LISBON
ADDICTIONS
2019

Assessing patterns of use of new psychoactive substances (NPS)

the *NPS-Euronet* project

Noelia Salgueiro-Gonzalez, Sara Castiglioni, Ettore Zuccato, Lubertus Bijlsma, Alberto Celma, Felix Hernandez, Alvaro Lopes, Mario Joao

Wednesday, 23rd October

NPS euronet

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www.npseuronet.eu

NPS euronet

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Identification and assessment of new psychoactive substances: A European network

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THE PROJECT INTENDS

to identify and assess the NPS mostly spreading in Europe, and to estimate their extent and pattern of use in Europe

NPS euronet Project Activities

WS3 - Monitoring extent and patterns of use of NPS

(identification of the most widely-used NPS)

Monitor the extent, pattern of use and circulation in Europe of the selected NPS by using quantitative, analysis of wastewater and urine samples.

- Urine collected from hospital emergency rooms and forensic cases

- **Wastewater from sewage of major European cities**

- Wastewater and pooled urine from music festival venues

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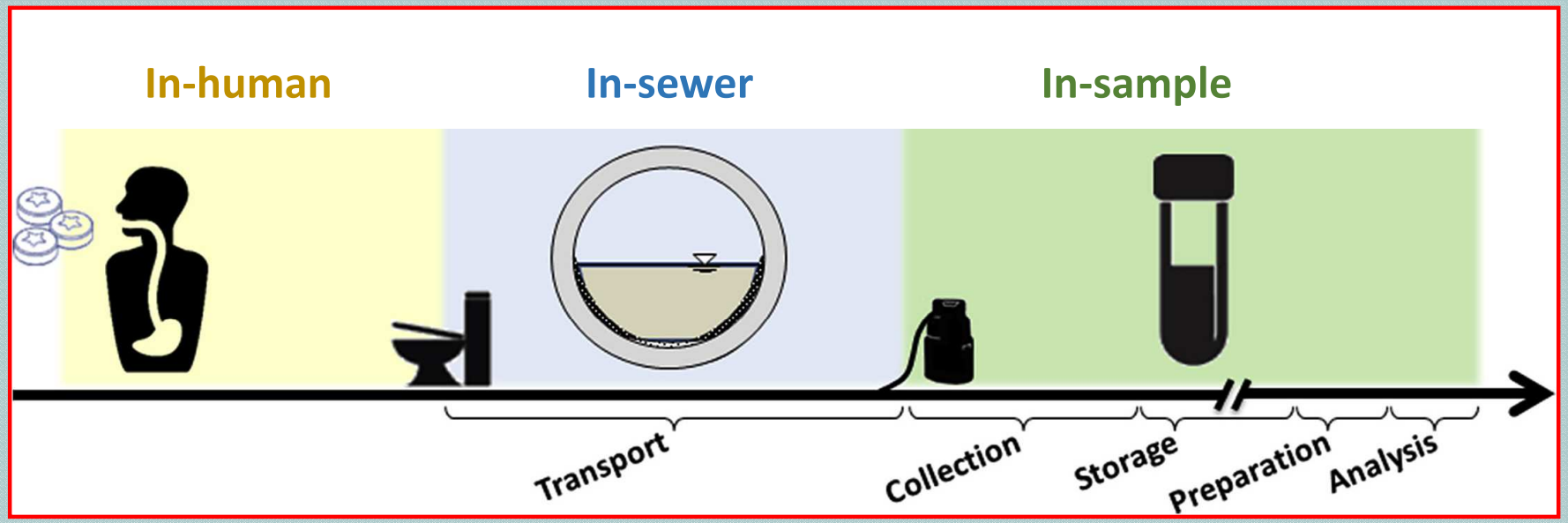
Wastewater-based epidemiology

Wastewater-based epidemiology (WBE) → Measurement of **excretion residues (biomarkers)** in urban wastewater to **evaluate the use**/consumption or exposure to substances



