables may be found in our Data catalogue.

References

Consult the list of references used in this module.

EU Drug Market: New psychoactive substances — Distribution and supply in Europe: Synthetic cannabinoids

This resource is part of EU Drug Market: New psychoactive substances — In-depth analysis by the EMCDDA and Europol.

Last update: *27 June 2024*

Overview

Synthetic cannabinoids are sold as 'legal' replacements for cannabis, but may sometimes also be sought in their own right as strong intoxicants. They are used by marginalised groups, such as people experiencing homelessness, prisoners and other vulnerable populations, because they cause profound intoxication, are easy to conceal and are cheaper than other drugs.

They are also used by people subject to drug testing, such as prisoners or those in drug treatment, because some routine tests cannot detect synthetic cannabinoids that are new to the drug market. In addition, in some parts of Europe, there has been an increase in reports of synthetic cannabinoids being vaped using electronic cigarettes; in some cases, individuals are unaware they are using synthetic cannabinoids because the products are mis-sold as containing THC or cannabidiol (CBD).

Synthetic cannabinoids may be available in several forms in Europe (EMCDDA, 2021a). Commonly, synthetic cannabinoids are sprayed onto herbal material or tobacco and smoked. Since 2020, low-THC cannabis (hemp) adulterated with synthetic cannabinoids has also been identified. In addition, the substances may be sold as e-liquids for vaping. Infusing paper (such as letters and photos) and clothing (such as underwear) is a common way to smuggle them into prisons. The items are then smoked, vaped or boiled to extract the substances. Synthetic cannabinoids may also be sold in the form of powders or occasionally tablets.

Synthetic cannabinoids can pose a high risk of poisoning, both because of their high potency and because the amount of cannabinoid can vary greatly in the product, leading to 'hot pockets' where the substance is highly concentrated (Moosmann et al., 2015). Drinking these substances when extracted from clothing poses similar risks, as users may have no control or knowledge of the dose they are taking.

Production

Most synthetic cannabinoids on the EU drug market are produced as bulk powders in China. However, the processing of these bulk powders into consumer products does take place in Europe. Recent signals suggest that the synthesis of synthetic cannabinoids may also be starting to occur to some degree in Europe. This could be partly driven by the generic controls on synthetic

cannabinoids introduced in China in July 2021, which banned the production and supply of most substances currently on the market.

Between 2017 and 2021, the five dismantled synthetic cannabinoid production facilities reported to the European Reporting Instrument on Sites related to Synthetic Production (ERISSP) were processing and packaging sites. Reports were provided by Germany, Spain, the Netherlands and Romania. Additional reports were obtained from national authorities and open-source information monitoring. These included reports of synthetic cannabinoid processing and packaging sites in the Netherlands, Hungary and Cyprus.

In the Netherlands, one production site was dismantled in 2018 on the premises of a commercial company. The synthetic cannabinoids were mixed and packed in bags with the 'Man-light' brand name. In 2020, another site was dismantled at a different location, where synthetic cannabinoids were mixed with herbal carrier material, packaged and distributed by post, mainly to Germany (National Police of the Netherlands, 2022).

In Hungary, the production of papers impregnated with synthetic cannabinoids and herbal smoking mixtures was discovered in 2021, at a site where seizures of acetone were recorded. Authorities believe that a significant proportion of infused papers seized in Hungary are produced within the country, using imported powders (EMCDDA, unpublished).

In Cyprus, a synthetic cannabinoid processing facility was seized in 2022. Acetone was found alongside a few kilograms of cannabinoid powders (JWH-210, ADB-BUTINACA, FUB-144 and MDMB-4en-PINACA) and illicit drugs (EMCDDA, unpublished).

Importantly, in 2023, two sites were dismantled where there were signs that the synthesis of synthetic cannabinoids may have occurred, rather than just processing and packaging. These sites were located in Greece and Spain.

In Greece, a storage warehouse and a makeshift laboratory were seized following an investigation by the Greek Police in cooperation with the Lithuanian Police, Europol and the DEA (the US Drug Enforcement Administration), in relation to a seizure in Lithuania of eight parcels originating in Greece. The Greek production site was fulfilling orders for Europe (Germany, France, Lithuania, Poland and Portugal), the United States and Australia via an encrypted communication platform. The orders were sent via postal and courier services and payments were made using cryptocurrency. In total, 41.5 kilograms of powder and 3.5 litres of synthetic cannabinoids were seized, alongside 6 kilograms of synthetic cathinones, 700 grams of cannabis herb and resin, 200 grams of CBD/cannabigerol and 17 benzodiazepine tablets. Five individuals were arrested, including four Greek nationals and one Albanian citizen (EMCDDA, unpublished) (see Photos Seized warehouse and laboratory producing synthetic cannabinoids in Greece, 2023).

Seized warehouse and laboratory producing synthetic cannabinoids in Greece, 2023. Source: Greek Police, Central Anti-drug Co-ordination Unit – National Intelligence Unit (SODN-EMP), General Chemical State Laboratory.

In Spain, following an international investigation triggered by US seizures originating from the country, a production facility was dismantled in Barcelona (1). This produced synthetic cannabinoids (ADB-BUTINACA, ADB-FUBIACA, ADB-B-5BR-INACA, A-FUBIACA and JWH-210), cathinones (alpha-PHiP) and opioids (unspecified) for export to North America, Oceania and EU countries via parcel services. The site was equipped with a tableting machine and a sophisticated production and logistics dispatch system resembling a supermarket display. It appears that some degree of manufacturing was occurring in the laboratory, given that precursors were seized, alongside laboratory equipment and solvents. Processing and packaging of end products did take place at the site, with over 7.5 million doses of new psychoactive substances seized. Three members of the same family were arrested, who used a Barcelona-based company with Hungarian connections for shipping (Spanish Police, 2023).

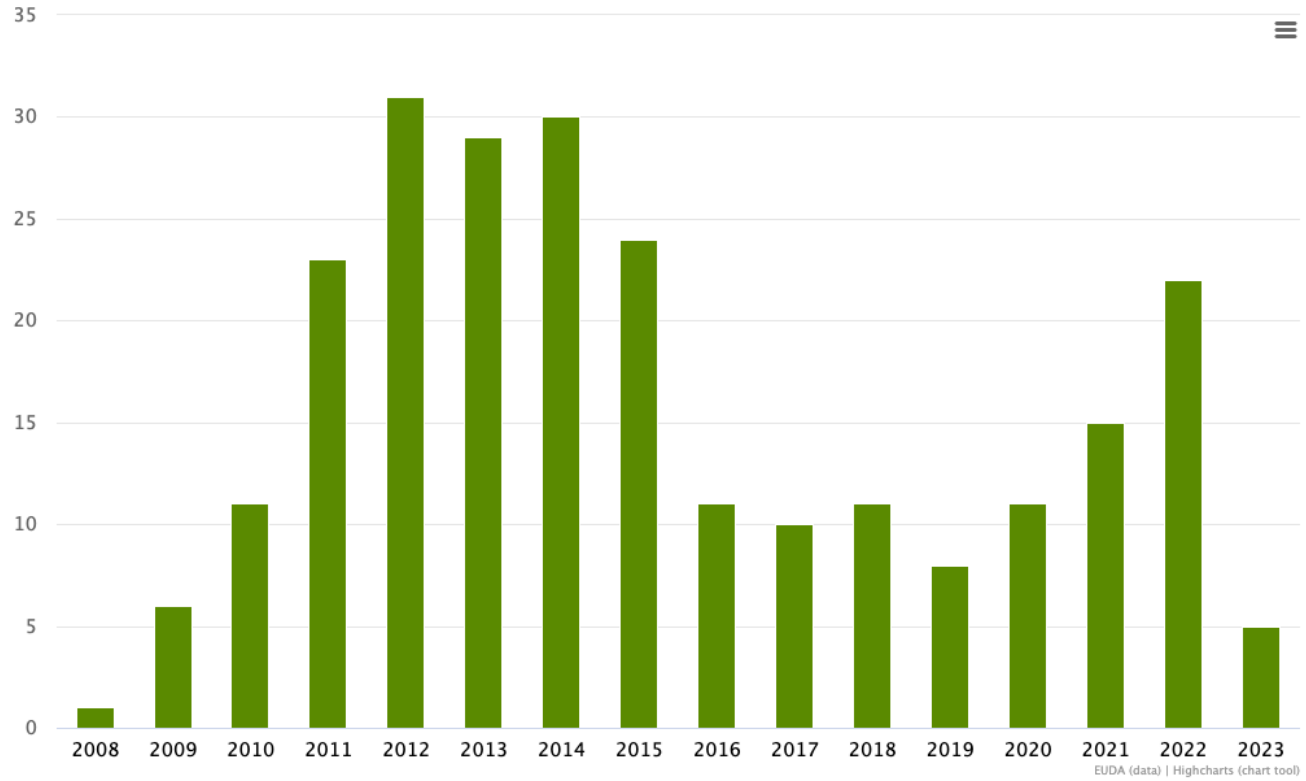
Situation

The EMCDDA currently monitors 247 synthetic cannabinoids, making them the largest group of new psychoactive substances in Europe (25 % of all substances). This includes five that were notified in 2023.

Between 2016 and 2020, the number of new synthetic cannabinoids appearing on the market was stable at around 10 per year, down from an average of 27 per year during the peak of the 'legal highs' phenomenon between 2011 and 2015. However, in 2021 and 2022 there was an increase in the number notified, with 15 and 22 substances reported, respectively. Similar increases have also been reported in the United States (Krotulski et al., 2021). These new cannabinoids have possibly been developed to circumvent the generic controls introduced in China in 2021.

Laboratory studies of the effects of some of these new cannabinoids suggest that while some are active, others may not be inactive or may even be precursors. Notably, in 2023, the number of newly reported synthetic cannabinoids appearing on the market for the first time fell to just five substances – a 14-year low (see Figure Number of synthetic cannabinoids notified to the EU Early Warning System for the first time, European Union, 2005-2023).

