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EMCDDA PAPER

Using open-source information to improve the European drug monitoring system

Content: Introduction (p. 1) | Methodology (p. 2) | Results (p. 4) | Discussion (p. 9) | References (p. 12) | Annex (p. 14)

Abstract: This paper describes open-source information monitoring and how we use it at the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) in the area of drug markets — what it is and, importantly, what it is not; the methodology for its use; what it can be used for; and its limitations. The EMCDDA first used this approach in 2016, to monitor for signs of serious and urgent health threats associated with new psychoactive substances, in order to support the work of the European Union Early Warning System. More recently, the technique has been extended to the area of European drug markets. This report describes how the EMCDDA uses open-source information monitoring, and presents the initial findings of a pilot project looking at how to improve the timeliness and quality of data with relevance to the analysis of European drug markets — specifically with reference to data on heroin and cocaine seizures of 100 kg or more for the European market between April 2017 and March 2018. The report offers insights and recommendations for continued monitoring, which have implications for policy and practice as well as applications to other areas of the EMCDDA's work.

Keywords Cocaine, drug markets, drug trafficking, EU Early Warning System, heroin, methodology, monitoring, open-source information

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Introduction

In 2017, the EMCDDA published a long-term strategy (EMCDDA, 2017a) to contribute to a healthier and more secure Europe, through better-informed drug policy and action. To achieve this, the agency emphasises the importance of collecting a core set of routine data, together with data from non-routine sources, to generate a picture of the illicit-drug phenomenon in Europe.

Drug seizures have long been a key element of drug market monitoring systems at national and international levels. These data have a range of applications spanning analytical, operational and policy areas. They are a vital component of any analysis and interpretation of illicit drug markets, and any attempt to estimate the size or scale of the drug market from a supply perspective will involve measuring the proportion of illicit drugs seized (Reuter and Greenfield, 2001).

The EMCDDA has been systematically monitoring and reporting on illicit drug seizures in the European Union for over 20 years. However, although routine drug seizure data

provide valuable information for analysis, they do have some shortcomings. One such issue relates to the length of time between seizures occurring and being reported — it can take up to 2 years to aggregate, submit and publish the data. This limits the opportunity to take timely action with regard to strategic analysis and to adapt law enforcement operations to tackle emerging trafficking routes and methods. A further drawback is the lack of contextual information from individual cases, reducing the analytical potential for operational and policy purposes at European and global levels. For example, the modus operandi of drug traffickers is as important as the type and aggregate weight of the drugs seized — particularly for targeting responses to address threats and inform policy (Kilmer and Hoorens, 2010; Kilmer et al., 2015; Singleton et al., 2018).

In 2016, the *EU Drug Markets Report* (EMCDDA and Europol, 2016) noted an unprecedented increase in the size of individual shipments of heroin, based on analysis by the European Union Agency for Law Enforcement Cooperation (Europol). Seizures of individual consignments of heroin of 100 kg or more have continued since the publication of the report, alongside increasingly frequent large seizures of cocaine. The size of bulk shipments means that only a few, non-intercepted consignments could significantly increase drug availability. Although the need has been identified for ongoing systematic monitoring of the relative importance of large seizures and of different trafficking routes and methods of transport, routine monitoring has remained largely at the same level.

Relying on a single source of data confines researchers to the boundaries imposed by that source's limitations, and the triangulation of data from multiple sources and the use of different methods has long been recognised as important for high-quality analysis in many policy areas, including illicit drug supply (Jick, 1979; Ritter, 2006; O'Cathain et al., 2010). Indeed, Thoumi (2005) has argued that the complexity of drug market measurement mandates a range of approaches. The EMCDDA is therefore looking into exploiting new data sources, and open-source information (OSI) appears to have the potential to complement routine data on seizures by addressing some of their shortcomings.

What is open-source information?

The concept of OSI is related to the intelligence discipline of open-source intelligence (OSINT). The Federal Bureau of Investigation defines OSINT as 'publicly available information that is collected, exploited, and disseminated in a timely manner to an appropriate audience for the purpose of addressing a specific intelligence and information requirement' (Williams and Blum, 2018). Increases in the quantity and types of challenges for contemporary law enforcement and security practitioners have accelerated the use of open sources to draw a more coherent picture of activities, entities and individuals (Tabatabaei and Wells, 2016). Many law enforcement and security agencies are using OSINT for the additional breadth and depth of information that it yields, which can reinforce and help validate contextual knowledge (Ramwell et al., 2016). It has been documented that OSINT can provide background and context, fill knowledge gaps and result in an altogether more complete intelligence picture (Hobbs et al., 2014).

The monitoring of OSI is increasingly used in a variety of fields, for example in public health for the early detection of disease outbreaks (Linge et al., 2012; van der Goot et al., 2013). More recently, it has been applied in the area of new psychoactive substances (Evans-Brown and Sedefov, 2018) and to monitoring terrorism-related activities (Dawson et al., 2018).

The EMCDDA therefore conducted a pilot project to investigate the potential for using OSI to complement current approaches to drug supply monitoring, with a particular, but not exclusive, focus on obtaining timely and detailed data on large drug seizures.

This paper describes how we use OSI at the EMCDDA, reports the initial findings of this project and considers the strengths and limitations of OSI as a source of data on drug markets. Finally, the report offers insights and recommendations for continued monitoring, which have implications for policy and practice, along with ideas on how OSI might be applied to other areas of the EMCDDA's work.

Methodology

What do we monitor through open-source information and how?

Although the EMCDDA first began using OSI for the purposes of monitoring signs of harms associated with new psychoactive substances (Evans-Brown et al., 2018), here we focus on the application of OSI for identifying large seizures of heroin and cocaine.

Between April 2017 and March 2018, the EMCDDA, in collaboration with the European Commission Joint Research Centre, piloted the use of the European Media Monitor (EMM) ([1]), an automated multilingual internet monitoring system, for the purposes of identifying large seizures of heroin and cocaine relevant to Europe. The EMM continuously monitors over 22 000 RSS feeds (a format used to deliver web

([1]) http://emm.newsbrief.eu

TABLE 1

Process of record identification and data management

Automated categorisation	Manual processing and data management
▪ Identify reports as they appear in online source.	▪ Select and process relevant categorised content provided by the tool.
▪ Categorise reports based on alerts and filters. • **Alert.** Continuous scanning and checking of the full text of all new reports against a set list of weighted, multilingual keywords. • **Filter.** Categorising alerted reports based on desired predefined categories.	▪ Extract data from selected relevant content.
▪ Highlight and present relevant content to user in the form of website links via an RSS/XML feed or email alerts in real time.	▪ Clean and perform quality checks on extracted data.
	▪ Analyse and interpret data.

content that changes regularly) and websites from over 8 000 news portals in 60 languages. The system also retrieves data from national and regional law enforcement authorities across Europe. To perform the monitoring in a targeted way, sets of keywords were developed in English defining two categories: 'large heroin seizures' and 'large cocaine seizures' ([2]); to increase geographical coverage, these were translated into 11 languages (see Annex, Table A1). Records containing the appropriate keywords were automatically identified by the EMM system and placed in the appropriate category.

The records were screened for relevance. Relevance was established on the basis of two criteria:

- explicit connection to Europe (i.e. seizure within Europe or reported to be destined for Europe);
- seizure size (≥ 100 kg).

Records that met these criteria were manually reviewed to prevent double-counting. The process of record identification and data management is shown below (Table 1).

Relevant data, including key features of the seizure along with contextual information, were extracted and entered into a database (see Annex, Table A2 for a list of the variables and information recorded). The figure of 100 kg is regularly used to define 'large' individual seizures (see, for instance, UNODC, 2007, p. 7; UNODC, 2011, p. 13; UNODC, 2014, p. 29). However, since a sizeable proportion of records related to seizures of less than 100 kg, reports on smaller seizures were also systematically filed for analysis if the first criterion was met.

To assess the coverage of open sources for data and information on heroin and cocaine seizures, these data were compared with the EMCDDA's routine data on trafficking flows — which are determined on the basis of country of production, transit and destination of seized drugs as reported annually by the EMCDDA's network of national focal points across the 28 EU Member States, Norway and Turkey in Standard Table 13 (ST13). The time lag in the reporting process means that the data compared covered slightly different time spans (OSI, April 2017 to March 2018; ST13, 2017). The comparison, however, was considered valid with respect to a specific, limited number of variables, because routes for trafficking heroin and cocaine into Europe are fairly stable.

ST13 includes the number of seizures and the quantities (in kg) seized, by drug and by level of the market. Data on seizures by market level and on trafficking flows have been collected since 2015 — an innovation of the revised drug seizures monitoring process (EMCDDA, 2017a,b,c; Singleton et al., 2018). For each drug type, three tiers of the market are distinguished: the retail, middle-market and wholesale levels. EU definitions of the different market levels for heroin and cocaine are provided in Table 2. These thresholds, although arbitrary, were set based on a consensus of expert opinions.

For monitoring purposes, a 'drug seizure' is defined as an action performed by a law enforcement agency in which legal control of a scheduled substance is taken. 'Producing country' refers to the country where the illicit drug is known to have been produced. 'Transit country' refers to the last country through which the illicit drug was transported before the country of seizure. Finally, 'destination country' refers to the country where the drug will be sold to users. Reporting countries identify the proportion of seizures where the country of production, transit and destination is known, along with a list of relevant countries and prevalence, by category. The category 'producing country' is frequently interpreted as the country from which the seized drug shipment originated. For example,

TABLE 2

Market-level thresholds for heroin and cocaine

Market level	Drug	
	Heroin (kg)	Cocaine (kg)
Retail	< 0.001	< 0.01
Middle market	0.001-0.999	0.01-0.999
Wholesale	≥ 1	≥ 1

([2]) The category definitions (keywords) were used to tag incoming items only and could not be applied retroactively. The categories are applied from the time they are entered into the EMM system.

Belgium, an EU non-cocaine-producing country — but a transit country and a key entry point for cocaine trafficked into the EU — may be listed as a producing country for cocaine by Bulgaria if the intercepted shipment in Bulgaria could not be traced beyond Belgium; for this reason, this variable overlaps with the category 'country of transit'. As a result of this overlap, the reporting here combines the two categories into 'country of origin/transit'.

Results

Analysis of records retrieved

Over 2 000 reports were identified using the search terms during the study period. Of these, 349 unique reports related to heroin and cocaine seizures with relevance to Europe, of which 115 were large seizures as defined by the study (≥ 100 kg). The sections below summarise the key features of large seizures and outline the characteristics of the broader set of seizures across the two drug types.