Source: McCall et al. (2016) Water Res. 88, 933-947

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Wastewater-based epidemiology

First application (Zuccato *et al*. 2005)

Environmental Health

Cocaine in surface waters: a new evidence-based tool to monitor community drug abuse

Ettore Zuccato*[1], Chiara Chiabrando[1], Sara Castiglioni[1,2], Davide Calamari[2], Renzo Bagnati[1], Silvia Schiarea[1] and Roberto Fanelli[1]

Sewage analysis CORE group (2010)

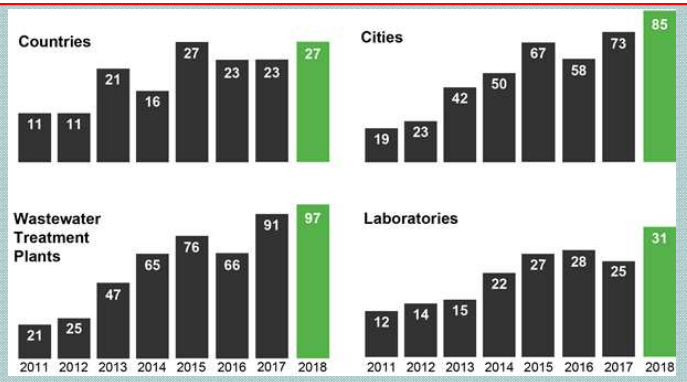
score
www.score-cost.eu

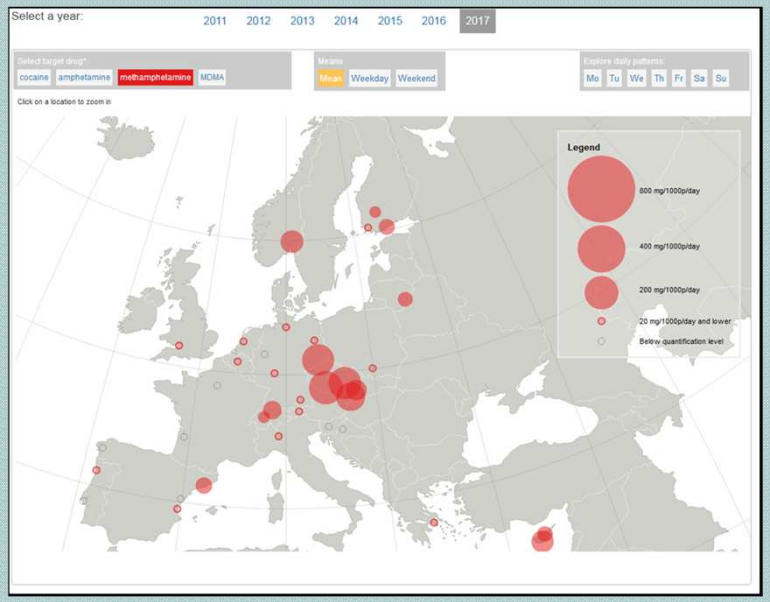
European Monitoring Centre for Drugs and Drug Addiction

Successfully applied to determine:

- Consumption of **alcohol, tobacco…**
- Exposure to **environmental and food contaminants**

European-wide monitoring illicit drugs (2011-2019)





http://www.emcdda.europa.eu/topics/pods/waste-water-analysis

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WBE for investigating NPS use

Identification of NPS
Evaluation of use

Ability to provide:

- **Objective** and **updated** estimates
- Near **real-time** estimates
- **Qualitative** and **quantitative** results
- **Complementary** information **to epidemiological indicators**

Challenges:

- **Low levels** in wastewater
- High number of substances
- Limited use
- Difficult **identify biomarkers**
- Human **metabolism is unknown**

Wastewater analysis needs to be tested

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Monitoring the pattern of use of NPS in Europe

Which NPS? → ***NPS database***

Where and when? → ***Study area (2016-2017)***

How? → ***Analysis of wastewater***

Qualitative analysis

- Identification (YES/NO)
- "Unknown/newest" NPS
- N° NPS: not limited

Quantitative analysis

- Amount of NPS
- "Well-known" NPS
- N° NPS: limited by Standards

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1 NPS database

List of substances

197 NPS

Frequency of detection and most recently reported by different Early Warning System (EWS) in Europe

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SISTEMA NAZIONALE DI ALLERTA PRECOCE
NATIONAL EARLY WARNING SYSTEM - N.E.W.S.