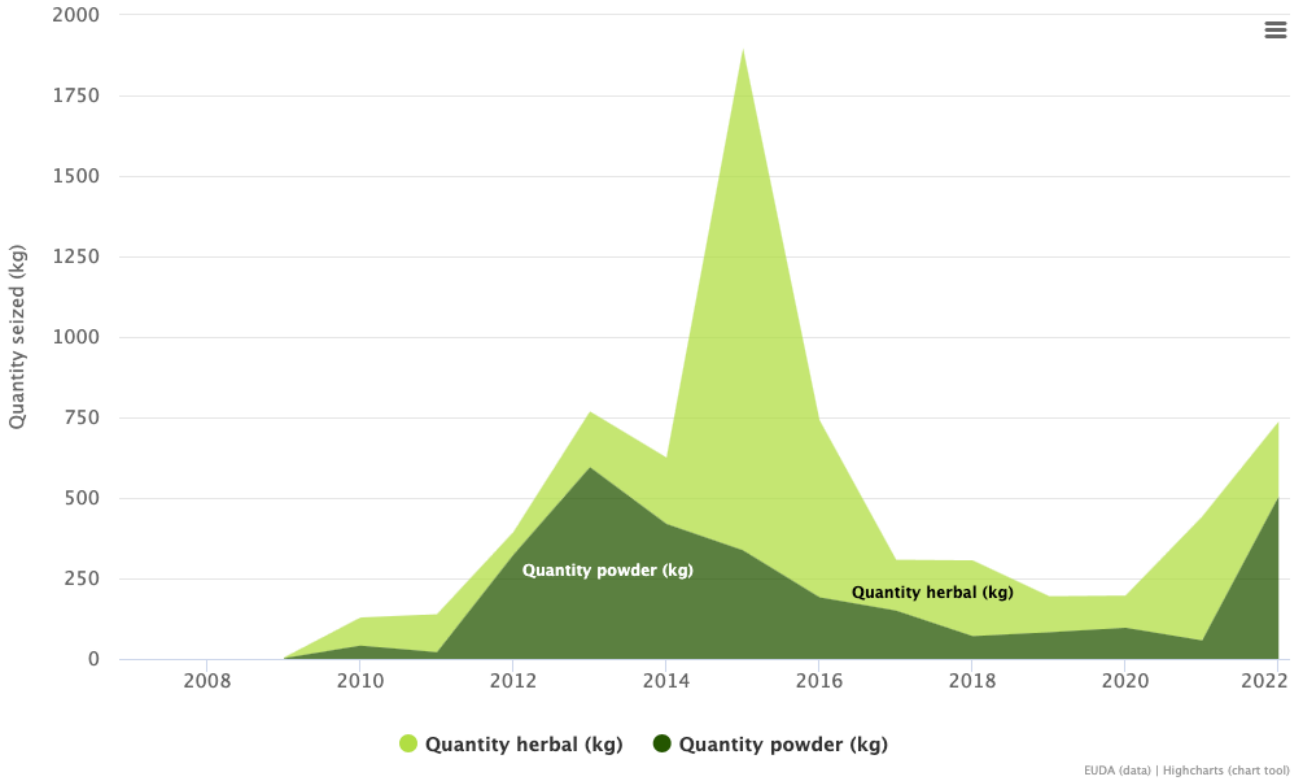
Number of synthetic cannabinoids notified to the EU Early Warning System for the first time, European Union, 2005-2023



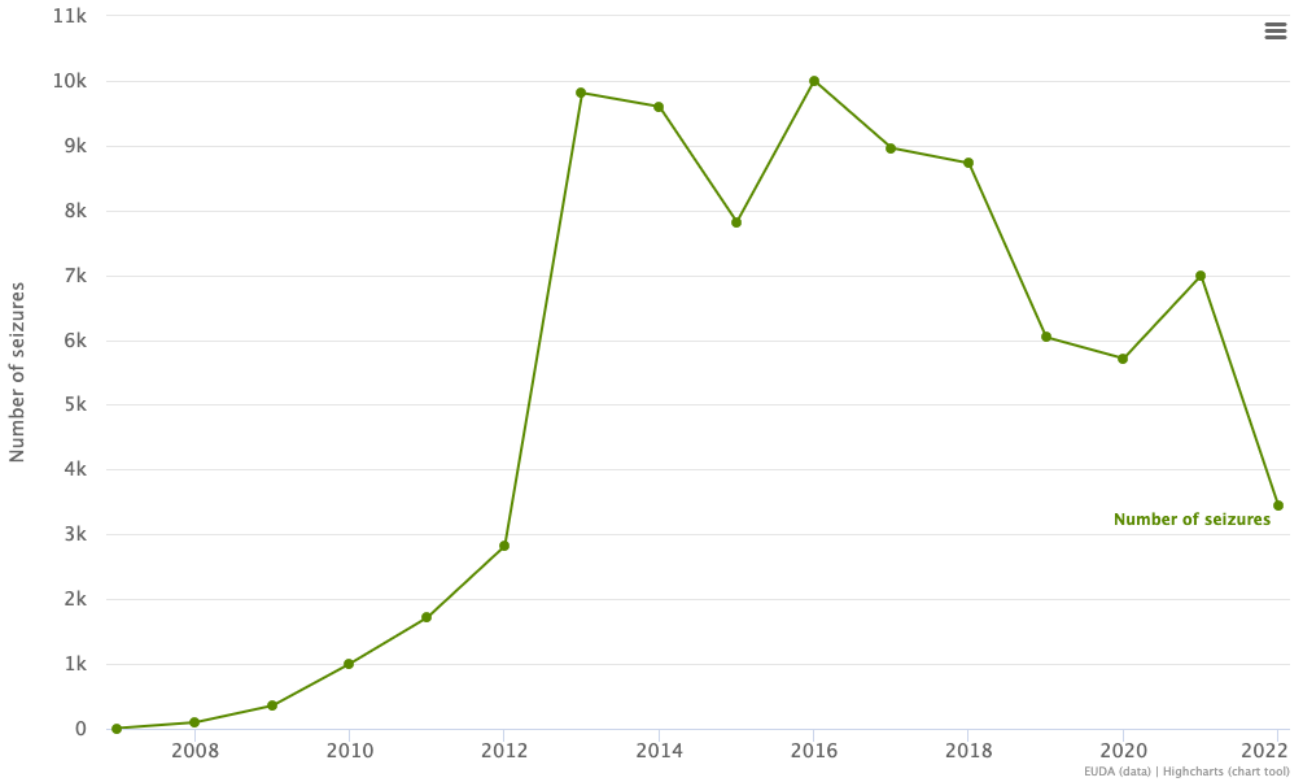
In 2022, 4 543 seizures of synthetic cannabinoids were reported to the EU Early Warning System, which accounts for around 13 % of the total number of seizures reported during that year by the EU Member States (see Figures Seizures of synthetic cannabinoids reported to the EU Early

Warning System: trends in number of seizures and quantities of powders and herbal material seized, European Union, 2005-2022). Most of these detections were in the form of herbal material (3 056 cases, 89 %; 233.5 kilograms) and powders (385 cases, 11 %; 504 kilograms) (see also Figures Number and quantity of synthetic cannabinoids seized in the form of herbal material, European Union, 2022 and Number and quantity of synthetic cannabinoids seized in the form of powder, European Union, 2022).

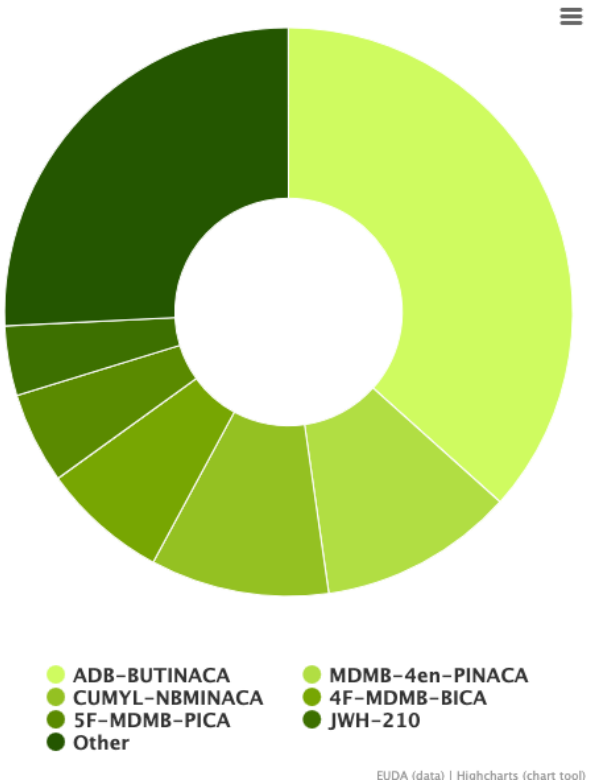
Seizures of synthetic cannabinoids reported to the EU Early Warning System: quantities of powders and herbal material seized, European Union, 2005-2022



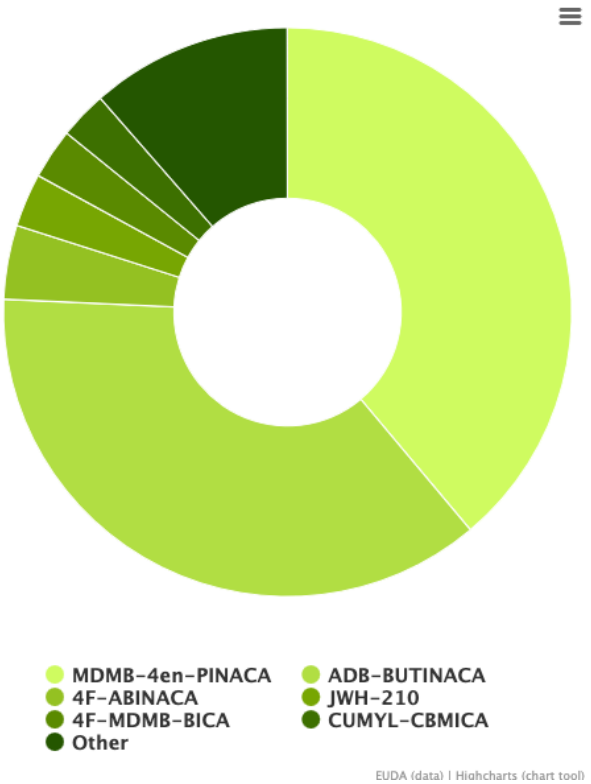
Seizures of synthetic cannabinoids reported to the EU Early Warning System: trends in number of seizures, European Union, 2005-2022