Heroin seizures: key features

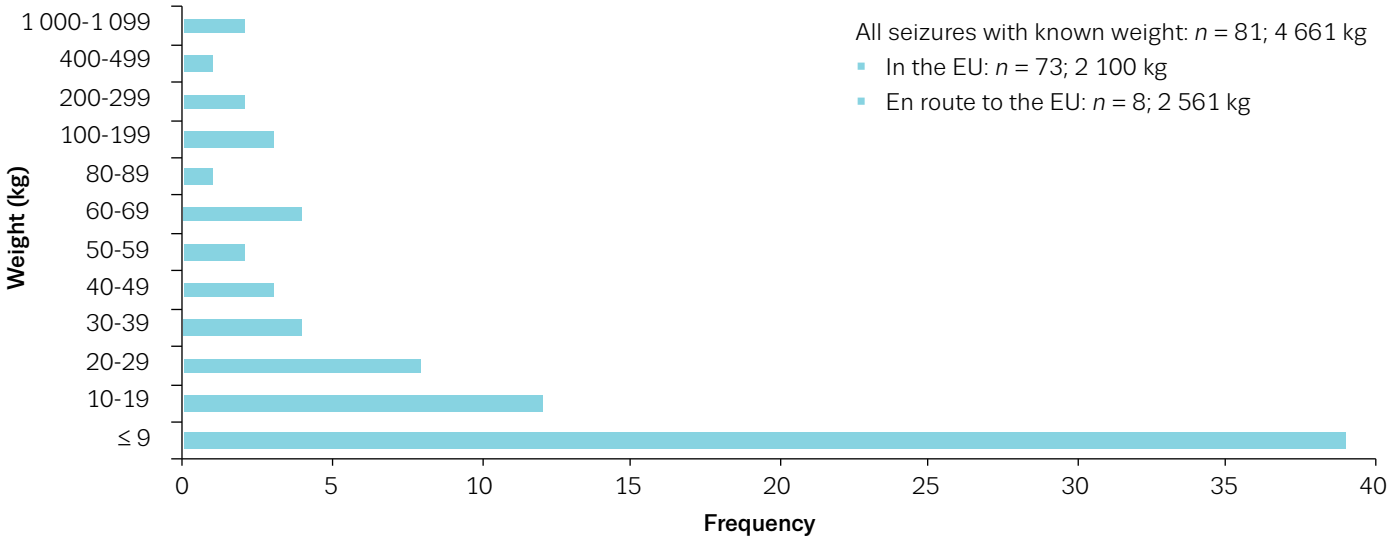
Number and weight of seizures

There were 83 heroin seizures identified, amounting to a total of 4 661 kg (min. 1 kg; max. 1 071 kg; exact weight was unknown for two seizures). The weight distribution of the heroin seizures is shown in Figure 1.

All 81 seizures for which weight information was available could be categorised as 'wholesale seizures' according to the EMCDDA definition (see Table 2). Eight (10 %) of these seizures exceeded 100 kg, representing 74 % (3 464 kg) of the total weight of heroin seized. By comparison, only around 2 % of the annual number of seizures reported to the EMCDDA through routine channels (data year 2017) were wholesale-level seizures (Figure 2; see Annex, Table A3). Although the ST13 data are categorised by market level, allowing direct comparison of these criteria, it is not possible to determine the number of seizures exceeding 100 kg within ST13, as the data submitted to EMCDDA are aggregated.

FIGURE 1

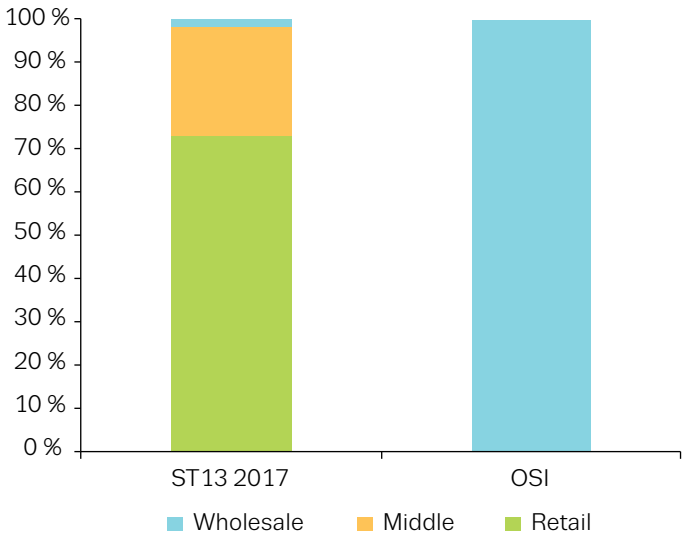
Number (*n*) of heroin seizures by weight distribution, April 2017 to March 2018 (*)



(*) Weight categories with a frequency of 0 (e.g. '70-79') are not marked.

FIGURE 2

Heroin: retail, middle-market and wholesale seizures as a proportion of all reported seizures, EMCDDA routine monitoring ST13, 2017; OSI, April 2017 to March 2018

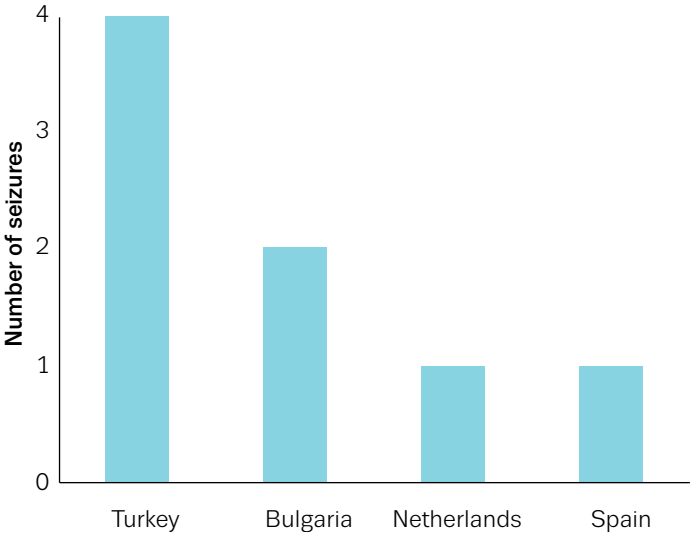


Geographical overview

The seizures reported in the OSI data occurred across Europe (*n* = 75), western Asia (*n* = 6) and southern Asia (*n* = 2). The seizures took place in a total of 12 countries (Italy, *n* = 37; Spain, *n* = 8; Bulgaria, *n* = 7; Greece and Turkey, *n* = 6 each; the United Kingdom, *n* = 5; France and Ireland, *n* = 4 each; Germany and Pakistan, *n* = 2 each; and Malta and the Netherlands, *n* = 1 each). The countries in which large quantities were seized in single events are shown in Figure 3.

FIGURE 3

Distribution of large (≥ 100 kg) heroin seizures, by seizing country



Some information relating to trafficking routes was available for 57 (70 %) of the heroin seizure cases. The most frequently reported country of origin/transit, where known (*n* = 30, 36 %), was Turkey (*n* = 7), followed by Kenya and the Netherlands (*n* = 3 each); Albania, France, Iran, Italy and South Africa (*n* = 2 each); and Afghanistan, Bulgaria, Czechia, Ethiopia, Pakistan, Spain and Switzerland (*n* = 1 each). The six large seizures for which the country of origin was reported came from Turkey (*n* = 3), Iran (*n* = 2) and Afghanistan (*n* = 1).

Where the destination country was reported (*n* = 37, 45 %), the country most commonly named was Italy (*n* = 18), followed by Greece and Spain (*n* = 3 each) then France, Ireland, Turkey and the United Kingdom (*n* = 2 each). Bulgaria, Malta, the Netherlands, Poland, Portugal, Switzerland and the United Arab Emirates were each reported once. The Netherlands, Poland, Greece and Turkey were each the reported destination for one large seizure.

In 10 cases information was available on both the country of origin and the country of destination, allowing the tentative reconstruction of heroin trafficking flows.

Contextual information

The OSI data also provided details of where the seizures were made and other information that can help to reveal information on the modus operandi of drug traffickers. In the OSI reports that relate to heroin, where reported (*n* = 73, 88 %), drug seizures most often occurred during transport over land (*n* = 57). Air (*n* = 11) and maritime (*n* = 5) routes were also reported. The majority of large seizures were of heroin being transported over land (*n* = 6), but two seizures related to transportation by sea.

Where reported (*n* = 75, 90 %), the most common place from which heroin was seized was from vehicles (*n* = 33), followed by private premises (*n* = 24). Eleven of the seizures were from aircraft, five from commercial premises and two from maritime shipping containers. The large seizures were mostly made from vehicles (*n* = 5), containers (*n* = 2) or commercial premises (*n* = 1).

In eight cases the heroin seized was not concealed. In cases where it was reported as being concealed, the most frequent method of concealment was in private storage (*n* = 31), followed by in luggage (*n* = 11), in false compartments (*n* = 10), among goods (*n* = 6), on/in body and in carrier material (*n* = 2 each). Where large seizures were made, these were reported as being concealed in false compartments (*n* = 4), among goods (*n* = 2) or in carrier material (*n* = 1), and in one case the drug was not concealed.

Where arrests were reported (*n* = 74), the arrested individuals were from Albania (*n* = 20); Italy (*n* = 10); Bulgaria (*n* = 7); Nigeria (*n* = 4); Tunisia and the United Kingdom (*n* = 3 each); Iran, Ireland, the Netherlands, Pakistan and Tunisia (*n* = 2 each); and Algeria, Czechia, the Dominican Republic, Ecuador, France, Greece, Iraq, Italy, Malta, Portugal, Romania and Turkey (*n* = 1 each). Where arrests following large seizures were reported (*n* = 5), the arrested individuals were from Bulgaria (*n* = 2); and Iran, the Netherlands and Turkey (*n* = 1 each).

Heroin and weapons

In 12 cases (including one large seizure) heroin was reported as being seized along with weapons, typically illegal firearms. In 11 cases, including the large one, the seizures occurred in Europe (Italy, *n* = 5; Spain, *n* = 2; and France, Ireland, the Netherlands and the United Kingdom, *n* = 1 each), with one seizure in western Asia (Turkey). The large seizure occurred in the Netherlands.

Where arrests following seizures of heroin along with weapons were reported (*n* = 11), the arrested individuals were from Albania (*n* = 4); Bulgaria (*n* = 2); and Algeria, the Dominican Republic, Ecuador, Ireland, Italy, the Netherlands and Spain (*n* = 1 each). Where arrests following large seizures were reported (*n* = 1), the arrested individuals were from the Netherlands and Bulgaria (*n* = 1 each).