UNODC
United Nations Office on Drugs and Crime

10 categories of NPS

- Synthetic cannabinoids
- Synthetic cathinones
- Phenethylamines
- Synthetic opioids
- Tryptamines
- Piperidines
- Aminorex derivatives
- Natural NPS
- Benzodiazepines
- Ketamine analogues

http://www.npseuronet.eu/

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2 Study area

COST SCORE Monitoring campaign **2016-2017**

↓

Raw Wastewater Samples
(Pooled weekdays/weekend samples)

↓

16 European countries and 24 cities

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3 Qualitative analysis

Flexible high resolution-mass spectrometry approach for screening new psychoactive substances in urban wastewater

Noelia Salgueiro-González [a,b,*], Sara Castiglioni [a,**], Emma Gracia-Lor [a,d], Lubertus Bijlsma [c], Alberto Celma [c], Renzo Bagnati [a], Félix Hernández [c], Ettore Zuccato [a]

197 NPS ⟷ **13 NPS identified in WW**

Year	Category of NPS	NPS	Country
2016	Phenethylamines	***para*-methoxyamphetamine (PMA)**	Romania, Serbia, Slovakia, Ukraine
2017	Synthetic cathinones	**3,4-DMeO-alpha-PVP**	Portugal
	Tryptamines	**alpha-methyltryptamine (AMT)**	Germany, Italy, Portugal, Slovenia, Slovakia, Spain
	Phenethylamines	**2-Phenethylamine (2-PEA)**	Poland, Slovenia
		2-methoxyamphetamine (2-MA)	Italy, Portugal, Spain
		25E-NBOMe	Germany, Slovenia
		25H-NBOMe	Portugal, Spain
		DOIP	Italy, Poland, Portugal
		N-methyl-2AI	Poland
	Piperidines	**HDMP-28**	Germany
		Isopropylphenidate	Germany
		Diphenidine	Italy
	Synthetic cannabinoids	**AMB-FUBINACA**	Germany

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3 *Quantitative analysis*

30 NPS

19 Synthetic cathinones
6 Phenethylamines
1 Ketamine analogues
1 Tryptamine
1 Aminorex derivative
1 Synthetic Cannabinoid

Method Quantitation Limits (MQL)
0.3 - 2 ng/L

12 NPS found in WW

2016	2017
Synthetic cathinones	**Synthetic cathinones**
Mephedrone	Mephedrone
Methcathinone	Methcathinone
Methylone	Methylone
Ethcathinone	Buphedrone
3,4-DMMC	**Phenethylamines**
Buthylone	25-iP-NBOMe
Pentylone	
MDPV	**3 NPS found in both years**
α -PVP	
Phenethylamines	
PMA	

