

Ten-year trends in hospitalizations related to cocaine abuse in France

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Abstract

In France, the abuse/misuse of psychoactive substances, including cocaine, is monitored via spontaneous notifications, and under-reporting is its main limitation. Therefore, the French national hospital discharge database (*Programme de Médicalisation des Systèmes d'information* [PMSI]) was used to identify all hospital stays possibly due to complications related to cocaine use. The objective was to determine the main trends in the rate of cocaine-related hospitalizations from 2010 to 2019 by age category and by areas. Relevant PMSI data were extracted using the International Classification of Diseases (10th edition). In France, hospitalizations for cocaine-related complications increased by fourfold (2461 in 2010, 9843 in 2019, +300%). This increase was similar in men and women and was observed in each age category. Patients were mainly men (75% in 2010 and in 2019), with a median age of 38.5 and 35.2 years for men and women, respectively, in 2019. Cocaine poisoning in pediatric patients (0–9 years) concerned less than 10 patients in 2010 and 21 patients in 2019. PMSI data analysis shows an overall increase of cocaine-related hospitalizations in France from 2010 to 2019 that can be linked in part to an increasing recreational use. The increase of pediatric cases of cocaine poisoning suggests a trivialization of cocaine consumption.

KEYWORDS

addictovigilance, cocaine, hospitalization, national hospital database

1 | INTRODUCTION

In the European Union (EU), cocaine is the second most used recreative substance after cannabis [1]. Survey results suggest that about four million adults in the EU have used cocaine in the previous year

with a prevalence ranging from 0.2% to 5.3% [1]. France has observed an upward trend from 2000, with a user prevalence of 3.2% for the first time in 2007 (almost 3% in Spain and 5.3% the United Kingdom). Moreover, French Health Barometer data suggest an increasing trend among adults with cocaine lifetime use ranging from 1.5% in 2000 to 5.6% in 2017—8% men, 3% women [2]. A similar trend has been observed among adolescents [3].

The French Addictovigilance Network (FAN), under the supervision of the French National Agency for

Abbreviations: DRAMES, Décès en Relation avec l'Abus de Médicaments et de Substances; EU, European Union; FAN, French Addictovigilance Network; ICD, International Classification of Disease; OPPIDUM, Observatoire des produits psychotropes illicites ou détournés de leur utilisation médicamenteuse; PMSI, Programme de Médicalisation des Systèmes d'information.

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Medicines and Health Products Safety (Agence Nationale de Sécurité du Médicament et des Produits de Santé), was established in 1990 to monitor the abuse of potential of psychoactive substances (with the exclusion of tobacco and alcohol) and to provide information on the risk of addiction and advice for public health decision making [4, 5]. As the number and severity of complications related to cocaine consumption reported to the FAN have increased, the French health authorities commissioned a national pharmacoepidemiology study [6]. Data from different signal detection systems (i.e., spontaneous reports, *Observational survey of illegal psychotropic substances or diverted from their clinical use* [OPPIDUM] survey, and *Deaths related to abuse of licit and illicit psychoactive substances* [DRAMES] survey) were also analyzed to prepare an information brochure that summarized the results of this pharmacoepidemiological study [7]. The spontaneous reporting system remains a useful tool to generate “signals” or “warnings” of severe drug-associated events. However, under-reporting is considered its main limitation. The low notification rate is one of the reasons for the establishment of pharmacoepidemiological tools by the FAN [8]. To complete the FAN data, some groups have analyzed hospital records to identify serious complications related to the use of psychoactive substances [8–10]. To obtain information on 10-year trends in cocaine-related hospitalizations, we used the French national hospital discharge database (*Programme de Médicalisation des Systèmes d'information* [PMSI]) taking into account categories of age and French administrative regions to identify possible changes in hospitalizations related to cocaine use.

2 | MATERIALS AND METHODS

2.1 | Data collection

The PMSI database was started 30 years ago as the basis for the French national healthcare reimbursement system. This database describes each inpatient stay in a standardized dataset that summarizes information on the patient and the hospital stay (e.g., diagnoses as diagnosis-related groups and procedures) and entrance at the hospital, especially if it was via an intensive care unit [11]. For this study, data on hospital stays in the French Hospitals located in the 13 metropolitan regions and four overseas territories from 2010 to 2019 were used. To identify possible cocaine-related hospitalizations and their outcome, data were extracted using the International Classification of Diseases (10th edition ICD-10) codes F14.0 to F14.9 (mental and behavioral disorders due to use of cocaine), R78.2 (cocaine detection in blood), and T40.5 (cocaine poisoning).