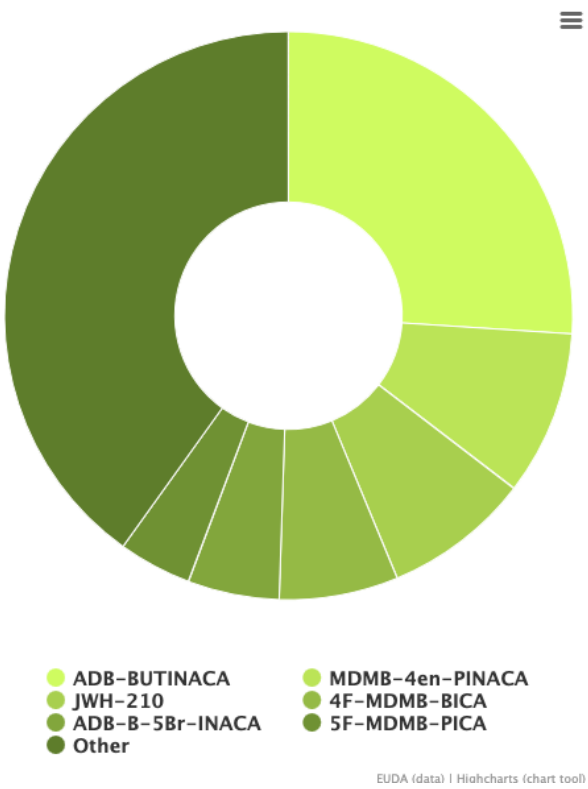
Number of synthetic cannabinoids seized in the form of herbal material, European Union, 2022



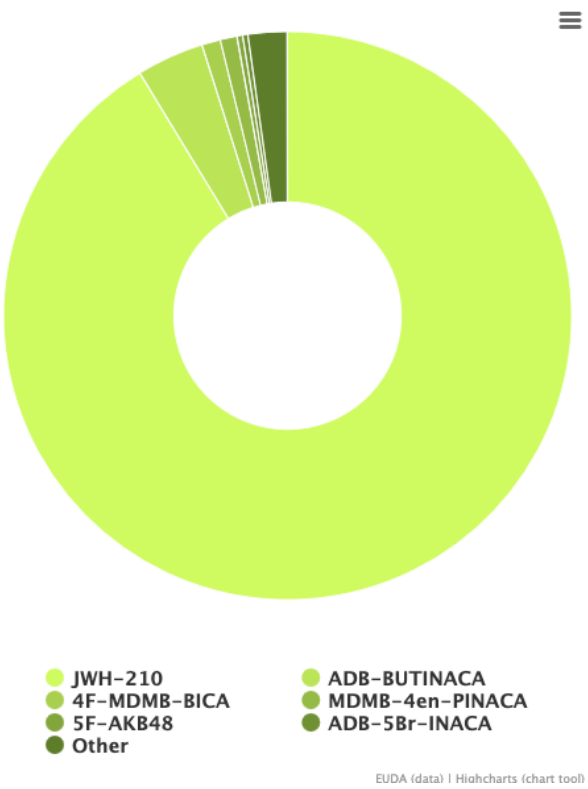
Quantity of synthetic cannabinoids seized in the form of herbal material, European Union, 2022



Number of synthetic cannabinoids seized in the form of powder, European Union, 2022



Quantity of synthetic cannabinoids seized in the form of powder, European Union, 2022

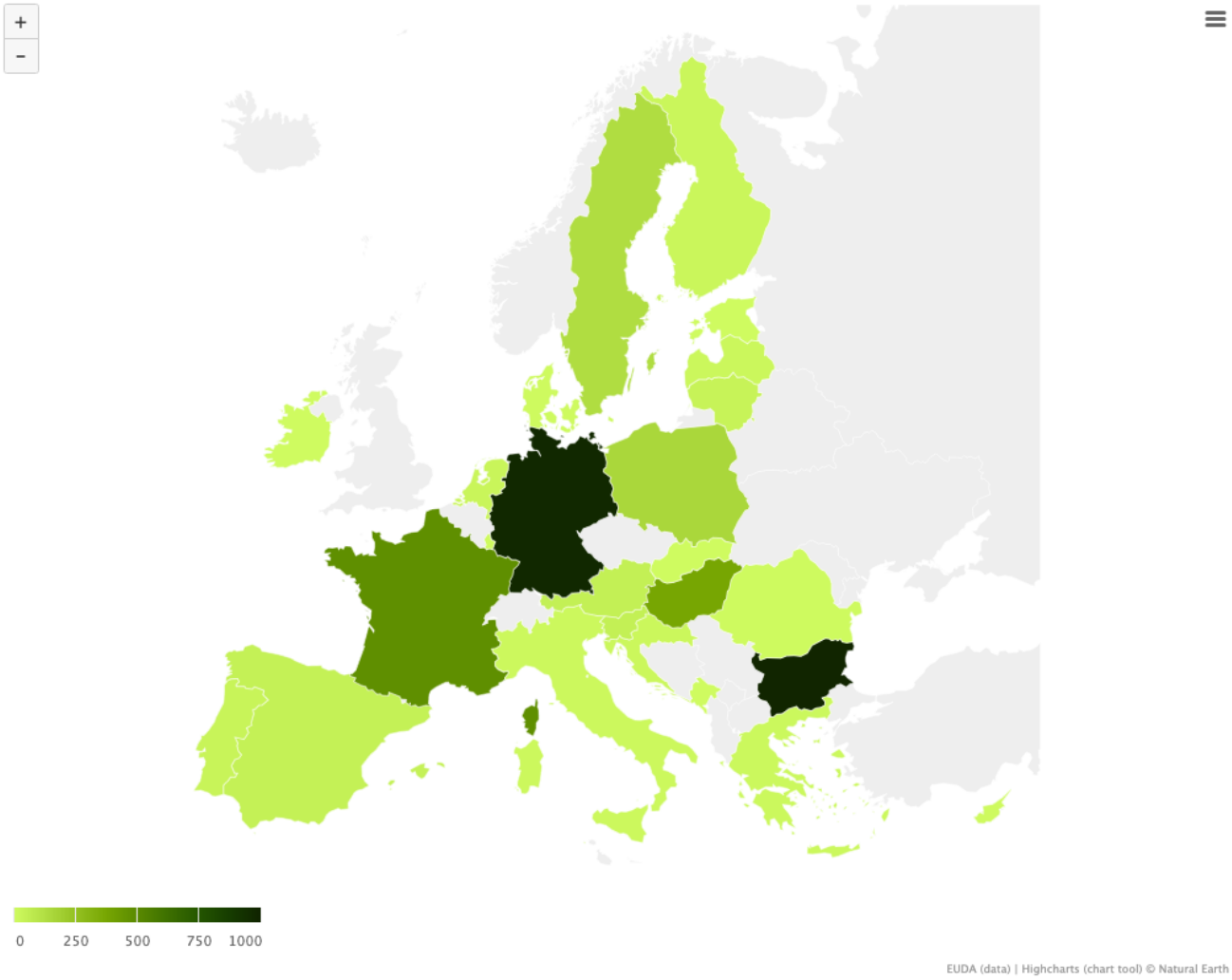


In 2022, the quantity of herbal material containing synthetic cannabinoids seized in the European Union remained significantly below the peak quantity seized in 2015 (see Figures Seizures of synthetic cannabinoids reported to the EU Early Warning System: trends in number of seizures and quantities of powders and herbal material seized, European Union, 2005-2022). This probably reflects a decrease in the large-scale processing of synthetic cannabinoids into herbal smoking mixtures, particularly the 'legal high' products that typified a large part of the NPS market in Europe between 2008 and 2015.

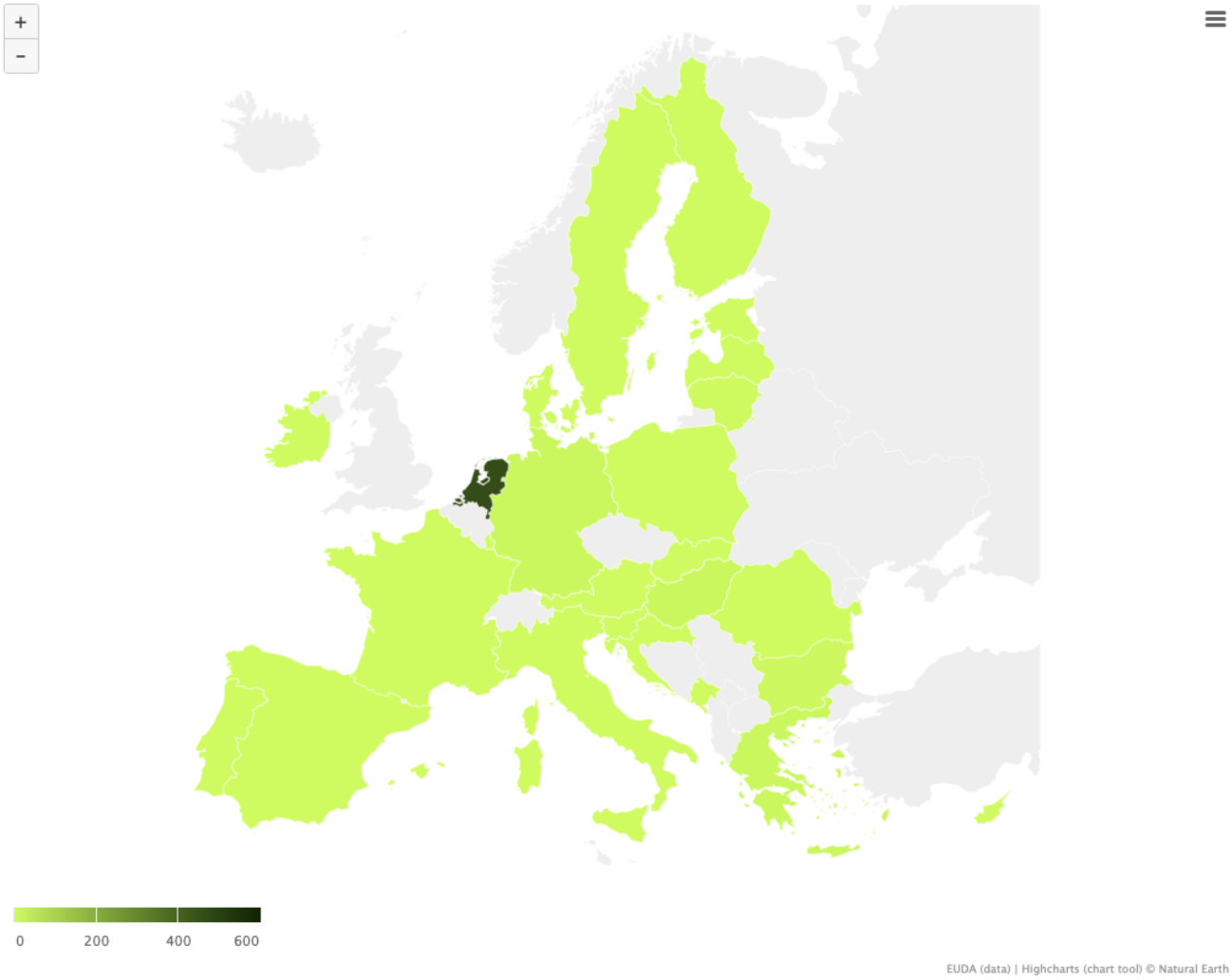
The quantity of powder containing synthetic cannabinoids seized in the European Union increased significantly in 2022 to the highest level since 2013 (504 vs 596 kilograms). However, 457 kilograms (91 %) of the total amount of powder in 2022 was from four large seizures by Dutch customs of a single cannabinoid, JWH-210. The source of this cannabinoid is unknown, although it has been controlled in China since 2015.