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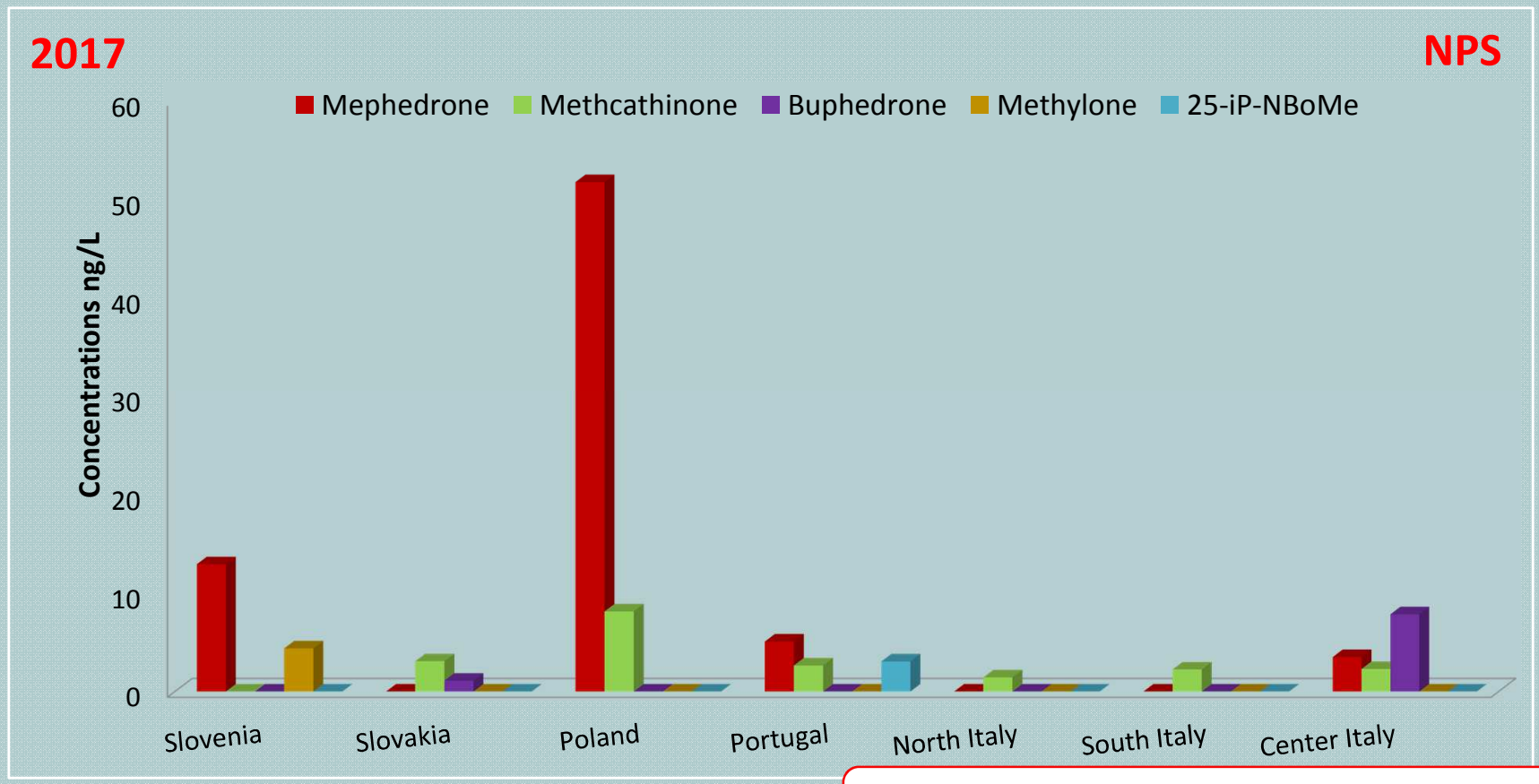
NPS occurrence in WW