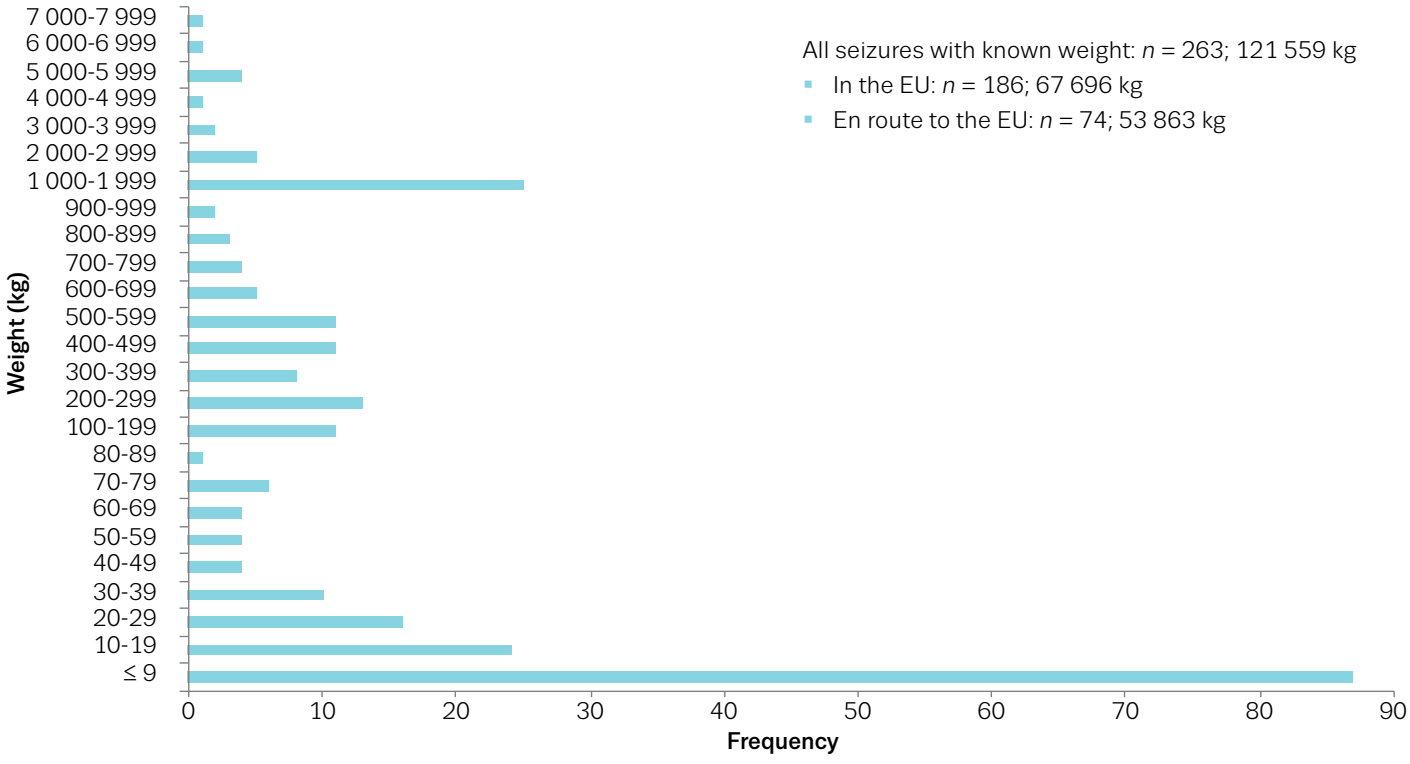
Cocaine seizures: key features

A total of 266 cocaine seizures were identified, amounting to a total of 121 559 kg (min. 0.4 kg; max. 7 000 kg; the exact weight was unknown for three seizures). The weight distribution of the cocaine seizures is shown in Figure 4.

All cocaine seizures represented activity on the wholesale or middle-level markets (see Table 2), with one seizure of 0.9 kg, three seizures of around 0.5 kg each, two seizures of 0.4 kg and one seizure of 0.45 kg. The number of seizures of in excess of 100 kg was 107 (40 %), accounting for almost the entire weight (96 %, 117 007 kg) of cocaine seized over the period. More than a third of such seizures were consignments of at least a tonne (*n* = 39, 36 %). Around 3 % of the annual number of seizures reported to the EMCDDA (data year 2017) were wholesale seizures (Figure 5; Annex, Table A4).

FIGURE 4

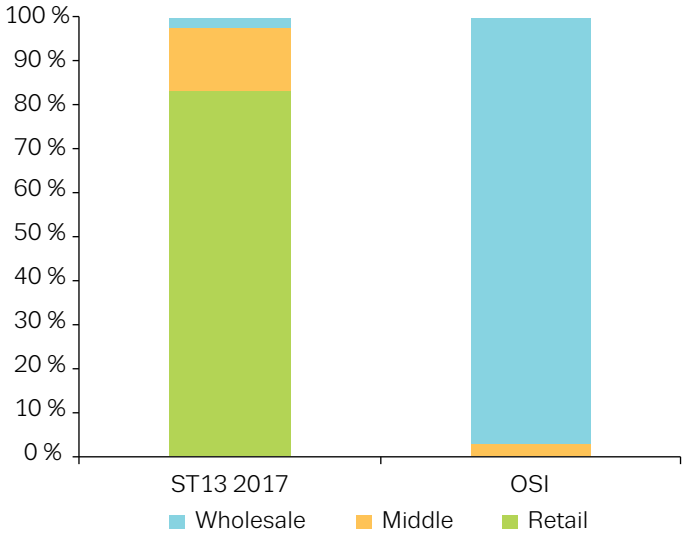
Number of cocaine seizures by weight (*)



(*) Weight categories with frequencies of 0 (e.g. '90-99') are not marked.

FIGURE 5

Cocaine: retail, middle-market and wholesale seizures as a proportion of all reported seizures, EMCDDA routine monitoring ST13, 2017; OSI, April 2017 to March 2018



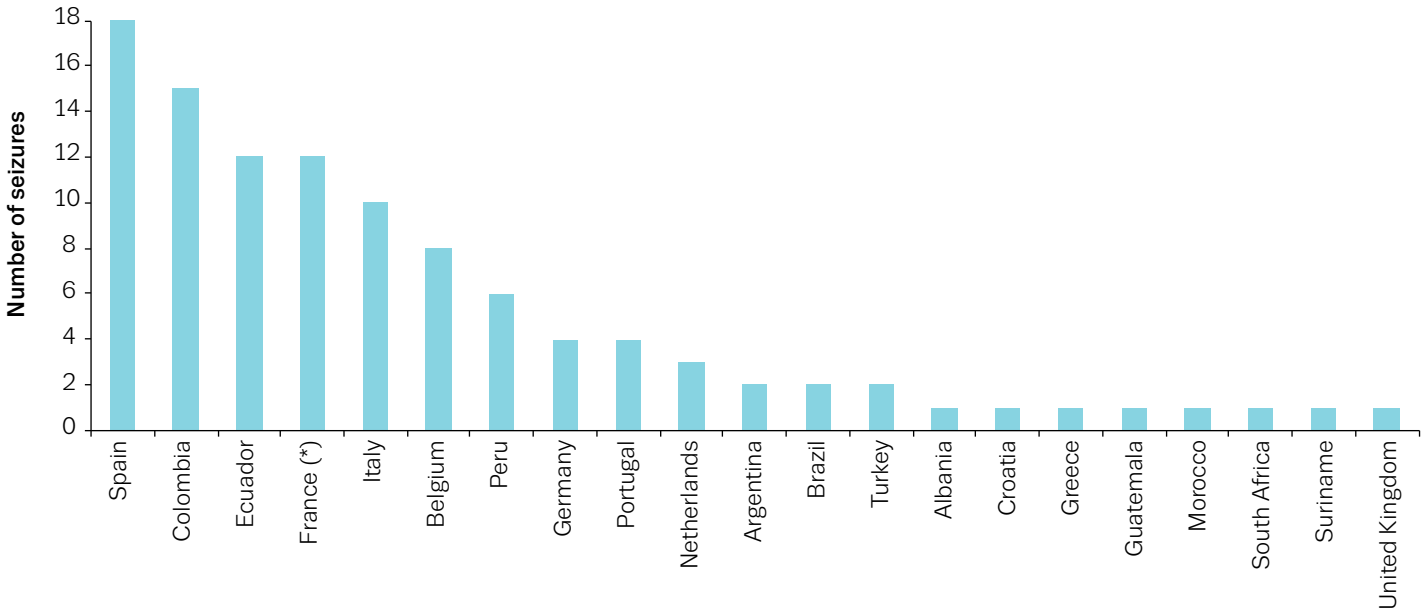
Geographical overview

The reported seizures occurred across Europe (*n* = 191); South America (*n* = 59); the Caribbean and Oceania (*n* = 3 each); northern Africa, Central America, western Asia and southern Europe (*n* = 2 each); and southern Africa and eastern Asia (*n* = 1 each). A total of 37 countries were involved: Italy (*n* = 82); Spain (*n* = 44); Colombia (*n* = 20); France (*n* = 19); Ecuador (*n* = 13); Belgium (*n* = 10); Peru (*n* = 8); Germany and Portugal (*n* = 7 each); Brazil (*n* = 6); the United Kingdom (*n* = 5); Argentina and the Netherlands (*n* = 4 each); Bulgaria, Chile, the Dominican Republic, Greece and Ireland (*n* = 3 each); Morocco, Paraguay and Turkey (*n* = 2 each); and Albania, Australia, Bolivia, Costa Rica, Croatia, Cyprus, French Polynesia, Guatemala, Guyana, Hong Kong, New Caledonia, Serbia, Slovenia, South Africa, Suriname and Switzerland (*n* = 1 each). The countries that reported seizing large quantities in single events are displayed in Figure 6.

Some information relating to trafficking routes was available for 183 (96 %) of the cocaine seizure cases. Where reported (*n* = 103, 36 %), the most frequent country of origin was Colombia (*n* = 27), followed by Brazil (*n* = 14); Peru and Spain (*n* = 7 each); Chile and Ecuador (*n* = 6 each); Belgium, the Netherlands, Panama and Venezuela (*n* = 4 each); the Dominican Republic (*n* = 3); Bolivia, Italy, Paraguay, the United States and Uruguay (*n* = 2 each); and Albania, Costa Rica, Germany, Greece, Honduras, Lithuania and Portugal (*n* = 1 each). The large seizures were reported to originate from Colombia (*n* = 19); Brazil (*n* = 7); Chile (*n* = 5); Peru (*n* = 4); Ecuador, Panama and Venezuela (*n* = 3 each); Bolivia, Spain and the United States (*n* = 2 each); and Belgium, Paraguay and Uruguay (*n* = 1 each).

FIGURE 6

Distribution of large (≥ 100 kg) cocaine seizures, by seizing country



(*) Number of seizures includes those in the French territories of French Polynesia and New Caledonia (*n* = 1 each).

In terms of destination, where reported (*n* = 134, 50 %), Italy and Spain (*n* = 37 each) were the countries most commonly cited, followed by France (*n* = 9); Belgium (*n* = 8); the United Kingdom (*n* = 6); the Netherlands and Portugal (*n* = 5 each); Germany, Ireland, Turkey and the United States (*n* = 3 each); Canada (*n* = 2); and Australia, Austria, Bulgaria, Brazil, Croatia, Egypt, Georgia, Greece, Iraq, Israel, Lebanon, Liberia and Poland (*n* = 1 each). Where reported, the most commonly reported country for large seizures was Spain (*n* = 17), followed by Belgium (*n* = 8); France and Italy (*n* = 5 each); the Netherlands, the United Kingdom and the United States (*n* = 3 each); Portugal (*n* = 2); and Austria, Croatia, Egypt, Liberia, Poland and Turkey (*n* = 1 each).

In 54 cases information was available on both the country of origin and the destination country, allowing the tentative reconstruction of cocaine trafficking flows.

Contextual information

Where reported (*n* = 239, 90 %), the cocaine that was seized was mainly transported via maritime routes (*n* = 106). Land (*n* = 84), air (*n* = 48) and postal (*n* = 1) routes were also reported. The majority of large seizures were of cocaine being transported by sea (*n* = 82), although some were of cocaine being transported over land (*n* = 12) or by air (*n* = 5).