The number seizures of synthetic cannabinoids and the quantity seized varies across Europe. In 2022, most of the seizures occurred in Bulgaria and Germany, with the greatest quantities of powders seized in the Netherlands by customs, and the greatest quantities of herbal material seized in Germany and the Netherlands (see Figures Seizures of synthetic cannabinoids reported to the EU Early Warning System by country: numbers of seizures, quantity of powder seized and quantity of herbal material, European Union, 2022).

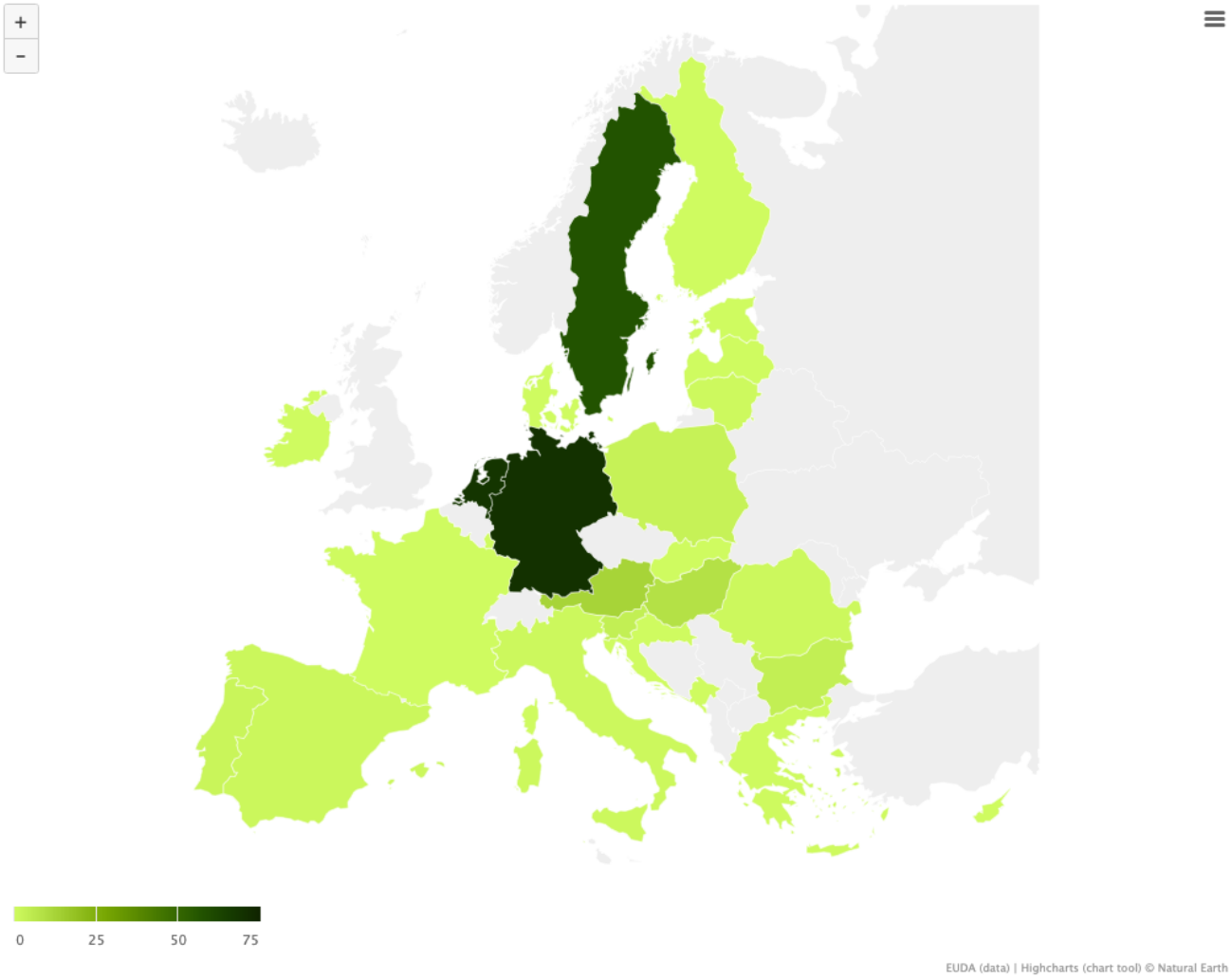
Seizures of synthetic cannabinoids reported to the EU Early Warning System by country: numbers of seizures, European Union, 2022



Seizures of synthetic cannabinoids reported to the EU Early Warning System by country: quantity of powder seized, European Union, 2022



Seizures of synthetic cannabinoids reported to the EU Early Warning System by country: quantity of herbal material seized, European Union, 2022



Since 2020, there has been an increase in reports of herbal material where THC or other natural cannabinoids, suggestive of low-THC hemp, were found alongside synthetic cannabinoids. At least 13 European countries have reported such cases, with most reports coming from Germany and Sweden. Such adulterated products may be more widely available but go undetected. During 2020, over 36 kilograms of adulterated herbal material suggestive of hemp was reported; this increased to 200 kilograms in 2021 before falling to 71.5 kilograms in 2022.

The reason for the adulteration is not entirely clear, but increased cultivation of low-THC industrial hemp in Switzerland has led to oversupply and a sharp drop in its price (Von Schläpfer et al., 2020). Low-THC herbal cannabis products have also become more commonly available in some EU countries. The adulterated cannabis appears similar in appearance to natural cannabis, and can be mis-sold as cannabis to unsuspecting consumers. Synthetic cannabinoids are highly potent substances, and adulterated products carry poisoning risks.

An additional concern is that cannabis edibles (foods, often in the form of ‘sweets’ that are typically infused with cannabis extract) have become more apparent on the illicit European market since 2021. In addition to the risks that these products pose because of their THC content and the possibility that they may be mistaken for legitimate commercial products, especially by children,

there are concerns that some of these products may contain synthetic cannabinoids. Since 2019, at least five countries have reported the identification of edibles containing synthetic cannabinoids that were in the form of sweets (gummies). In Ireland, these edibles are often found in commercial packaging similar to existing branding of sweets (see Photos Edibles containing synthetic cannabinoids seized in Ireland). According to Irish authorities, these sweets have taken on a more professional and commercial appearance, which may suggest a wider distribution strategy. The packaging is often labelled as being 'cannabis infused' or containing THC, although many of these sweets do not contain THC. Laboratory analysis by Forensic Science Ireland has found that more than 50 % of the sweets tested in 2022 did not contain THC, but contained synthetic cannabinoids instead. In some cases, use of these products by young people has led to poisonings requiring hospitalisation (Forensic Science Ireland, 2023).

Edibles containing synthetic cannabinoids seized in Ireland. Source: Forensic Science Ireland.

(1) The operation 'Canalla-Electrón' could be carried out thanks to the information posted on the NPS IONICS alert exchange platform of the International Narcotics Control Board (GRIDS Programme), the intervention of the Spanish National Police, the Deputy Directorate of Customs Surveillance and the coordination of the Intelligence Center against Terrorism and Organized Crime (CITCO).

All of the source data used in graphics and data tables may be found in our Data catalogue.

References

Consult the list of references used in this module.

EU Drug Market: New psychoactive substances — Distribution and supply in Europe: Synthetic cathinones

This resource is part of EU Drug Market: New psychoactive substances — In-depth analysis by the EMCDDA and Europol.

Last update: *27 June 2024*

Background

Synthetic cathinones first appeared on the European fdrug market in 2004. Since then, they have been sold as replacements for controlled stimulants such as amphetamines, cocaine and MDMA. They are also mis-sold as these controlled stimulants to unsuspecting consumers.

Typically, they are found as powders and, to a lesser degree, tablets. In the latter case, these may be mis-sold as or used to adulterate MDMA (ecstasy) tablets. Other physical forms are reported to a much smaller degree.

The cathinones are used recreationally, but they are also used by high-risk drug users in some countries, including by people who inject stimulants and opioids. This also includes in the context of chemsex. In some cases, changes in patterns of use, such as an increase in injecting frequency with cathinones, have been linked to HIV and HCV outbreaks.