Low levels of NPS in WW

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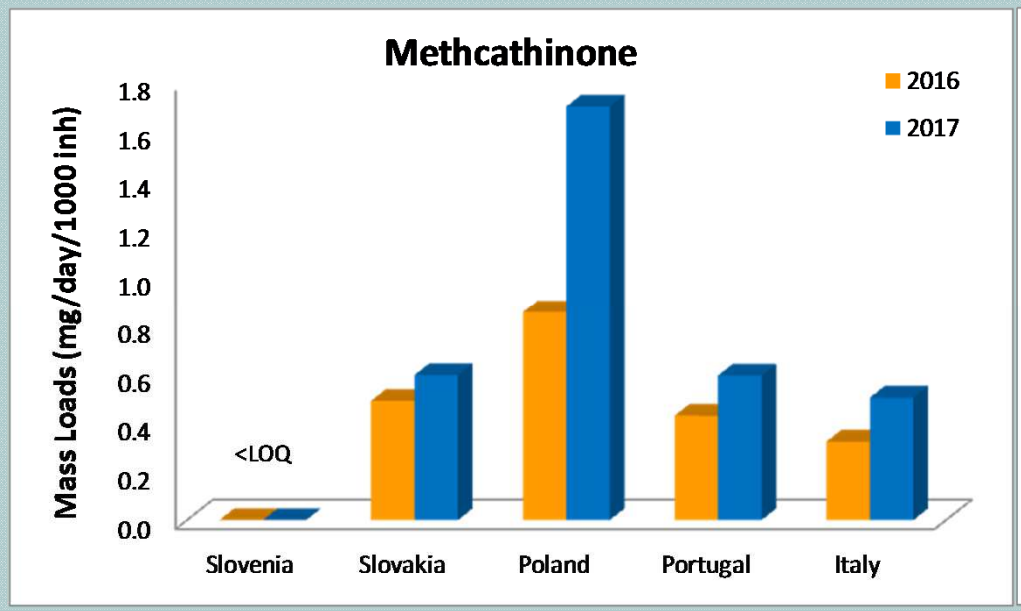
3 Estimating NPS use

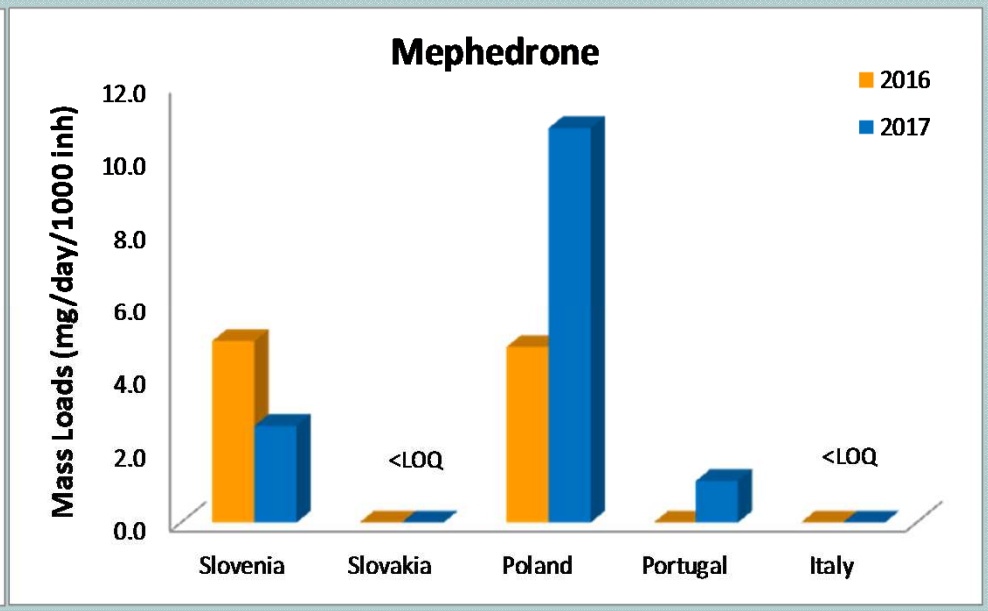
Concentrations of NPS in WW (ng/L)

Daily flow rate
Population served by plant

Mass loads
normalized by population
(mg/day/1000 inhabitants)

Comparison among different countries and years





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3 Comparison between NPS and DOA

NPS

Mass Loads
(mg/day/ 1000 inh)

0.2-21

Classical Drugs

Mass Loads
(mg/day/ 1000 inh)