In cases where it was reported (*n* = 249, 94 %), the most common place from which cocaine was seized was from maritime shipping containers (*n* = 73), followed by vehicles (*n* = 64), aircraft (*n* = 40), private premises (*n* = 39), boats (*n* = 17), commercial premises (*n* = 13), water/beaches (*n* = 3), people (*n* = 2), a postal office (*n* = 1) and other (*n* = 1). The large seizures were mostly made from maritime shipping containers (*n* = 58), but also from boats (*n* = 14), vehicles (*n* = 13), commercial premises (*n* = 8), private premises (*n* = 4), water/beaches (*n* = 3) and aircraft (*n* = 1), where reported.

The most frequently used method of concealment was in private storage (*n* = 58), followed by 'rip-on/rip-off' ([3]) (*n* = 40), among goods (*n* = 31), in luggage (*n* = 28), in false compartments (*n* = 25), in carrier material (*n* = 17), on/in body (*n* = 7), by 'drop-off' ([4]) (*n* = 4), in parcels (*n* = 3) and below ground (*n* = 2). In 23 cases the cocaine was not concealed. Where large seizures were made, these typically involved 'rip-on/rip-off' (*n* = 32). In 11 cases no concealment method was employed. Other large seizures involved cocaine concealed among legitimate goods (*n* = 24), in false compartments and in private storage (*n* = 7 each), in carrier material (*n* = 5), by 'drop-off' (*n* = 4), in luggage and below ground (*n* = 2 each).

Where arrests were reported (*n* = 196), the arrested individuals were from Italy (*n* = 27); Colombia (*n* = 22); Spain (*n* = 19); Albania (*n* = 16); the Netherlands (*n* = 13); Venezuela (*n* = 9); the United Kingdom (*n* = 8); Morocco and Peru (*n* = 7 each); France and Greece (*n* = 5 each); Brazil, the Dominican Republic, Ecuador and Romania (*n* = 4); Argentina and Serbia (*n* = 3); and Azerbaijan, Bulgaria, Chile, Poland and Portugal (*n* = 2 each). A further 23 nationalities were identified, each with a single occurrence. Where arrests following large seizures were reported (*n* = 58), the arrested individuals were most often from Spain (*n* = 12), followed by Colombia (*n* = 8); Ecuador and Peru (*n* = 4 each); Argentina, Greece, the Netherlands and Venezuela (*n* = 3 each); Poland (*n* = 2); and Albania, Azerbaijan, Belgium, Croatia, France, Honduras, Italy, Mexico, Moldova, Montenegro, Morocco, Portugal, Romania, Serbia, Senegal, Turkey, Tanzania and the United Kingdom (*n* = 1 each).

Cocaine and weapons

In 19 cases (including six large seizures), cocaine was reported as being seized along with weapons, typically illegal firearms. In 15 cases (including three large seizures) the seizures occurred in Europe (France and Spain, *n* = 6 each; Italy, *n* = 2; and Ireland, *n* = 1), in three cases (including three large seizures) the seizures occurred in South America (Argentina, *n* = 2; and Colombia, *n* = 1) and in Oceania (Australia *n* = 1). The large seizures occurred in Spain (*n* = 3), Argentina (*n* = 2) and Colombia (*n* = 1).

Where arrests following seizures of cocaine along with weapons were reported (*n* = 19), the individuals were from Spain and the United Kingdom (*n* = 3 each); Argentina and France (*n* = 2 each); and Colombia, the Dominican Republic, Italy, Mexico and Poland (*n* = 1 each). Where arrests following large seizures of cocaine along with weapons were reported (*n* = 6), the arrested individuals were from Argentina (*n* = 2), Mexico, Spain and the United Kingdom (*n* = 1 each).

Comparison with routine data sources

To assess the reliability of open sources, the data obtained between April 2017 and March 2018 were compared with EMCDDA's routine data on countries of origin/transit and destinations of seized drugs (ST13, 2017) (see Annex, Tables A5-A8).

([3]) The 'rip-on/rip-off' method involves loading the consignment at the port of departure and recovering it at the port of arrival. The involvement of corrupt employees at both ends is a key element.

([4]) With the 'drop-off' method, drugs are dropped into the sea close to desired destinations and collected. It is increasingly common to use a global positioning system to locate the consignment.

Heroin

An examination of the agreement between the two datasets revealed similar patterns overall across the groups of countries of origin/transit (Annex, Figure A1) and countries of destination.

As would be expected, OSI identified most of the countries that lie along the main trafficking route towards the EU, namely the Balkan route. Specifically, all key countries except Greece were tagged as countries of origin or transit along this traditional route, consistent with the picture emerging from the ST13 data analysis (Figure A1a). Furthermore, open sources also highlighted the main western European countries — France, the Netherlands and Spain — through which heroin flows pass towards the main European heroin markets; the three countries are consistently marked as key transit points by EMCDDA reporting countries (Figure A1b). However, during the study period, OSI did not pick up any reports of heroin seizures in relation to other known transit and consumer countries, such as Germany.

Finally, open sources revealed some additional information not found in ST13. Czechia was identified as a transit country for heroin. In addition, countries along other heroin trafficking routes were highlighted, particularly the Southern route, including countries along the coast of East Africa (Ethiopia, Kenya and South Africa) and countries involved in flows going through the Suez Canal (Egypt). Combining the two sets (OSI and ST13) of geographical data reveals a fuller picture of the trafficking routes (Figure A1c).

With regard to countries of destination, Bulgaria, France, Greece, Italy, the Netherlands, Poland, Spain and Turkey featured in both datasets, although routine monitoring revealed a broader set of countries that also included Belgium, Germany, Latvia and Romania. On the other hand, Ireland, Malta and the United Kingdom were identified by OSI but did not appear in the routine data.

Cocaine

An examination of the relationship between the two datasets showed similar patterns across the groups of countries of origin/transit (Figure A2) and destination. All South American and Caribbean countries in key production and trafficking areas were identified by OSI as countries of origin/transit for cocaine (Bolivia, Brazil, Chile, Colombia, the Dominican Republic, Ecuador, Panama, Paraguay, Peru, Uruguay and Venezuela; Figure A2a). In Europe, OSI identified Belgium, the Netherlands and Spain as transit points for cocaine; although more countries were flagged by ST13 (Figure A2b), these three countries are known to be key entry points for cocaine shipments into Europe and to be most important in terms of quantity of cocaine seized. Combining the two sets (OSI and ST13) of geographical data reveals a fuller picture of the trafficking routes (Figure A2c).

In terms of countries of destination, OSI identified a number of key countries, consistent with the information provided in ST13 (Belgium, France, Germany, Ireland, Italy, the Netherlands, Portugal, Spain, the United Kingdom), although once more ST13 provided a more extensive list of destination countries, including Finland, Latvia and Romania.

Discussion

This paper outlines the ways in which the EMCDDA uses OSI monitoring and assesses its practical potential for EU-focused drug market analysis. The study indicates a range of potential types of information that can be obtained from OSI data and yields a number of important lessons that need to be considered if OSI is to be incorporated into future drug supply monitoring frameworks. These lessons are discussed below from the perspective of the European drug monitoring framework and the range of potential users of the data and analytical output, including law enforcement practitioners, the monitoring and research communities and policymakers. It should be noted that, during a short pilot period, the number of records observed was limited — necessitating a focus on descriptive analysis to illustrate the potential uses of the data and areas for further investigation. The analysis and conclusions need to be viewed in this light.

This pilot study focused on monitoring seizures with EU relevance. When establishing the project we hypothesised that open-source data would mainly feature large seizures, which would be considered more newsworthy. This proved to be the case, as the records retrieved covered almost exclusively seizures that were above the threshold defined as wholesale for Europe. Moreover, 10 % of the heroin and 40 % of the cocaine seizures were of quantities in excess of 100 kg. Such major consignments, if not intercepted, may have a range of impacts and consequences for the market, including availability, public health and related social ramifications.

Validating a new source of data on seizures, such as the OSI data, is hampered by the limitations of the existing data. There were two barriers to comparing OSI with the routine EMCDDA data from ST13 for validation purposes. First, the aggregate format of ST13 data precluded investigating whether or not individual seizures identified by OSI are also captured by ST13. This is particularly significant for seizures above 100 kg, a shortcoming that is likely to remain, at least in the short term. Second, a caveat needs to borne in mind when comparing trafficking routes based on the countries of production/origin,

transit and destination in reports from OSI and ST13. Routes should be taken as broadly indicative rather than as definitive outlines: trafficking may deviate to other countries along the established routes, and there are secondary flows that may not be consistently used or reflected in the data every year. Additionally, the growing number of EMCDDA reporting countries that provide data on these variables and, generally, the evolving reporting capacity of the Member States in this area allows only indicative parallels to be established.

Although OSI data picked up a set of European countries that is broadly comparable to that picked up by ST13, key countries such as Greece (heroin), and Portugal and the United Kingdom (cocaine) did not feature prominently. This is likely to be in part a reflection of the fact that the OSI dataset mainly includes large seizures. Other possible causes could relate to the category definitions provided in these languages and the reach of relevant sources. A review should be undertaken to examine what drives these inconsistencies and whether they persist over time. It should also be noted that seizures, particularly large seizures, are sporadic in nature and so data are liable to fluctuate from year to year.

The results presented here illustrate a number of potential advantages of utilising OSI on seizures, including access to contextual information from significant cases and improved timeliness, which enhance its usefulness for developing appropriate responses. These are discussed in more detail below and have been grouped, for clarity, based on their relevance to monitoring and research, law enforcement and policymaking, although it is recognised that the requirements of these groups intersect.

From the perspective of monitoring and research, OSI can fill in a number of knowledge gaps concerning drug markets and supply. Data and information obtained during the current pilot period illuminate aspects of wholesale market activity, as almost all seized quantities were from seizures at the wholesale level, complementing the information from law enforcement activity at the retail level of the market, which makes up the largest proportion of data on routine seizures. Access to data at the level of individual cases gives a richer understanding of the activity at this market echelon; this is particularly significant for large seizures, which cannot be identified within routinely collected aggregated data. Additionally, it provides information about countries for which there may not be consistent access to data on routine drug seizures. In such cases, open data might be used as a proxy for closed (formal) national data on seizures.

One of the main benefits of OSI is the timeliness and sensitivity that it can offer. OSI has the potential to underpin an alert system for Europe in relation to significant drug trafficking events, thus enhancing the utility of this information for policy and operational purposes at the European and global levels and addressing shortcomings that have previously been identified (Singleton et al., 2018; Kilmer et al., 2010, 2015). Importantly, open sources can complement the qualitative contextual information, thus allowing monitoring of emerging trends and changing trafficking modi operandi or routes, etc. The present analysis shows that OSI can provide contextual information for most of the seizure reports accessed during the study period. Furthermore, data and information from open sources can be used to highlight seasonal fluctuations that might be missed in annual routine figures.

Although beyond the scope of this paper, it is not hard to see how using the methodology developed and applied to large seizures of heroin and cocaine could be applied more widely. For example, it could be applied to other drug types, with a geographical focus spreading beyond Europe, as well as to other priority topics in the field, such as drug-related crime and community issues. Each of these areas has the potential to provide a rich dataset with near-real-time data and information available openly, such as that found in news reports, on law enforcement sites or obtained from other sources. The present analysis maintained a focus at the country level. However, more geographical detail is available (e.g. geographical locations automatically extracted from open-source texts), which might allow the analysis of intercity routes, highlighting strategic points in the wholesale trafficking of heroin and cocaine. Additionally, combining open-source and other information, including routine monitoring and research, could provide a rich multidimensional analysis. Future work in this area is necessary to establish how to integrate information from various sources (on different timescales, in different formats, etc.).