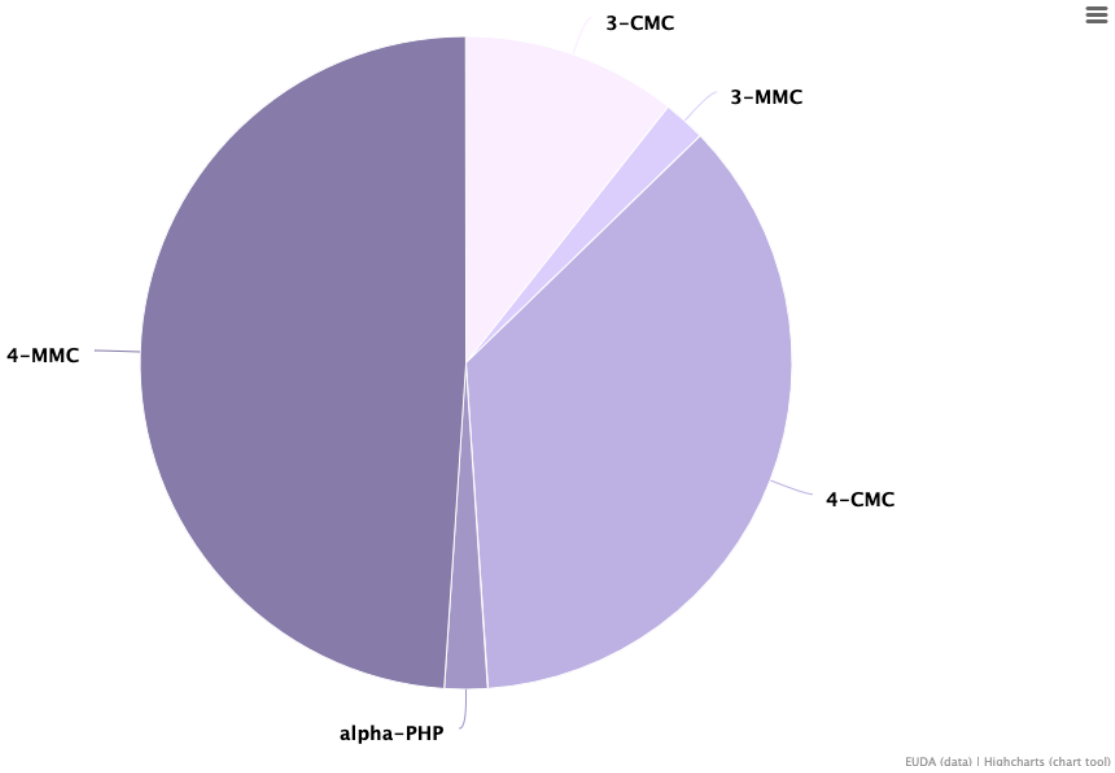
There are some indications that certain cathinones, such as 4-MMC (mephedrone), 4-CMC (clephedrone) and 3-CMC (clophedrone), may be becoming more established in Europe, in part due to domestic production that takes place mainly in the Netherlands and Poland.

Production

Until around 2019, most bulk quantities of synthetic cathinones seized at the external EU borders originated in China. However, since then, production has also spread to India, where these substances are apparently produced on a large scale. In addition, the production of synthetic cathinones continues to grow in parts of Europe.

At least 68 illicit laboratories dismantled in Europe since 2013 were producing cathinones. Of these, the majority (47 sites, 69 %) were dismantled between 2017 and 2021. During that period, dismantled production facilities were reported by Poland (36 sites, 77 %), the Netherlands (8 sites, 17 %) and France, Slovakia and Spain (one site each). The majority of sites produced 4-MMC (23 sites, 49 %) and 4-CMC (17 sites, 36 %), both of which are substances under international control, since 2015 and 2020, respectively (see Figure Dismantled laboratories associated with cathinone production in Europe by substance produced, 2017-2021).

Dismantled laboratories associated with cathinone production in Europe by substance produced, 2017-2021



Preliminary information from the Polish Police suggests that the production of cathinones in Poland has continued to be significant in 2022 and 2023, with 17 laboratories dismantled in 2022 and 16 in the first six months of 2023. The latter has resulted in seizures of cathinones that may amount to 10 tonnes of (wet) cathinones, mostly 4-MMC, 4-CMC and 3-CMC (Polish Police Central Bureau of Investigation, personal communication). In the Netherlands, four laboratories were seized in 2022 and at least two in 2023, all of which were manufacturing 4-CMC, 3-CMC or both. It was reported that Polish individuals were alleged to have been involved in the laboratories found in the Netherlands.

In Europe, the size and scale of cathinone laboratories varies from 'kitchen-scale' production sites in basements and family dwellings (Wojciech, 2022; Wrzesień et al., 2018), to higher throughput facilities operated by multiple 'cooks' producing several dozens of kilograms of finished product per batch in special reactors (Wojciech, 2022). In the smaller sites, production appears to be destined mostly for local markets and, occasionally, for sale on the darknet. Although information is very limited, larger production sites also appear to supply local markets and occasionally the finished product is exported outside Europe (see Box Dismantled 4-MMC laboratory in Austria, 2021).

Dismantled 4-MMC laboratory in Austria, 2021

In 2021, an illicit laboratory producing 4-MMC and amphetamine was dismantled in Austria. The 4-MMC was to be placed inside beverage cans and shipped to New Zealand, evidence that cathinones produced in Europe are now destined for export, and of sophistication in the

concealment method.

The precursors were sourced from China and misdeclared as ‘polypropylene’ or ‘fluorescent pigment’ to evade detection. They included 139 kilograms of 2-bromo-4’-methylpropiophenone (for cathinone production), 510 kilograms of MAPA (used to make BMK for amphetamine production) and 125 kilograms of methylamine (a reagent used in synthetic drug production). Other essential chemicals (solvents and acids) found on-site were sourced from a German chemical company.

Dismantled 4-MMC laboratory in Austria. Empty beverage cans to be used to ship mephedrone to New Zealand. Source: Austrian Police

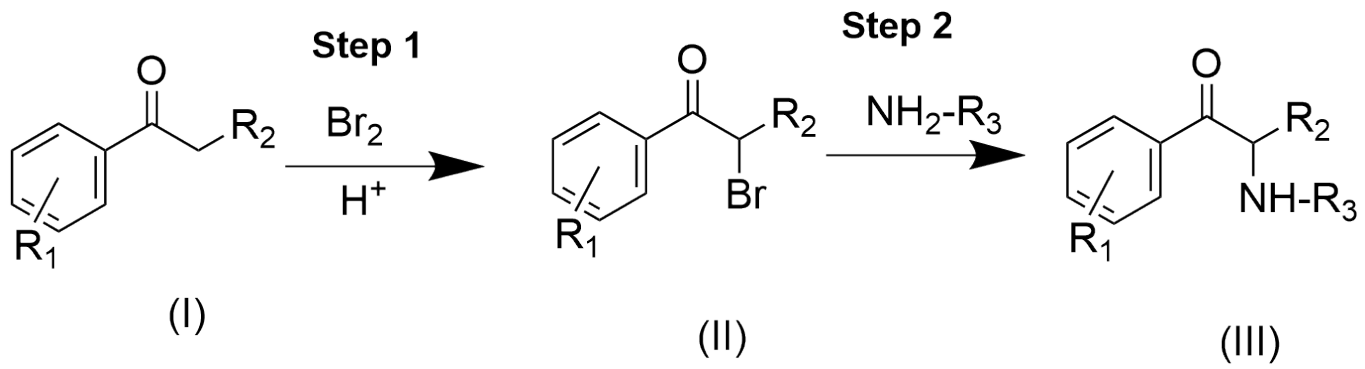
At some of the sites dismantled, the production of cathinones took place alongside the storage or production of illicit drugs such as MDMA, amphetamines or scheduled precursors (or the designer precursors needed to synthesise them). This suggests that synthetic drug-producing criminal networks in Europe may be looking to diversify their product lines and respond to (or stimulate) market demand for cathinones (EMCDDA, 2017).

Cathinone production does not require sophisticated equipment. Nonetheless, production appears to be getting more industrialised and efficient. In Poland, basic laboratory glassware has been gradually replaced by large plastic reactors with cooling, heating and mixing systems and temperature control. This demonstrates some interest in improving production efficiency, since heating or mixing are not required to synthesise most cathinones, but their use increases reaction speed and yields. In several dismantled laboratories, the producers alternated between the production of different cathinones (e.g. 4-MMC and 4-CMC), using the same equipment and only varying some of the chemicals used (Wojciech, 2022).

Cathinone synthesis and precursor seizures

The production of synthetic cathinones is a relatively straightforward process. Although, in theory, several synthetic approaches may be used, the method encountered in European production facilities is a two-step procedure sometimes called 'bromination-amination' (EMCDDA, 2022c; Europol, 2019) (see Figure Bromination-amination method for the preparation of ring-substituted cathinones).

Bromination-amination method for the preparation of ring-substituted cathinones



Note: For 4-MMC (mephedrone) R_1 = p-CH_3; R_2 = CH_3; R_3 = CH_3. Step 1 – preparation of 2-bromo-4-methylpropiophenone; step 2 – preparation of 4-MMC by amination with methylamine.

The first step (bromination) consists of adding bromine to a suitable 'propiophenone' (I) to produce a 'bromopropiophenone' intermediary (II). The bromine required for this step can be commercially obtained as a liquid or prepared in the clandestine facility. This is by far the most challenging and hazardous step of the process, given the high toxicity and corrosive properties of bromine.

In the second step (amination), an amine is added to the 'bromopropiophenone' intermediary (II) to produce the final cathinone. This amine can be changed according to the desired product. For example, methylamine is the compound of choice for the production of mephedrone or clephedrone. Methylamine is also commonly used in the production of methamphetamine and MDMA.

The amination step does not require heating and can be easily scaled up, making it a relatively simple procedure to execute. This synthesis produces the desired products as racemic mixtures. Finally, the resulting base products are converted into salts (typically hydrochloride salts) and then recrystallised to remove impurities in the large plastic trays that are characteristic findings in cathinone production facilities (see Photos Dismantled site associated with 4-CMC production in Poland, seized in 2022 with approximately 2 400 litres of 4-CMC seized) (Wojciech, 2022).

Dismantled site associated with 4-CMC production in Poland, seized in 2022 with approximately 2 400 litres of 4-CMC seized. Source: Central Police Investigation Bureau, Polish Police

The preparation of cathinones using this method is an industrially efficient process for two reasons. First, because bromopropiophenones are commercially available in several variations and are not subject to any international regulatory controls, the first step can be skipped altogether. And also because the bromopropiophenones can be divided into batches and each batch used to produce a different cathinone, if desired (Collins et al., 2016). Theoretically, 0.42 kilograms of 4-MMC can be produced from 1 kilogram of 2-bromo-4-methylpropiophenone, a yield of approximately 45 % (Europol, 2019).