Nominative, sensitive, or personal data were not collected. As recommended by the French authorities,

the study had a public interest and the used information were not linked to personal data and were within the scope of the French Reference Methodology MR-005 according to the 2018-256 law of June 7, 2018 on the modernization of the French health system [12].

2.2 | Data analysis

Age- and sex-standardized incidence rates were calculated using 2010 and 2019 data. Changes in these incidence rates were calculated using the year 2010 as reference and by assigning to this year a value of 100. Data concerning fewer than 10 hospitalizations were noted as ≤ 10 .

3 | RESULTS

Between 2010 and 2019, the number of hospitalizations presumably related to cocaine use increased by fourfold (2461 in 2010 vs. 9843 in 2019, +300% or equivalently a fourfold increase; Figure 1). This increase was similar between sexes and in all age groups. Patients were mainly men (75% in 2010 and also in 2019), with a median age of 38.5 and 35.2 for men and women, respectively, in 2019 (Table 1). Moreover, 44% and 37% (in 2010) and 39% and 35% (in 2019) of these men and women, respectively, were hospitalized via the emergency room, for an event potentially related to cocaine use. The mean number of hospitalizations per patient varied from 1.25 in 2010 to 1.51 in 2019.

Cocaine poisoning cases in pediatric patients (0–9 years) were fewer than 10 in 2010 and increased to 21 in 2019 and in patients from age group ≥ 10 –19 years a 10-fold increase is observed (Figure 1).

The trends in cocaine-related hospitalization incidence differed between the French regions (Figure 2). The highest incidences were observed in Bourgogne France-Comté, Bretagne, and Pays de la Loire in metropolitan France and at the Reunion Island for the French overseas territories.

4 | DISCUSSION

The analysis of the PMSI data allowed monitoring cocaine-related hospitalizations in France, showing their increase by fourfold from 2010 to 2019. Cocaine pharmacoepidemiological surveys are usually done in the general population to assess the prevalence of cocaine use by sex and age, the frequency of consumption (experimentation, regular use, or daily use), and the type of cocaine used (cocaine or crack cocaine). The study by the Euro-DEN research group described the pharmacoepidemiology and cocaine-related complications

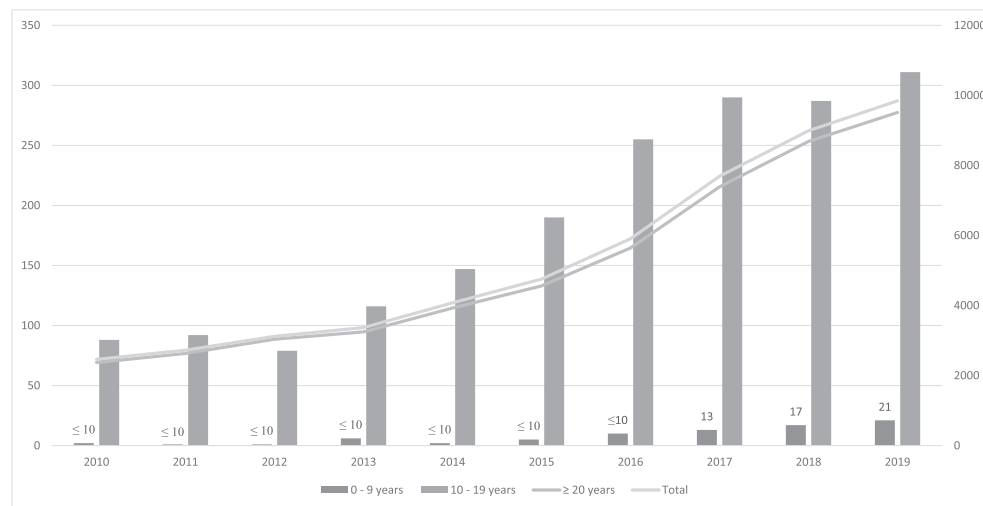


FIGURE 1 Number of hospitalizations possibly related to cocaine use (cocaine-related International Classification of Diseases codes) in French region between 2010 and 2019 by age group. According to the MR-005 French Reference Methodology, ≤10 was used when data were fewer than 10

TABLE 1 Total number of hospitalizations possibly related to cocaine use (cocaine-related International Classification of Diseases codes) by years (2010 to 2019)