From a security perspective, OSI monitoring could be developed as a method of obtaining and communicating strategic early warnings for the detection of transnational organised crime threats through the identification of signs. The detection of multiple signs within the same or similar areas, possibly triangulated using a range of sources, could serve as an early warning to relevant agencies of emerging drug trafficking activity. The system could be augmented with data projected onto maps or timelines or by the use of statistics derived from local, national or international data. There are examples in the literature based on a similar idea (e.g. the Collaborative information acquisition processing exploitation and reporting for the prevention of organised crime project ([4]) as described by Aliprandi et al., 2014).

OSI could also have a role to play in the data-driven threat assessment of evolving patterns of drug trafficking and other predictive law enforcement initiatives, or at the policy level to support effective forward-looking policymaking. While decision-makers and policymakers recognise the need to

([4]) http://www.fp7-caper.eu/

be informed about past events, and generally welcome the opportunity to understand why those events happened (or did not happen), their main preoccupation is to gain insights into what is likely to happen in the future. Adding more up-to-date data and information to that already available may improve the ability to predict where, when and how drug trafficking may occur, and enable law enforcement resources to be allocated in the most effective and efficient way.

To aid the appropriate use of these techniques, Table 3 highlights some areas where OSI should or should not be used.

There are, of course, a number of limitations. Key information management issues such as the harvesting of large quantities of data and the processing of data need to be addressed if the potential of these sources is to be fully realised. The amount of information accessible through the OSI tool is considerable, and cleaning the data is time consuming. Active data management is essential, and human resources have to be invested on an ongoing basis; although all categorised reports are stored in an index, analysts only have easy access during a window of a few weeks (depending on the settings used in the tool). OSI harvesting could take place on a project basis with appropriate planning, although, if such data are likely to be used frequently, it would be more efficient to have the data harvested and stored in a central repository for processing at a later date. Advances in the field of artificial intelligence could reduce the amount of human intervention required in the future. For example, machine-learning techniques might be used to identify new keywords from relevant datasets (Tanev and Zavarella, 2014).

The nature of the sources that contribute to OSI means that significant (i.e. newsworthy) seizure events are likely to be disproportionately over-represented. This is not a failing of the EMM tool per se, but rather it mirrors the media landscape. OSI is unlikely to have value for monitoring the retail level of the market. It should also be noted that OSI data and information are non-representative, as there are no consistent rules for what is reported. Furthermore, there are potential reliability issues, such as drug misidentification or other misreporting.

Finally, sourcing seizure data from OSI is subject to a limitation that is common to seizure data from any source, namely that drug seizure activities are shaped by law enforcement priorities, the setting of which may be influenced by a number of factors beyond just market activity levels. Furthermore, the decision to report seizures will be influenced by editorial priorities and competing stories. For items reported by law enforcement, there may be operational reasons why seizures are not reported. Nonetheless, even in this short pilot project, OSI demonstrates a clear potential as a complementary data source to improve the strategic analysis of drug markets, by providing information on international drug trafficking that is not currently available from existing seizure data.

In conclusion, this study demonstrates the potential value of open-source monitoring as a supplement to traditional monitoring at the international and national levels that overcomes some of the challenges of using routine data sources, specifically the lack of contextual detail and the significant time lags.

TABLE 3

Selected areas where the use of OSI is recommended or discouraged

Use for	Do not use for
▪ Analysis of new trends in changing trafficking routes and methods	▪ Analysis of retail-level markets
▪ Early warning of emerging trafficking threats	▪ Calculation of overall levels of seizures
▪ Analysis of trafficking patterns in countries with limited/no access to data on routine seizures	▪ Replacing routine data
▪ Evidence-based resource allocation	
▪ Evidence-based policy and operational prioritisation (e.g. the European multidisciplinary platform against criminal threats)	

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Annex

TABLE A1

Keyword patterns, OSI, heroin (5)

	AND	AND
MUST CONTAIN	one or more of	one or more of
ENGLISH		
heroin	multi*	police
	large*	officer*
	big*	authorit*
	ton*	arrest*
	huge	bust*
	massive	enforc*
		organised crime
		traffick*
		seiz*
		maritime
		port
		harbour
		customs
		checkpoint
		airfield
		airport
		haul
		force*
		cooperati*
		partner*
		operati*
		container*
		vessel*
		ship*
GREEK		
Ηρωίνη	πολυ*	αστυνομία
	μεγάλ*, μεγαλύτ*	αξιωματικ*, αστυνομικ*
	μεγάλ*, μεγαλύτ*	αρχές, αρχή
	τόνοι, τόνος	*Συλλήψεις, σύλληψη*
	τεράστι*	εξάρθρωσ*, έφοδος,
	σημαντικές, υπέρογκες	καταπολέμησ*, δίωξη, επιβολή
		οργανωμένο έγκλημα
		διακίνηση, διακινού*, εμπόριο
		κατασχε*, κατάσχε*,
		ναυτικ#, ναυτιλιακ#, θαλάσσι*
		λιμάνι/λιμένας
		τελωνείο, τελωνεία

(5) Similar lists were developed for the cocaine categorisation as well.

TABLE A1 (continued)

	AND	AND
MUST CONTAIN	one or more of	one or more of
		σημείο ελέγχου
		αεροδιάδρομος, αεροδρόμιο, χώρος αεροδρομίου
		αεροδρόμιο
		φορτίο
		δύναμ*, δυνάμ*, σώμα, φορ*
		συνεργ*, συνεργασία
		σπείρα, ομάδα, συνεργ*,
		επιχειρή*, επιχείρησ*
		κοντέινερ, εμπορικιβώτιο
		σκάφος
		*πλοιο
BULGARIAN		
хероин	голям*	полиц*
	тон*	служител*
	мулти*	офицер*
	огром*	власт*
	мащабн*	арестува*
		задържа*
		операция
		организирана престъпност
		трафик*
		конфиск*
		МВР
		иззет*
		морски
		порт
		пристанищ*
		митни*
		контролно-пропускателен пункт
		летище
		сил*
		екипн*
		реализира*
		съвмест*
		оператив*
		контейнер*
		кораб
		дрог*
GERMAN		
Heroin	Multi*	Polizei
	gross*, groß*	Beamt*, Polizist, Angestellte*
	erheblich*	Behörde, Dienststelle
	Tonn*	verhaft*, Festnahme

TABLE A1 (continued)

	AND	AND
MUST CONTAIN	one or more of	one or more of
	gewaltig*	Hochnehmen, hochgenommen
	riesig*	Vollzug, Vollstreckung
		organisiertes Verbrechen, organisierte Kriminalität
		illegaler Handel, Drogenhandel, Drogenhändler
		Sicherstellung, sicher gestelle
		See*
		Hafen
		Zoll*
		Kontrollstelle, Checkpoint
		Flugfeld
		Flugplatz
		Beute
		Zwingen, Zwang
		Kooperation, Zusammenarbeit, Beteiligung, Mithilfe
		Partner*
		Operation, Betrieb
		Container
		Schiff
DANISH		
heroin	multi*	politi
	flere	betjent
	stor	myndighed*
	største	autoritet
	ton*	anhold*
	kæmpe	arrestere*
	uhyre	bryde
	massiv	brudt
	enorm	håndhæve
	overordentlig	fremtvinge
		organiseret kriminalitet
		traffik
		beslag*
		gribe
		maritime
		havn
		told*
		kontrolpunkt
		flyveplads
		lufthavn
		hale
		magt
		tvang
		samarbejd*
		partner*

TABLE A1 (continued)

	AND	AND
MUST CONTAIN	one or more of	one or more of
		operati*
		container*
		fartøj
		*skib
DUTCH		
heroïne	multi	politie
	grote	officier*, agent*
	grote	autorit*
	ton	arrest*
	enorme	vangst, vangen
	gigantische	handhaven
		georganiseerde criminaliteit
		trafiek, smokkel*
		inbeslagnemen, in beslag genomen, inbeslagname
		maritieme
		zeehaven
		haven
		douane
		checkpoint
		vliegveld
		vlieghaven
		vangen
		kracht*, dienst*
		samenwerk*, cooperati*
		partner
		operati*
		container*
		boot*
		schip
SPANISH		
heroina	multi*	policía
	gran*	oficial*
	gran*	autoridad*
	tonelada*	arrest*
	enorme*	desarticula*
	masivo*	enforc*
		crime organizado
		tráfico*
		decomis*
		maritim*
		puerto
		aduan*
		control*
		aer*

TABLE A1 (continued)

	AND	AND
MUST CONTAIN	one or more of	one or more of
		aer*
		alijo
		fuerza
		cooperativ*
		socio
		operaci*
		contenedor
		embarcaci*
		barco
		buque
		navío
		nave
		lancha
		paneador*
ITALIAN		
eroina	multipl*, moltitudine	polizia
	grand*, maggiore, grosso	ufficiale, poliziotto
	(see 'large')	autorità
	tonnellat*	arrest*
	enorme, immenso, gigantesco	acciuffare, smascherare, beccare, cogliere sul fatto, sorprendere
		applicare una sanzione, stabilire d'autorita', far rispettare
		criminalità organizzata
		trafficare, trafficante
		confiscare, sequestrare
		marittimo
		porto
		dogana, doganiere, doganale
		posto di controllo
		campo di aviazione
		aeroporto
		bottino, retata
		forze
		cooperazione, collaborazione
		partner, socio, alleato
		operazione, intervento
		container
		nave, navi, barca, natante,
		spedizion*, spedire
LATVIAN		
heroīn*	vairāk*	policij*
	liel*	virsniek*
	apjomīg*	ierēdni*

TABLE A1 (continued)

	AND	AND
MUST CONTAIN	one or more of	one or more of
	ton*	arestē*
	milzīg*	izpild*
	smag*	organizēt*, noziedzīb*
		kontraband*
		konfiscē*
		jūras
		osta
		piestatn*
		muit*
		kontrolpunkt*
		lidlauk*
		lidost*
		sadarbīb*
		parner*
		operācij*
		konteiner*
		kuģ*
		laiv*
POLISH		
heroin*	wielo*, multi*	policj*
	duż*, szerok*	oficer*
	duż*	wladz*
		areszt
	ogromn*	nalot*, policyjn*
	wielk*	wprowadz*, egzekwowa*
		przestępczoś*, zorganizowan*
		nielegaln*, hand*
		konfisk*
		morsk*
		port*
		odpraw*, celn*
		posterun*, punkt*, kontroln*
		lotnisk* wojskow*
		lotnisk*
		sił*, zmusza*
		współprac*
		partner*
		operacj*
		kontener*
		okręt*, statek
		statek
RUSSIAN		
героин*	множественн*	полиц*

TABLE A1 (continued)