Amphetamine	**3.8-120**
Methamphetamine	**0.3-177**
MDMA	**2.9-60**
Cocaine	**47-476**

NPS levels in wastewater are at least **5 times lower** than classical drugs

Lower use of NPS

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Conclusions

- Screening of 197 NPS → **13 NPS identified in WW**
- Quantitative analysis of 30 NPS → **12 NPS found in WW**

- **Different spatial and temporal trends** were observed
- **Lower use than the classical drugs** was evidenced

Wastewater analysis was proved useful to investigate the use of NPS on a large scale and to evaluate patterns of use

Selection of biomarkers
- human metabolism of NPS
- stability of NPS in wastewater

Long-term and ongoing monitoring to better understand the changeable drug market of NPS

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Acknowledgements

Francesco Riva
Silvia Schiarea
Elena Fattore
Sara Castiglioni
Ettore Zuccato

Carlo Pacciani; Sonia Carminati; PhD. Emma Gracia-Lor; PhD. Nikolaos Rousis; PhD. Iria Gonzalez-Marino

Project Partners

- Mario Negri Institute (coordinator)
- University Jaume I
- Faculdade de Farmacia Universidade de Lisboa
- Instituto Nacional de Medicina Legal e Ciencias Forenses
- Institute of Health Sciences "Egas Monitz"
- (Norwegian Institute of Water Research)

European Monitoring Centre for Drugs and Drug Addiction

Paul Griffith, Liesbeth Vandam, Ana Gallegos, João Matias

Project Collaborators (who kindly provided samples)

Igor Bodik (Slovakia); Ester Heath (Slovenia); Katarzyna Styszko (Poland); Erik Emke (The Netherlands); Barbara Kasprzyk-Hordern (UK); Lisa Jones (Ireland); Mariya Skobley and Tanya Bodnarchuk (Ucraine); Maja Turk Sekulic and Jelena Radonic (Serbia); Andjelka Petkovic (Serbia); Simone Milanolo (Bosnia Herzegovina); Simion Beldean (Romania); Jelyaz Rangelov and Teodora Todorova (Bulgaria); Francesca Pizza (Italy); Björn Helm and Christoph Ort (Germany), Francesco Poretti (Switzerland), Jose Benito Quintana and Cristina Postigo (Spain), and Miguel Santos, Alvaro Lopes and Mario João Dias (Portugal).

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ANY QUESTIONS?

For more information:

Noelia Salgueiro González
Postdoctoral researcher
E-mail: noelia.salgueiro@marionegri.it