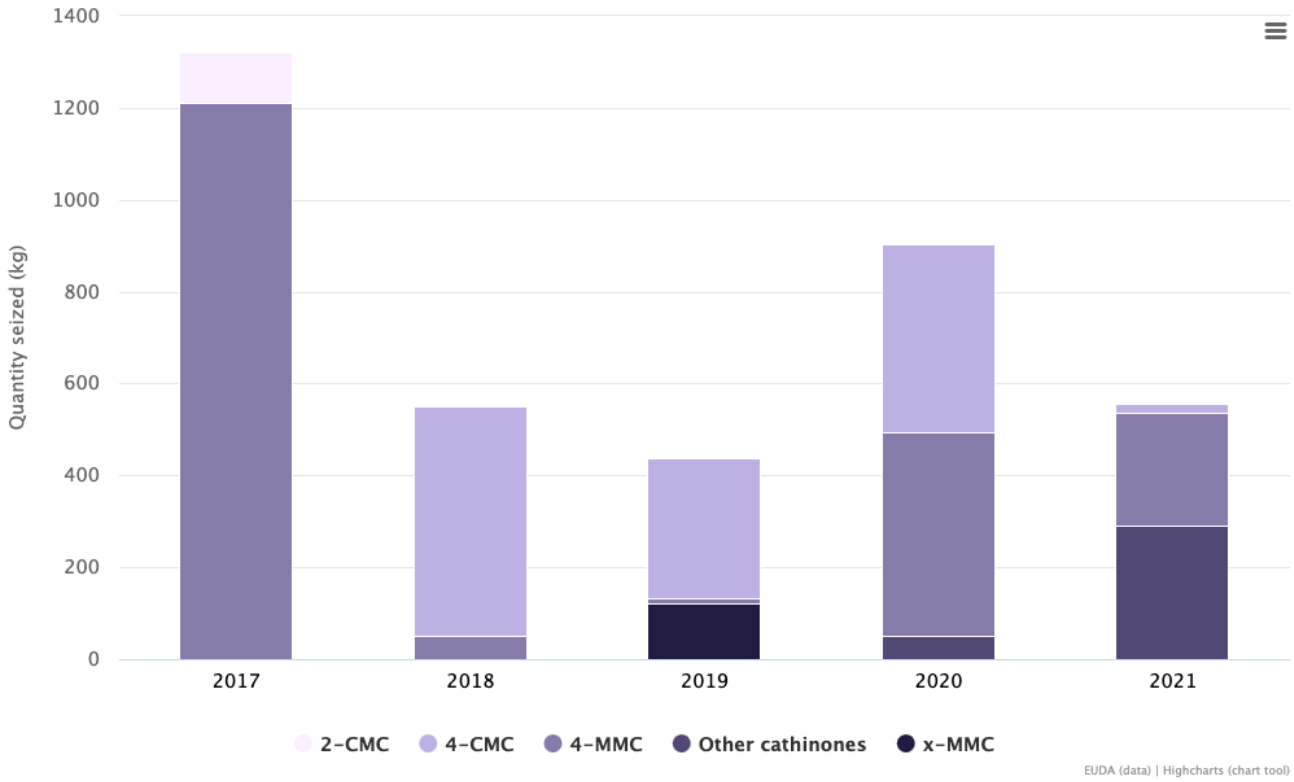
Both information from dismantled laboratories and precursor seizure data confirm that European producers mostly start the production of cathinones from the second (amination) step.

From 2017 to 2021, approximately 3.8 tonnes of precursors associated with the production of cathinones was seized in the European Union and reported to the EU drug precursors database. These seizures included 3.5 tonnes of bromopropiophenone intermediates, but only 261 kilograms of propiophenones needed for step one.

More than half of the precursors seized during this time were for the production of 4-MMC (2.0 tonnes) and 4-CMC (1.2 tonnes) (see Figure Seizures of cathinone precursors in Europe, 2017-2021, by cathinone produced), confirming the interest of European drug producers in manufacturing controlled cathinones. Almost half of all seizures were reported by the Netherlands (1.9 tonnes), followed by Germany (0.8), Luxembourg (0.5) and Poland (0.4). Seizures were also reported by Belgium, France, Hungary and Austria. As these compounds are not under legal control, seizures tend to occur only when customs irregularities are detected (such as misdeclaration) or when law enforcement investigations occur. Additional seizures (0.5 tonnes) were reported by Czechia to the Precursors Incident Communication System (PICS) hosted by the International Narcotics Control Board (INCB).

Where the origin was known, cathinone precursor shipments originated in China and India. The final destination countries included Poland, the Netherlands, Spain and the United Kingdom. Seizures of cathinone precursors not occurring at the EU external borders often occurred in illicit cathinone laboratories, mainly in Poland and the Netherlands.

Seizures of cathinone precursors in Europe by cathinone produced, 2017-2021



Source: European database on drug precursors. x-MMC indicates that the isomer was not identified.

Globally, EU seizures of cathinone precursors make up a modest part of all seizures reported to the INCB PICS system (approximately 5 % of seizures reported in the period 2017 to 2021), which appears to suggest that – despite the dramatic increase in production in the European Union – production remains small-scale compared with other world regions, with outputs probably destined mainly for local markets. Large seizures of cathinone precursors have taken place in China, Russia, Ukraine and Taiwan. Some seizures were associated with large cathinone laboratories in Russia and Ukraine. In China, the precursors were seized at a chemical production plant.

Notwithstanding its global ranking, both precursor seizure data and data collected from dismantled production facilities show that cathinone production is a well-established feature of the European market, especially in Poland and to a lesser extent in the Netherlands, with precursors and material for the synthesis acquired and transported via neighbouring countries (including Germany, France and Luxembourg).

The dumping of hazardous chemical waste from these production sites may result in significant environmental damage, directly affecting the surrounding areas, and possibly affecting the population and the aquatic environment (including surface and drinking water) (ter Laak and Emke, 2023).

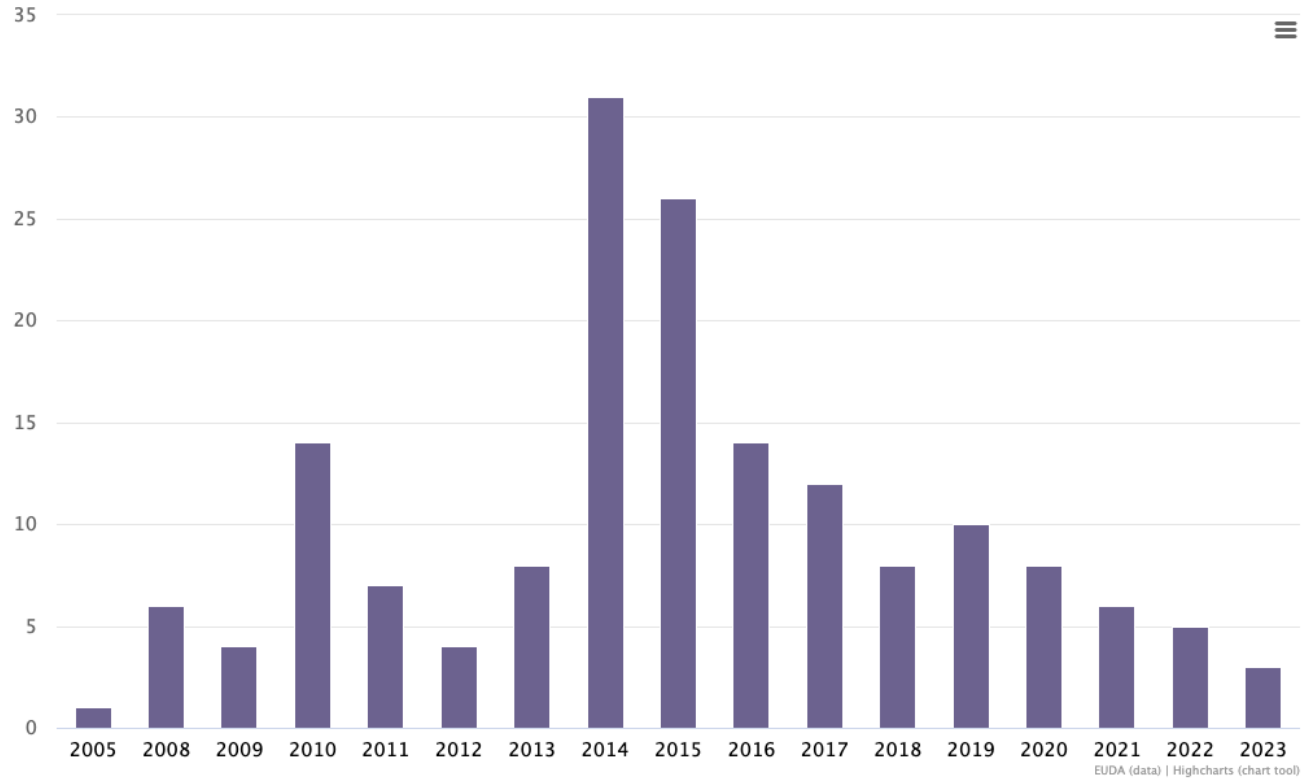
In addition to full synthesis in Europe, chemically masked derivatives of controlled synthetic cathinones can be produced to evade detection by law enforcement such as customs agencies. In this scheme, the cathinone is chemically masked to produce a non-controlled substance, which can

be converted back into the parent cathinone drug. For example, in 2019, Dutch Police seized 350 kilograms of chemically masked 3-MMC at a site linked to a producer/distributor that had apparently imported the substance from India. The 3-MMC was masked as N-acetyl-3-MMC. It is thought that this derivative was intended to be converted to 3-MMC, for example by acid hydrolysis using hydrochloric acid. Approximately 150 kilograms of 3-MMC were also seized at the site. These masked drugs are not controlled and can be ordered and transported using the same channels as new psychoactive substances.

Situation

Synthetic cathinones are the second-largest category of new psychoactive substances monitored by the EMCDDA, after synthetic cannabinoids, with the 167 cathinones representing 17 % of all new psychoactive substances. The number of cathinones reported for the first time each year in Europe has fallen from a peak of 31 substances in 2014 to 10 in 2019 and then 3 in 2023, a decrease of 90 % (see Figure Number of synthetic cathinones notified to the EU Early Warning System for the first time, European Union, 2005-2023).