Year	Number of patients (n)			Median age (years)			Percentage of first hospitalized through the emergency room (%)			Mean number of hospitalizations per patient (n)		
	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total
2010	1843	618	2461	36.4	35.6	36.2	44%	37%	42%	1.24	1.28	1.25
2011	2018	706	2724	37.0	37.8	37.2	43%	28%	39%	1.23	1.59	1.32
2012	2326	792	3118	37.5	36.5	37.2	41%	38%	40%	1.33	1.43	1.36
2013	2494	874	3368	37.7	35.3	37.1	46%	37%	44%	1.23	1.45	1.29
2014	3068	1009	4077	37.8	35.4	37.2	42%	36%	40%	1.33	1.51	1.37
2015	3534	1221	4755	37.6	34.7	36.9	39%	40%	39%	1.42	1.37	1.41
2016	4489	1417	5906	37.3	34.6	36.7	40%	36%	39%	1.37	1.55	1.41
2017	5782	1908	7690	37.6	34.5	36.8	41%	37%	40%	1.34	1.58	1.40
2018	6781	2208	8989	37.8	34.7	37.1	40%	36%	39%	1.38	1.54	1.42
2019	7361	2482	9843	38.5	35.3	37.7	39%	35%	38%	1.47	1.62	1.51

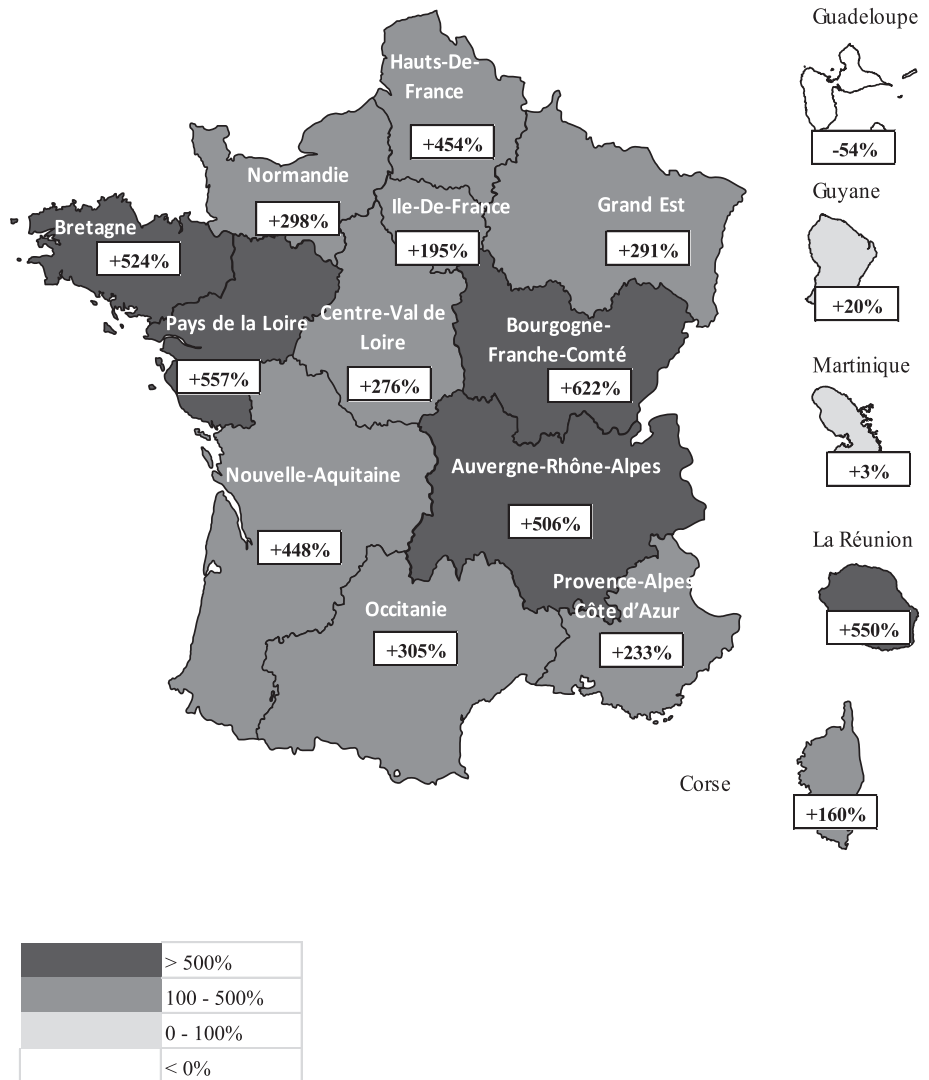
observed specifically in emergency units, using data on substance use self-reported by patients. Between October 2013 and September 2014, cocaine was the second substance involved in acute psychoactive substance toxicity events leading to emergency hospitalization in Europe [13]. However, data for France were obtained only from one hospital in Paris.