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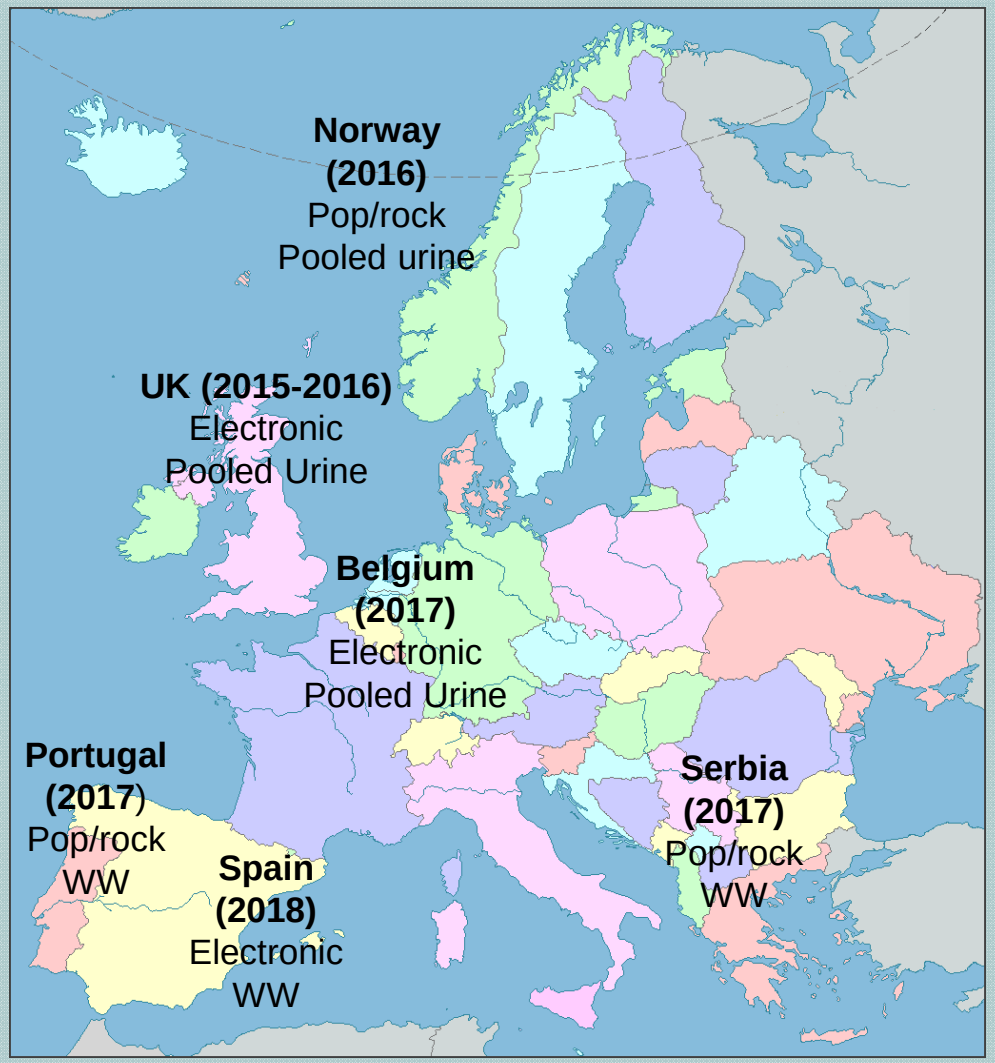
NPS use in European festivals



6 Music Festivals (2015-2018)
465 000 attendees

Pooled urine or WW analysis

6 illicit drugs and metabolites

- *MDMA and cocaine*
- *Spatial and temporal trends*

197 NPS

- ***21 NPS identified***
- *Lower levels of NPS than DOA*

Lower use of NPS

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NPS in hospital emergency rooms

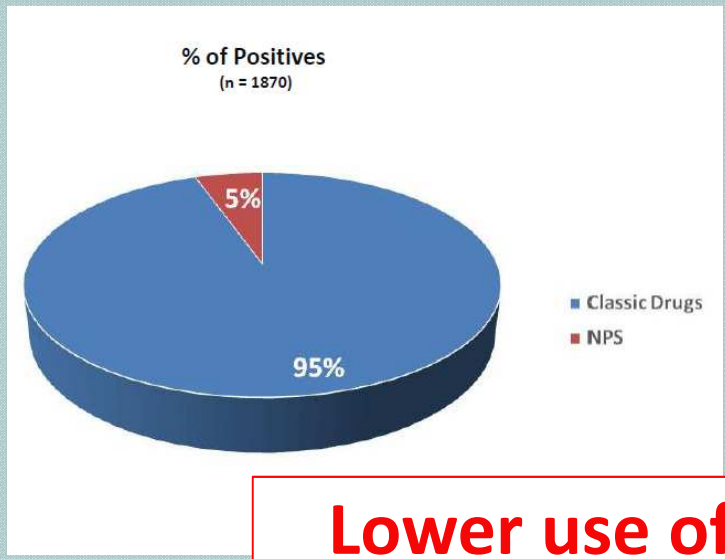
Classical drugs and metabolites

+

>50 NPS and metabolites

50% of positive samples

12 NPS identified



Lower use of NPS