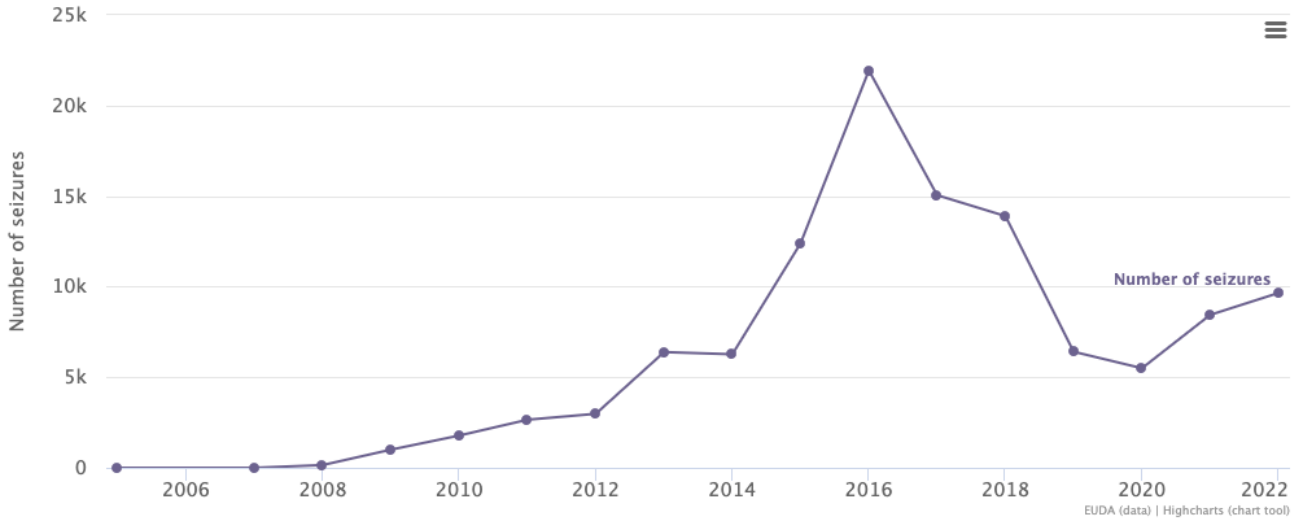
Number of synthetic cathinones notified to the EU Early Warning System for the first time, European Union, 2005-2023



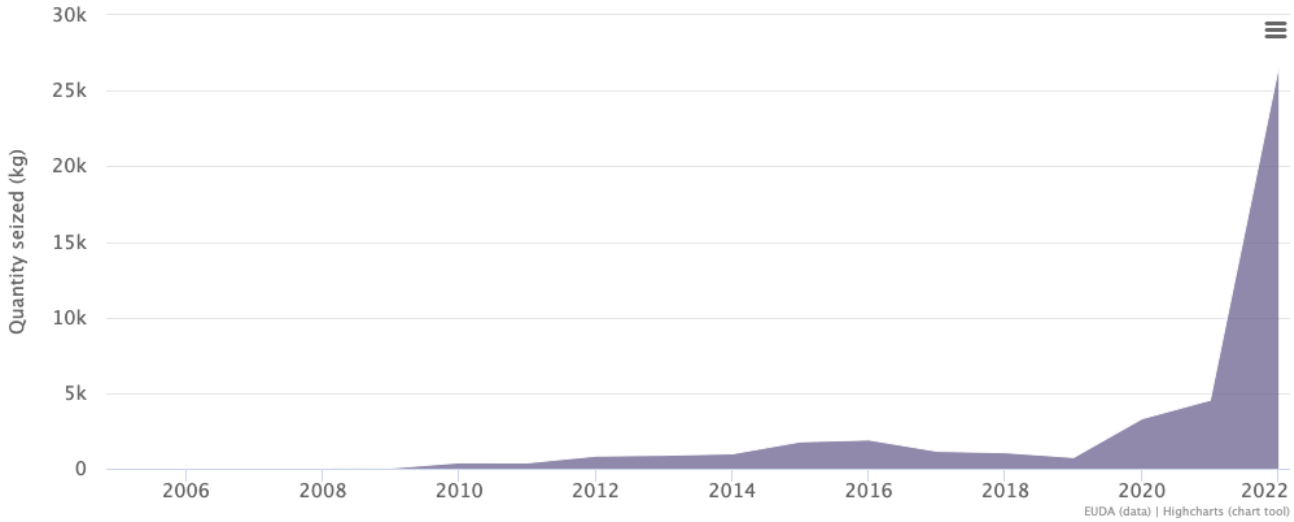
After falling from a peak of 1.9 tonnes in 2016, the quantity of synthetic cathinones seized in Europe rose sharply between 2020 and 2022, increasing to 3.3 tonnes in 2020, 4.5 tonnes in 2021 and 26.5 tonnes in 2022 (see Figure Seizures of synthetic cathinones reported to the EU Early Warning System: trends in total number of seizures and quantity of material seized for all forms

reported in weight, European Union, 2005-2022).

Seizures of synthetic cathinones reported to the EU Early Warning System: trends in total number of seizures, European Union, 2005-2022

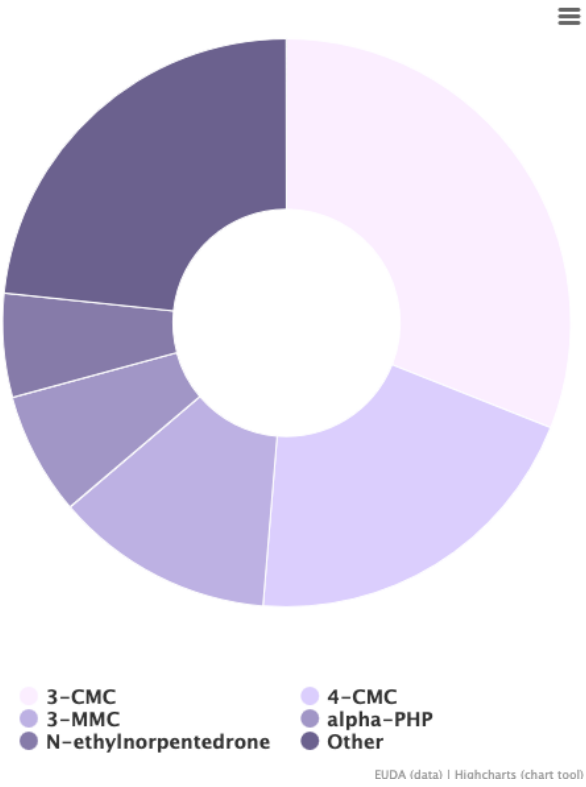


Seizures of synthetic cathinones reported to the EU Early Warning System: quantity of material seized for all forms reported in weight, European Union, 2005-2022 (kg)

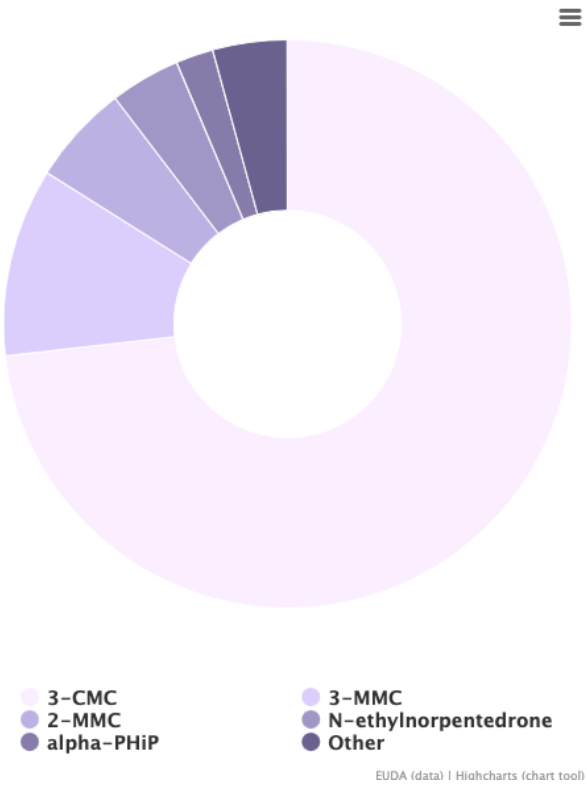


This increase was driven by a small number of large seizures by customs agencies in the Netherlands and Spain. In 2022, for example, 78 seizures of three cathinones (3-CMC, 3-MMC and alpha-PHiP) accounted for 22.3 tonnes, 84 % of the total quantity of cathinones seized during the year. Overall, these 78 seizures accounted for 73 % of the total quantity of new psychoactive substances (see Figure Top five synthetic cathinones seized by number of seizures and quantity of material seized for all forms reported in weight reported to the EU Early Warning System, European Union, 2022). All of these consignments originated from India (see Table Reported large seizures of cathinones originating from India in 2022).

Top five synthetic cathinones seized by number of seizures reported to the EU Early Warning System, European Union, 2022 (9 661 seizures)



Top five synthetic cathinones seized by quantity of material seized for all forms reported in weight reported to the EU Early Warning System, European Union, 2022 (26.5 tonnes seized)



Overall, approximately 25 tonnes (94 %) of the cathinones seized in 2022 was imported from India. Of this material, 21.9 tonnes (83 %) was intercepted by the Netherlands and 3.1 tonnes (12 %) was intercepted by Spain (see Box A large-seizure of synthetic cathinones originating from India – Spain, January 2022).

Reported large seizures of cathinones originating from India in 2022

Substance	Quantity (kilograms)	Number of cases	Seized by	Origin
3-CMC	18 700	73	Netherlands	India
3-MMC	2 500	1	Spain	India
3-CMC	300	1	Spain	India
alpha-PHiP	300	1	Spain	India
alpha-PHiP	257	1	Netherlands	India
3-MMC	250	1	Spain	India
Total	**22 307**	**78**		

A large seizure of synthetic cathinones originating from India – Spain, January 2022

On 22 January 2022, more than 3 tonnes of powders of 3-MMC, 3-CMC and alpha-PHiP was seized at Barcelona airport by Spanish Civil Guard Customs and Police. 3-MMC was identified in about 2.5 tonnes of a white-beige powder contained in 126 drums; alpha-PHiP was identified in about 300 kilograms of a white powder in 'rock' form contained in 20 drums; and 3-CMC was identified in about 300 kilograms of a crystalline substance contained in 22 drums.