	AND	AND
MUST CONTAIN	one or more of	one or more of
	многочисл*	милиц*
	многократн*	правохранитель*
	значительн*	правоприменени*
	больш*	офицер*
	тон	сотрудник*
	огромн*	орган
	громадн*	арест*
	крупн*	задерж*
		конфиск*
		организованн*, преступност*
		трафик*
		незаконн*, оборот*
		изья*
		морск
		порт*
		гаван*
		тамож*
		контроль*, пункт*
		аэродром*
		аэропорт*
		сил*
		сотруднич*
		партн*
		опера*
		контейн*
		судн*
		корабл*
SWEDISH		
heroin	multi, kombination	polis
	stor, större, störst, omfattande	polisman, polismän
	massivt	befogenhet, befogenheter, myndighet, myndigheter
	ton	arrest*
	mycket stor	gripa, greps, gripits; fånga, fångats, fångades
	enorm*	upprätthåll*, kontrollerande
		organiserad brottslighet
		narkotikatrafik, narkotikahandel, smuggling, narkotkasmuggling
		beslag*
		knarkbeslag
		maritim, handel, sjöfart
		hamn*
		skydd*, tillflyktsort
		tull*, tullmyndigheten
		kontroll*gränskontroll, tullkontroll, tullfiltret
		flygfält

TABLE A1 (continued)

	AND	AND
MUST CONTAIN	one or more of	one or more of
		flygplats
		tvinga*, kontrollerande
		samarbet*
		samarbetspartner
		operation, insats, insatsstyrka
		container, conteinrar, conteiners
		fartyg, sjöfart
		skepp, båt, lastfartyg, segelbåt, motorbåt

TABLE A2

List of variables and information recorded, OSI database

Variable	Information recorded
Date of seizure	dd/mm/yy
Geographical location of seizure:	UN codes for continents, countries and cities ([6])
i. continent	
ii. country	
iii. city.	
Point of seizure	National/international waters; port; airport; land; border crossing
Origin, transit and destination:	UN codes for continents, countries and cities
i. continent	
ii. country	
iii. city.	
Type of transport route of the drug	Air; land; maritime; post; NR ([7])
Place of seizure	Vehicle; private premises; commercial premises; boat; container; aircraft; post office; water; other (specify)
Method of concealment	In parcel; on/in body; in luggage; in carrier material; rip-on/rip-off; among goods; drop-off; false compartment; private storage; not concealed; other (specify)
Main drug seized	heroin; cocaine powder; cocaine liquid
Unit of measurement	kg; l
Quantity seized	Numerical value
Estimated value of drug seized	Value in euros
Individuals arrested	Yes; no; NR
Number of individuals arrested	Numerical value
Nationality of individuals arrested	UN country codes
Organised crime group involved	Yes; no; NR
Weapons seized along with drugs	Yes; no; NR

([6]) https://unstats.un.org/unsd/methodology/m49/
([7]) NR: not reported.

TABLE A3

Heroin: number of seizures by market level, ST13, 2017

Country	Number of seizures				Quantity seized (kg)
	Total	Level of the market			
		Retail	*Middle*	*Wholesale*	
Belgium	1 790	–	–	–	53
Bulgaria	32	0	18	14	698
Czechia	90	39	45	6	19
Denmark	561	245	311	5	16
Germany	–	–	–	–	298
Estonia	3	0	3	0	< 0.1
Ireland	765	–	–	–	–
Greece	1 952	1 576	337	39	359
Spain	7 283	6 568	681	34	524
France	4 544	2 940	–	–	658
Croatia	140	–	–	–	27
Italy	2 296	458	1 722	116	610
Cyprus	4	4	0	0	0.4
Latvia	66	47	19	0	0.2
Lithuania	173	–	–	–	4
Luxembourg	69	–	–	–	1
Hungary	34	16	13	5	21
Malta	25	11	–	10	13
Netherlands	–	–	–	–	1 110
Austria	967	245	707	15	70
Poland	2	0	2	0	2
Portugal	492	108	376	8	29
Romania	222	185	36	1	4
Slovenia	286	–	–	–	11
Slovakia	41	32	9	0	0.6
Finland	138	–	–	–	0.4
Sweden	675	32	18	15	45
United Kingdom	11 075	–	–	–	844
Norway	628	–	–	–	99
Turkey	12 932	–	–	–	17 385
European Union (*)	33 725				5 418
EU, Norway and Turkey (*)	47 285				22 902
Total across market levels where reported	17 071	12 506	4 297	268	
		73.2 %	25.2 %	1.6 %	

(*) The total values presented here differ from the ones published in the *European Drug Report* (EDR) (2019), Annex A7. This is because the EDR summary value includes 2015 seizure data for Germany, which are excluded from the present calculation.

TABLE A4

Cocaine: number of seizures by market level, ST13, 2017

Country	Number of seizures				Quantity seized (kg)
	Total	Level of the market			
		Retail	*Middle*	*Wholesale*	
Belgium	4 695	–	–	–	44 752
Bulgaria	30	6	17	7	42
Czechia	227	182	29	16	27
Denmark	4 786	2 779	19 88	19	151
Germany	–	–	–	–	8 166
Estonia	154	128	23	3	17
Ireland	792	–	–	–	–
Greece	596	418	161	17	234
Spain	42 206	40 208	1 289	709	40 960
France	12 214	8 375	3 203	636	17 500
Croatia	418	–	–	–	466
Italy	7 812	4 482	2 996	334	4 084
Cyprus	118	104	11	3	8
Latvia	61	48	12	1	2
Lithuania	98	–	–	–	623
Luxembourg	222	–	–	–	3
Hungary	276	226	50	0	6
Malta	232	199	0	33	0.3
Netherlands	–	–	–	–	14 629
Austria	1 571	1 297	256	18	71
Poland	9	3	5	1	69
Portugal	816	562	182	72	2 734
Romania	169	141	25	3	8
Slovenia	277	–	–	–	12
Slovakia	42	32	9	1	3
Finland	383	–	–	–	7
Sweden	3 640	3 131	480	29	162
United Kingdom	18 912	–	–	–	5 697
Norway	1 185	–	–	–	80
Turkey	3 829	–	–	–	1 476
European Union (*)	100 756				140 433
EU, Norway and Turkey (*)	105 770				141 989
Total across market levels where reported	74 959	62 321	10 736	1 902	
		83.2 %	14.3 %	2.5 %	

(*) The total values presented here differ from the ones published in the *European Drug Report* (2019), Annex A7. This is due to the inclusion of 2015 seizure data for Germany in the EDR summary value, which is excluded from the present calculation.

TABLE A5

Heroin: countries of origin/transit

(a) OSI, April 2017 to March 2018

Country	Frequency
Turkey	11
Netherlands	5
Italy	4
Bulgaria	3
France	3
Iran	3
Kenya	3
Spain	3
United Arab Emirates	3
Afghanistan	2
Albania	2
Azerbaijan	2
South Africa	2
Switzerland	2
Belgium	1
Czechia	1
Egypt	1
Ethiopia	1
Ireland	1
Pakistan	1
Poland	1
Qatar	1
Romania	1

(b) ST13, 2017

Country	Frequency
Spain	66
Bulgaria	32
Netherlands	32
Turkey	20
Belgium	16
France	16
Germany	13
Mozambique	12
Albania	11
Qatar	9
Afghanistan	8
Ethiopia	7
Pakistan	6
United Arab Emirates	4
Greece	3
Morocco	2
Cyprus	1
Iran	1
Tanzania	1

TABLE A6

Heroin: countries of destination

(a) OSI, April 2017 to March 2018

Country	Frequency
Italy	18
Greece	3
Spain	3
France	2
Ireland	2
Turkey	2
United Kingdom	2
Bulgaria	1
Malta	1
Netherlands	1
Poland	1
Portugal	1
Switzerland	1
United Arab Emirates	1

(b) ST13, 2017

Country	Frequency
Spain	203
Italy	53
Greece	50
Portugal	6
Germany	5
Bulgaria	4
France	4
Romania	3
Austria	2
Belgium	2
Latvia	2
Luxembourg	2
Morocco	2
Netherlands	2
North Macedonia	2
Romania	2
Turkey	2

TABLE A6 (continued)

Cyprus	1
Finland	1
Poland	1

TABLE A7

Cocaine: countries of origin/transit

(a) OSI, April 2017 to March 2018

Country	Frequency
Colombia	28
Brazil	14
Spain	14
Panama	8
Belgium	7
Ecuador	7
Chile	6
Netherlands	6
Peru	6
Italy	4
Portugal	4
Venezuela	4
Bolivia	3
Dominican Republic	3
Germany	3
United States	3
France	2
Paraguay	2
Turkey	2
Ukraine	2
Uruguay	2
Albania	1
Argentina	1
Costa Rica	1
Ethiopia	1
Greece	1
Guatemala	1
Honduras	1
Lithuania	1
Malta	1
Switzerland	1

(b) ST13, 2017

Country	Frequency
Spain	337
Brazil	296
Peru	238
Colombia	232
Netherlands	64
Dominican Republic	34
Chile	29
Germany	23
Ecuador	20
France	19
Venezuela	19
Belgium	16
Bolivia	15
Costa Rica	13
Switzerland	9
Bulgaria	8
Panama	6
Portugal	5
China	4
Poland	3
Sweden	3
Albania	2
Ecuador	2
Italy	2
Paraguay	2
Turkey	2
United States	2
Estonia	1
Hungary	1
Romania	1
Serbia	1
United Arab Emirates	1

TABLE A8

Cocaine: countries of destination

(a) OSI, April 2017 to March 2018

Country	Frequency
Italy	37
Spain	37
France	9
Belgium	8
Netherlands	5
United Kingdom	5
Portugal	4
Germany	3
Ireland	3
Turkey	3
United States	3
Canada	2
Australia	1
Austria	1
Bulgaria	1
Croatia	1
Georgia	1
Greece	1
Iraq	1
Israel	1
Lebanon	1
Liberia	1
Poland	1
United Kingdom	1

(b) ST13, 2017

Country	Frequency	Rank
Spain	1 802	
Portugal	98	
Italy	90	
Greece	46	
Spain	17	
Israel	12	
Bulgaria	8	
Netherlands	8	
Latvia	7	
France	5	
Ireland	4	
Turkey	4	
United Kingdom	4	
Switzerland	3	
Belgium	2	
Romania	2	
Turkey	2	
Cyprus	1	
Finland	1	
India	1	
Iraq	1	
Luxembourg	1	
Malta	1	
Switzerland	1	
Tunisia	1	
Turkey	1	
United Arab Emirates	1	