In France, the FAN analyzed data on cocaine use, obtained using three different tools (spontaneous notifications, OPPIDUM, DRAMES), and found that cocaine-related complications are increasingly reported to the addiction monitoring centers, although the real frequency is certainly underestimated [6, 10]. Using these three data sources provides complementary data: (1) cocaine-reported complications, (2) number of cocaine and crack cocaine users and number of patients with use disorders in addiction care centers, and (3) cocaine-related deaths [5]. However, these epidemiologic approaches have some limitations, such as the lack of objectivity because information collected in

some population surveys comes from users' self-reports. Moreover, data resulting from spontaneous notifications are often biased by underreporting, making it difficult to extrapolate to a population of users.

The analysis of PMSI data showed a fourfold increase of cocaine-related hospitalizations between 2010 and 2019. The rate of cocaine-related hospitalizations was higher in six French regions (Auvergne-Rhône-Alpes, Bourgogne-Franche-Comté, Hauts-De-France, Ile-De-France, Nouvelle-Aquitaine, and Occitanie). Nevertheless, changes in hospitalization rates between 2010 and 2019 were heterogeneous among regions. The most important reason that could influence drug abuse and traffic is the availability of the substance. Moreover, the distribution of substances disorder management support units for outpatients is different among regions and might partly explain some of these differences. A study evaluates the profile of drug users and characteristics of the psychoactive substances used in French overseas territories, using data

FIGURE 2 Temporal trend of the standardized incidence rate of hospitalizations possibly related to cocaine use in each French region between 2010 and 2019 (d-maps.com)



from the OPPIDUM survey from 2012 and 2013 [14]. Cocaine was frequently consumed in the French Americas, mainly in the “freebase” form, versus in metropolitan France. It is surprising not to observe more increase in hospitalization rates in these territories.

An increase by 10-fold of pediatric cases of cocaine poisoning was observed in most of the regions over the study period. Pediatric cocaine poisoning could occur at birth because of the mother’s addiction, by maternal–infant transmission through breast milk, or by accidental poisoning. Their strong increase is a marker of cocaine trivialization. Based on the PSMI database a similar study was realized by the FAN on pediatric cannabis poisoning. A steady increase was reported, since 2014, in the number of pediatric cannabis poisoning mainly in children under 2 years of age, occurring in the family setting [15].

Among the strengths of this study is the use of the PSMI database that collect data from all French health-care facilities [16]. Therefore, its exhaustive nature should guarantee the absence of selection bias.

Nevertheless, the quality of data, which were not originally intended for pharmacoepidemiological studies, have been evaluated [9]. This pilot study was performed in a single hospital and demonstrates how hospital databases could be used as a source for the identification of abuse and dependence cases [9].

There are also some limits linked to the PSMI tool. First, as no information on the cause or role of cocaine use is reported, it is not possible to confirm that the cause(s) leading to each hospital stay was cocaine use. Second, a coding error or coding with insufficient precision on the causal role of the substance or drug might have occurred. Third, we cannot rule out the improvement of coding efficiency by clinicians and the increasing use of actionable data in patient records by the hospital medical data teams during the study period. Moreover, it is possible that sometimes there was no mention of cocaine during hospitalizations for multiple reasons. However, these improvements should not be sufficient to explain the observed increase of hospitalizations related to cocaine use in France.

The World Health Organization recommended that countries should develop vigilance systems specifically dedicated to substance use disorders [17]. Many of the existing surveillance systems rely on spontaneous reporting of medical complications related to psychoactive substance use; in this context, PMSI, and other national health databases, can be a useful tool to complete data collection.

5 | CONCLUSION

In France in 2019, nearly 10 000 patients were referred to hospital for cocaine-related complications with a four-fold increase between 2010 and 2019. This result demonstrates the burden of cocaine consumption and its health implications for the French hospital system. Understanding cocaine consumption and its national health consequences remains a difficult task; this research illustrates the added value of combining complementary data sources to obtain a more complete and accurate picture of the situation.

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CONFLICT OF INTEREST


The corresponding author on behalf of all authors declares that they have no conflict of interests and that there has been no involvement that might raise the question of bias in the work reported or in the conclusions, implications, or opinions stated.