Image not found or type unknown

Drums containing 3-CMC and alpha-PHiP seized at Barcelona airport by Spanish Civil Guard Customs and Police – Spain, January 2022. Source: Spanish Civil Guard Customs and Police

Before 2019, the origin of comparable consignments of cathinones, where reported, was China. However, from 2015 onwards, China introduced legal controls for a range of substances, including 3-MMC and 3-CMC (see Box Re-emergence of 3-MMC and 3-CMC in Europe – role of producers in India). China has also increased regulatory oversight of the chemical industry. In addition, supply chain disruption due to the COVID-19 pandemic may have contributed to a shift in production and supply from China to India. Preliminary data suggest that synthetic cathinones originating from India continued to be transported to Europe in large quantities during 2023, with seizures of 3-CMC (almost 15 tonnes), 2-MMC and NEP (almost 2 tonnes each) originating from India reported by Dutch customs, and individual seizures of 450 kilograms of 4-MMC and 500 kilograms of 3-CMC.

Re-emergence of 3-MMC and 3-CMC in Europe – role of producers in India

3-MMC and 3-CMC were first identified on the European drug market in June 2012 and September 2014, respectively. Following their control in China in 2015, the quantities of 3-MMC seized in Europe declined significantly, while 3-CMC appeared to play a small role in the European market at this time. During 2020, signals suggested the re-emergence of these substances in Europe. This was based on seizures at the EU border of large quantities of the substances originating from India and on reports of increased availability and associated harms in some European countries, such as the Netherlands.

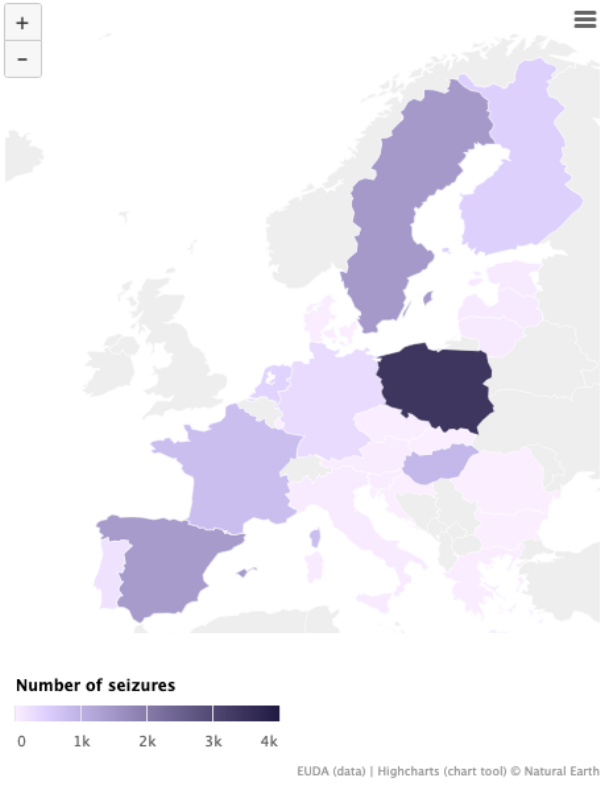
3-MMC and 3-CMC were sold as 'legal' replacements of the closely related substances 4-MMC and 4-CMC that were controlled internationally in 2015 and 2020, respectively. Use of these substance appears to occur mainly in recreational settings and involves snorting or ingesting, but injecting has also been reported in high-risk settings or contexts, such as chemsex.

In 2020, 3-MMC accounted for 746 kilograms and 3-CMC for 860 kilograms of the total quantity of cathinones seized. In 2021, a combined amount of 3 150 kilograms of 3-MMC and 3-CMC, originating in India, was reported to the EMCDDA. This change in the source country for supplies of 3-MMC and 3-CMC is thought to have facilitated their re-appearance in Europe following control measures introduced in China.

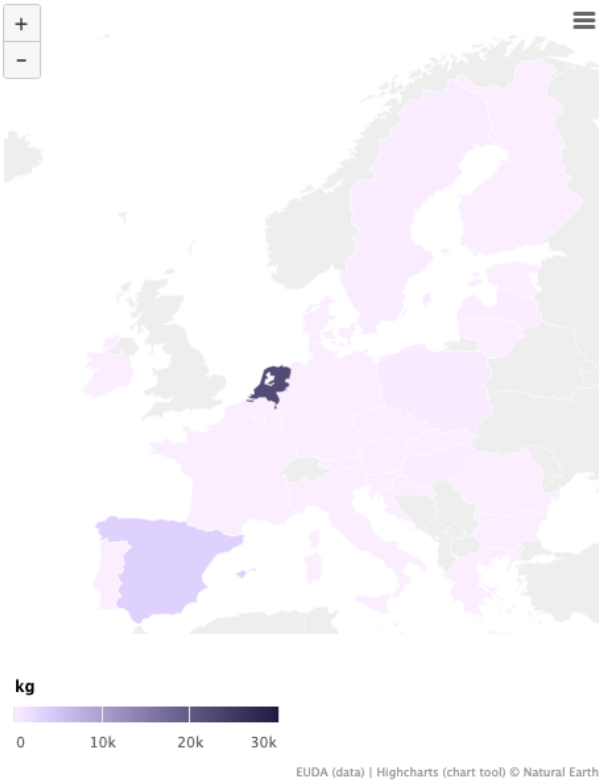
In November 2021, the EMCDDA risk-assessed 3-MMC (EMCDDA, 2022c) and 3-CMC (EMCDDA, 2022b). Based on the risk assessments, on 18 March 2022 the European Parliament adopted a proposal by the European Commission to control the substances across Europe. Subsequently, 3-MMC and 3-CMC were controlled internationally in 2022 and 2023, respectively. Signals suggest that the closely related substance 2-MMC may now re-emerge as a replacement for 3-MMC and 3-CMC.

The number of synthetic cathinone seizures and the quantity seized varies across Europe, with the highest number of seizures carried out by police in Poland and the greatest quantities seized by customs in the Netherlands (see Figure Seizures of synthetic cathinones reported to the EU Early Warning System by country: numbers of seizures and quantity of material seized for all forms reported in weight, European Union, 2022).

Seizures of synthetic cathinones reported to the EU Early Warning System by country: numbers of seizures, European Union, 2022



Seizures of synthetic cathinones reported to the EU Early Warning System by country: quantity of material seized for all forms reported in weight, European Union, 2022



Information on the price and purity of cathinones is not collected systematically in Europe. An indication of the price of four of the main cathinones (4-MMC, 3-MMC, 4-CMC and 3-CMC) on the market in the Netherlands is provided in the table Price of cathinones in the Netherlands, 2022.

Price of cathinones in the Netherlands, 2022

Cathinone	Location in the supply chain	Price
4-MMC powder	Wholesale	EUR 2 125 per kilogram
3-MMC powder	Wholesale	EUR 2 469 per kilogram
4-CMC powder	Wholesale	EUR 2 400 per kilogram
3-CMC powder	Wholesale ([1])	EUR 2025 per kilogram
4-MMC powder	Street price	EUR 22.50 per gram
3-MMC powder	Street price	EUR 18.00 per gram

Source: Central Criminal Investigations Division, Dutch Police, Netherlands.
([1]) Price based on one information source. The wholesale and street prices for tablets containing these cathinones are not available. Information on the street price of 4-CMC powder and 3-CMC powder is not available.

Cathinones were also detected in tablets (249 seizures totalling to 50 192 units and 616 seizures totalling to 7.8 kg) and, for the most part, reflect the main substances seized as powders (3-MMC, 4-MMC, 4-CMC and 3-CMC). In 2022 and 2023, signs of a possible increase in synthetic cathinones mis-sold as or used to adulterate MDMA were identified by the EU Early Warning System. While the overall scale of this issue is unknown, it has been reported by drug checking services in at least three EU Member States, namely Spain, the Netherlands and Austria. The affected products included MDMA tablets, crystals and powders, typically containing 4-CMC, 3-MMC, 3-CMC, 4-MMC and dipentylone.

All of the source data used in graphics and data tables may be found in our Data catalogue.

References

Consult the list of references used in this module.

EU Drug Market: New psychoactive substances — Actions to address current threats and increase preparedness

From the analysis presented here, strategic priority areas emerge that will address the health and security problems associated with the NPS market.

- Continue to support and strengthen the capacity of national and EU early warning systems to increase situational awareness, as well as strengthen preparedness planning and the development of response measures. Ensure that threats are communicated to all stakeholders in a timely manner.
- Continue to enhance international cooperation between the Member States, EU bodies and agencies, third countries and key international partners.
- Develop plans now to minimise the potential future impact of potent opioids. This requires strengthened monitoring, plans to assess and understand the risk of the threat, and action plans to prevent and mitigate threats and to communicate threats to all stakeholders in a timely manner.
- Take measures to mitigate the public health threats associated with opioids, including ensuring access to the opioid antidote naloxone for healthcare facilities, people who use opioids, law enforcement officers and laboratories.
- Share intelligence, assess threats, monitor the situation and carry out research to improve understanding of the production and supply of new psychoactive substances in Europe, the involvement of criminal networks and the interactions that may exist between the NPS market and the more established controlled drugs market.
- Systematically integrate intelligence on operational responses to criminal networks involved in the NPS market – such as cross-border investigations or investigations within the framework of operational task forces or joint investigation teams – into NPS monitoring.
- Continue to support capacity-building activities, including training, sharing of best practices and provision of specialist equipment for law enforcement agencies (in particular customs), to increase the detection of shipments of new psychoactive substances at EU borders and within the postal and parcel services.
- Increase the ability of forensic science and toxicology laboratories to identify new psychoactive substances as well as their precursors and metabolites. This requires support for training, resources for testing, and a mechanism for producing and sharing analytical data, up-to-date analytical libraries, reference materials and expertise.

This resource is part of EU Drug Market: New psychoactive substances — In-depth analysis by the EMCDDA and Europol.

Last update: *27 June 2024*

- Systematically monitor and disrupt online marketplaces, particularly those selling wholesale quantities, both on the surface web and on darknet markets, and further strengthen the partnerships with industry to restrict such sales. Particular consideration should be given to the disruption of markets selling new opioids.
- Enhance monitoring of precursors used for the production of new psychoactive substances. Understanding of this crucial element needs to be improved, in particular as regards the role of source countries and trafficking between Member States. Criminal networks currently adapt to legislation and measures implemented to control precursors, exploiting the time lag between the identification of new precursors and their control. This is particularly relevant when source countries control entire groups of new psychoactive substances using generic definitions but their precursors remain non-controlled.
- Support research into the pharmacology and toxicology of new psychoactive substances identified by the EU Early Warning System.

References

Consult the list of references used in this module.