FIGURE A1

Heroin: countries of origin/transit

(a) OSI, April 2017 to March 2018

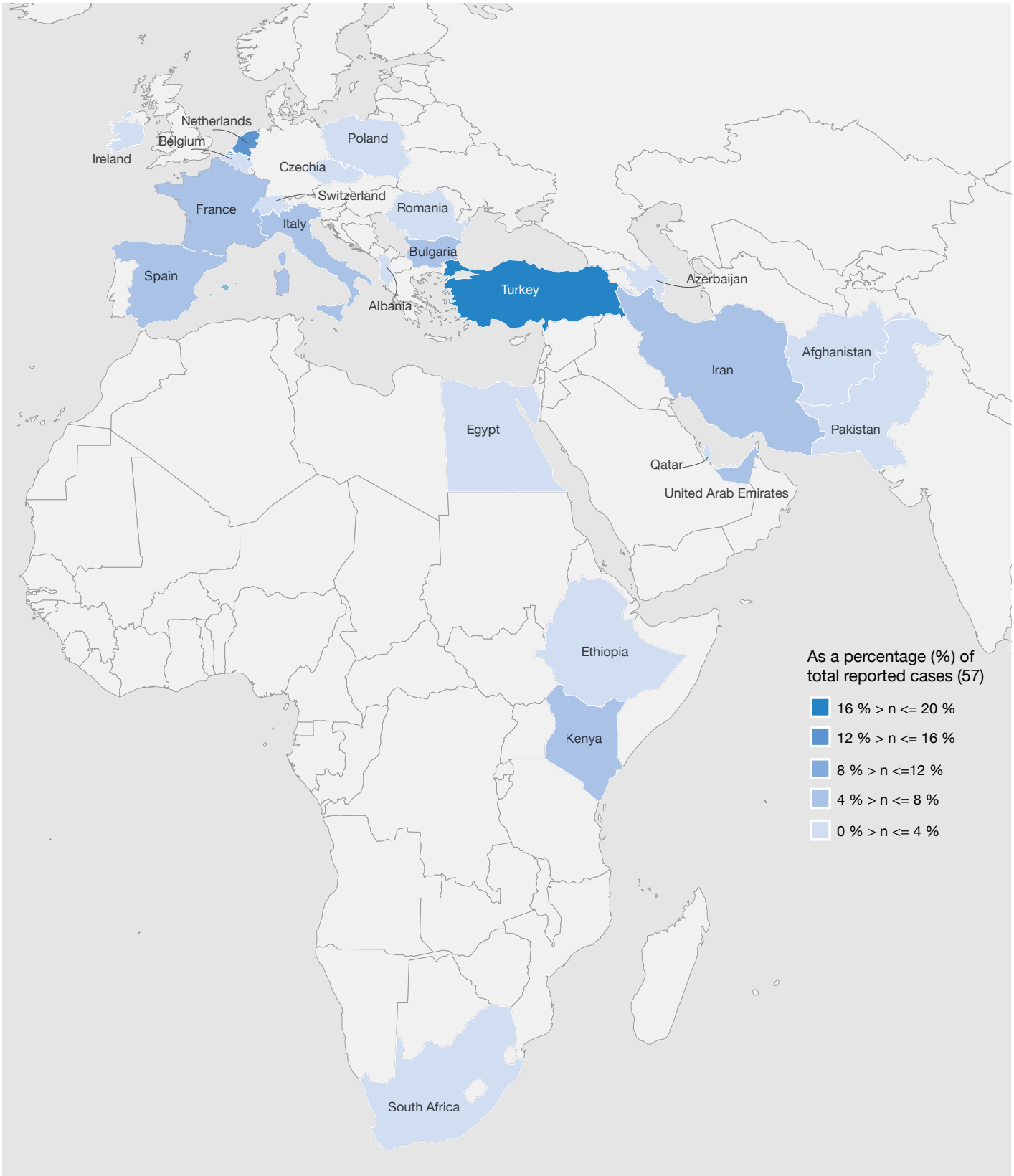


FIGURE A1

Heroin: countries of origin/transit

(b) ST13, 2017

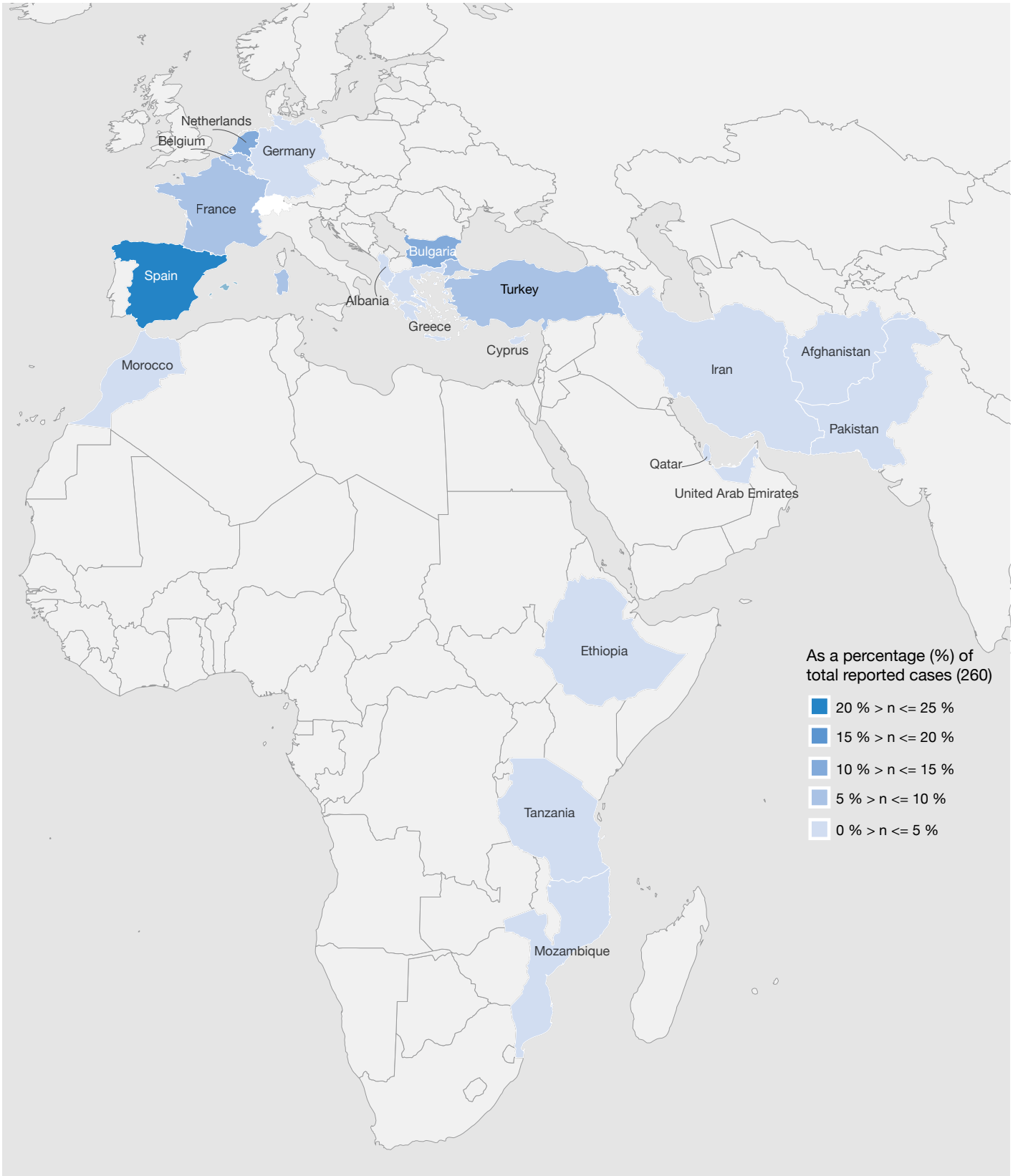


FIGURE A1

Heroin: countries of origin/transit

(c) OSI and ST13 data overlaid

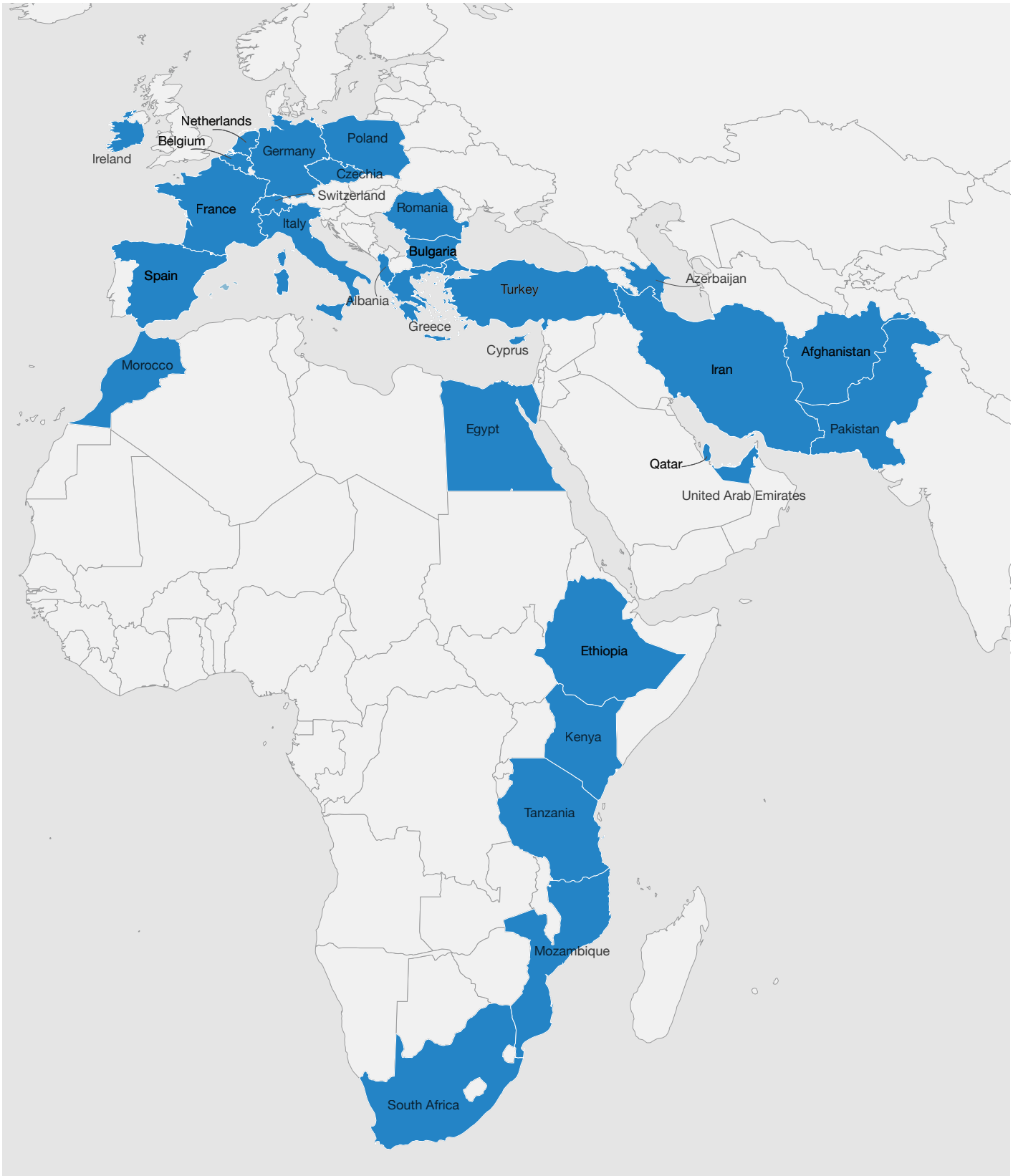
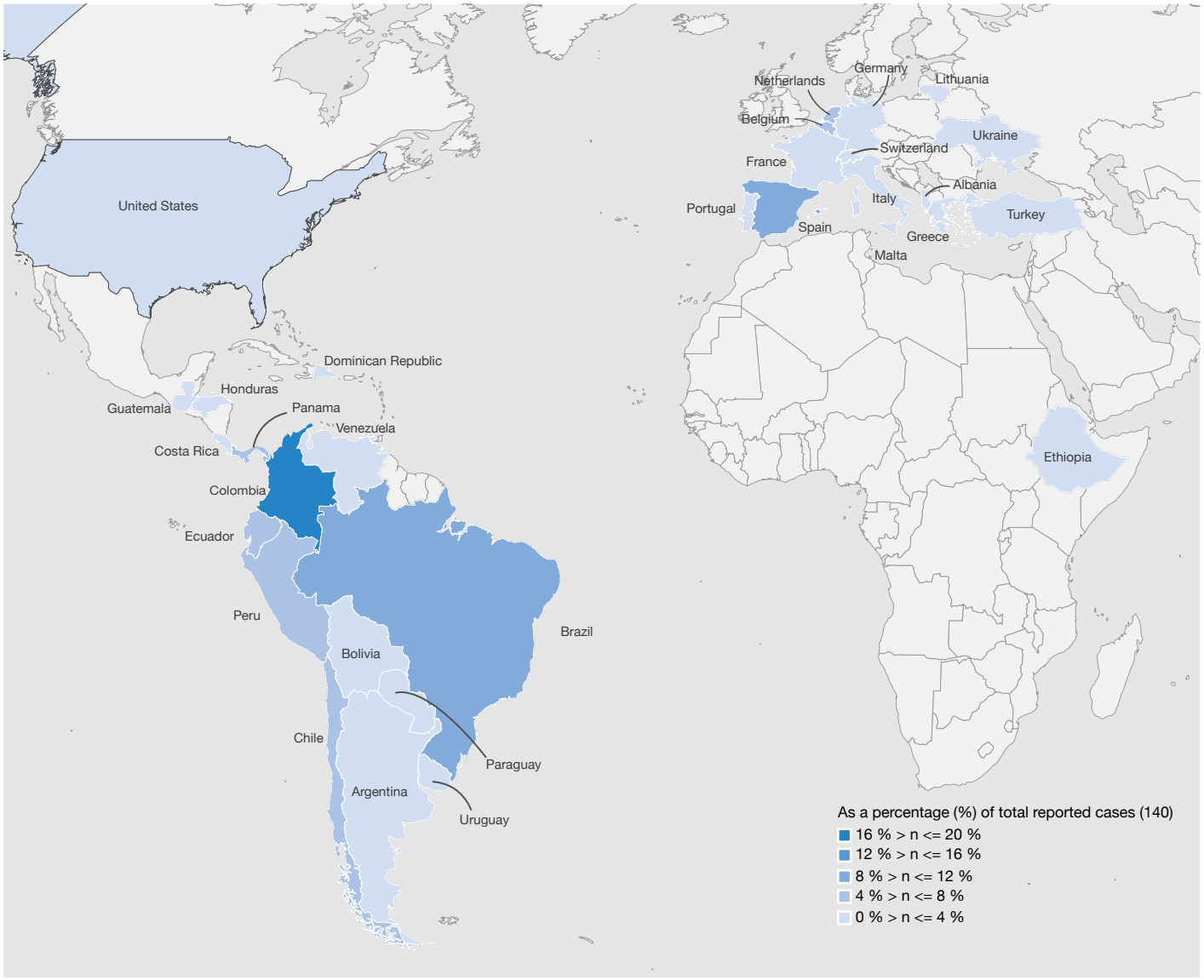