AUTHOR CONTRIBUTIONS

All authors have been personally and actively involved in substantial work leading to the paper and will take public responsibility for its content.

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REFERENCES

- EMCDDA. EMCDDA Drug Report 2020. <https://www.emcdda.europa.eu/edr2020> (available September 2020).
- Spilka S, Richard J-B, Le Nézet O, et al. Levels of illicit drug use in France in 2017. *Tendances*. 2018;128:1-6. <https://www.ofdt.fr/BDD/publications/docs/eftxssyb.pdf> (available 22/07/2021).
- Spilka S, Le Nézet O, Janssen E, et al. Drug use in 17-year-olds: analysis of the 2017 ESCAPAD survey. *Tendances*. 2018; 123:1-8. <https://en.ofdt.fr/BDD/publications/docs/tenden123.pdf> (available 22/07/2021).
- Jouanjus E, Gibaja V, Kahn JP, Haramburu F, Daveluy A. A signal identification in addictovigilance: the functioning of the French system. *Therapie*. 2015;70(2):113-131. doi:10.2515/therapie/2015011
- Micallef J, Jouanjus E, Mallaret M, Lapeyre Mestre M. Safety signal detection by the French Addictovigilance Network: innovative methods of investigation, examples and usefulness for public health. *Therapie*. 2019;74(6):579-590. doi:10.1016/j.therap.2019.09.005
- Eiden C, Vincent M, Serrand C, et al. Health consequences of cocaine use in France: data from the French Addictovigilance Network. *Fundam Clin Pharmacol*. 2021;35(2):455-465. doi:10.1111/fcp.12603
- The French National Agency for the Safety of Medicines and Health Products (ANSM). Increased reports of cocaine and crack-related intoxication—security information. <https://ansm.sante.fr/actualites/augmentation-des-signalements-dintoxication-liee-a-la-consommation-de-cocaine-et-de-crack> (available 22/07/2021).
- Jouanjus E, Pourcel L, Saivin S, Molinier L, Lapeyre-Mestre M. Use of multiple sources and capture-recapture method to estimate the frequency of hospitalizations related to drug abuse. *Pharmacoepidemiol Drug Saf*. 2012;21(7):733-741. doi:10.1002/pds.3280
- Daveluy A, Miremont-Salamé G, Kostrzewa A, et al. Identification of abuse and dependence cases through a hospital database. *Pharmacoepidemiol Drug Saf*. 2012;21(12):1344-1349. doi:10.1002/pds.3369
- Lafaurie M, Pochard L, Lotiron C, Molinier L, Lapeyre-Mestre M, Jouanjus E. Identification of somatic disorders related to psychoactive drug use from an inpatient database in a French university hospital. *Clin Drug Investig*. 2018(38):977-982. doi:10.1007/s40261-018-0679-4
- Osmont M-N, Cuggia M, Polard E, Riou C, Balusson F, Oger E. Use of the PMSI for the detection of adverse drug reactions. *Therapie*. 2013;68(4):285-295. doi:10.2515/therapie/2013042
- MR-005. <https://www.cnil.fr/fr/declaration/mr-005-etudes-necessitant-laccès-aux-données-du-pmsi-et-ou-des-rpu-par-les-etablissements>
- Dines AM, Wood DM, Yates C, et al. Acute recreational drug and new psychoactive substance toxicity in Europe: 12 months data collection from the European Drug Emergencies Network (Euro-DEN). *Clin Toxicol (Phila)*. 2015;53(9):893-900. doi:10.3109/15563650.2015.1088157
- Daveluy A, Frauger E, Peyrière H, Moracchini C, Haramburu F, Micallef J. Which psychoactive substances are used by patients seen in the healthcare system in French overseas territories? Results of OPPIDUM survey. *Fundam Clin Pharmacol*. 2017; 31(1):126-131. doi:10.1111/fcp.12233
- ANSM. ANSM Actualité—Augmentation du nombre d'intoxications au cannabis par ingestion accidentelle chez les enfants—ANSM (sante.fr) (available 25/05/2022).
- Boudemaghe T, Belhadj I. Data resource profile: the French National Uniform Hospital Discharge Data Set Database (PMSI). *Int J Epidemiol*. 2017;46(2):392-392d. doi:10.1093/ije/dyw359
- World Health Organization. Alcohol, drugs and addictive behaviours unit. <https://www.who.int/teams/mental-health-and-substance-use/alcohol-drugs-and-addictive-behaviours/drugs-psychoactive> (available 25/05/2022).

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