FIGURE A2

Cocaine: countries of origin/transit

(a) OSI, April 2017 to March 2018



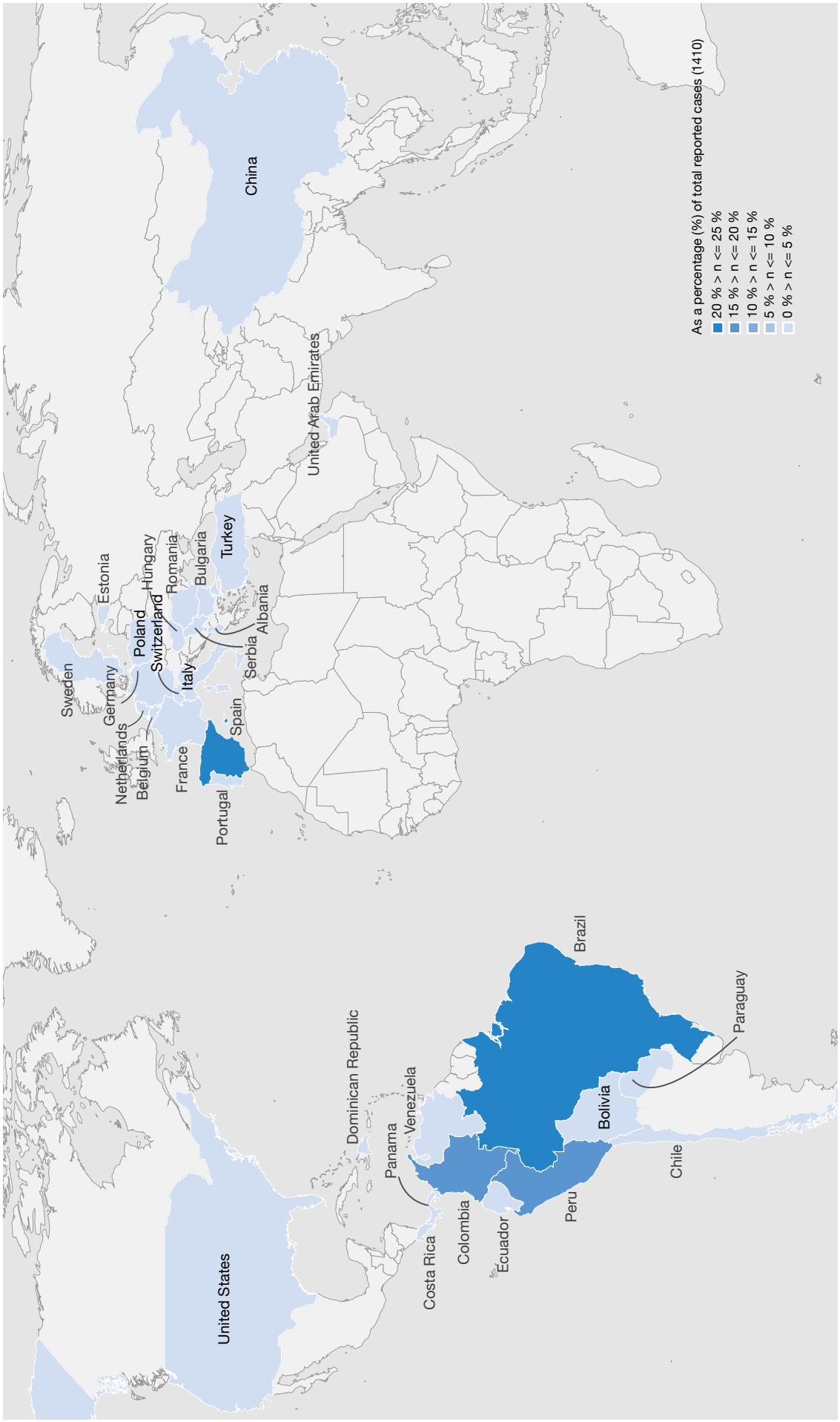


FIGURE A2
Cocaine: countries of origin/transit
(b) ST13, 2017

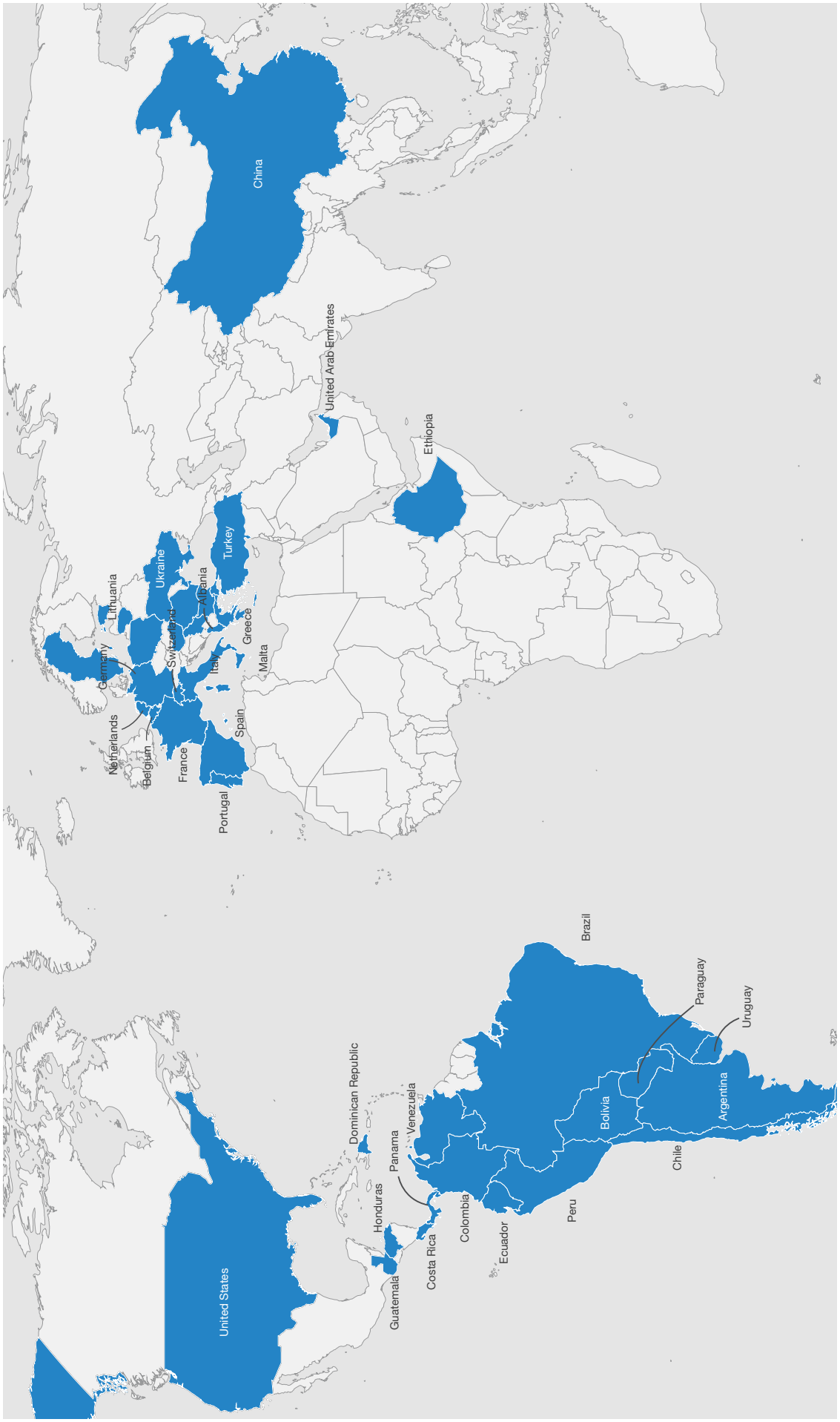


FIGURE A2
Cocaine: countries of origin/transit
(c) OSI and ST13 data overlaid

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