European Monitoring Centre for Drugs and Drug Addiction

Prevalence and patterns of drug use among general population Indicator (GPS)
Annual Expert Meeting 2016

19-20 September 2016 - EMCDDA (Lisbon) - Conference centre

Conceptual Framework for the Integration of Wastewater and Hospital Emergencies Data

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NIVA Norsk institutt for vannforskning

Guy's and St Thomas' NHS NHS Foundation Trust

Funding and Conflicts of Interest

Euro-DEN and Euro-DEN Plus

- 2013-2015:
  - The Euro-DEN project had financial support from the DPIP/ISEC Programme of the European Union
- 2015-6:
  - The Euro-DEN Plus Project has received support from EMCDDA since August 2015 (Contract Code CT.15.EPI.0071.1.0)
- Conceptual Framework for the Integration of Wastewater and Hospital Emergencies Data in Local and City Level Monitoring. (Contract Code: CT.16.SDI.0066.1.0)

Personal

- Expert advisor to the EMCDDA including contributing to risk assessment processes on NPS
- Co-opted member of the UK Advisory Council for the Misuse of Drugs (ACMD)

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Outline of presentation

1. Brief overview of waste water analyses and hospital emergencies data
2. Define conceptual framework to investigate combining these two data sources at a regional / city level
3. Testing of this conceptual framework in two European city settings (London, UK and Oslo, Norway)
4. Suggest future testing and development of this conceptual framework

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Assessing illicit drugs in wastewater

Advances in wastewater-based drug epidemiology

Editor
Sara Castiglioni
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EMCDDA project group
Liesbeth Vandam and Paul Griffiths

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UPDATED 31.5.2016

PERSPECTIVES ON DRUGS

Wastewater analysis and drugs: a European multi-city study

The findings of the largest European project to date in the emerging science of wastewater analysis are taken up in this 'Perspective on drugs'. The project in question analysed wastewater in over 60 European cities and towns (hereinafter referred to as 'cities') to explore the drug-taking habits of those who live in them. The results provide a valuable snapshot of the drug flow through the cities involved, revealing marked geographical variations.

Wastewater analysis is a rapidly developing scientific discipline with the potential for monitoring real-time data on geographical and temporal trends in illicit drug use. Originally used in the 1990s to monitor the environmental impact of liquid household waste, the method has since been used to estimate illicit drug consumption in different cities (Daughton, 2001; Zuccato et al., 2008; van Nuijs et al., 2011). It involves sampling a source of wastewater, such as a sewage influent to a wastewater treatment plant. This allows scientists to estimate the quantity of drugs consumed by a community by measuring the levels of illicit drugs and their metabolites excreted in urine (Zuccato et al., 2008).

Wastewater testing in European cities

In 2010 a Europe-wide network (Sewage analysis CORe group — Europe (SCORE)) was established with the aim of standardising the approaches used for wastewater analysis and coordinating international studies through the establishment of a common protocol of action. The first activity of the SCORE group was a Europe-wide investigation, performed in 2011 in 19 European cities, which allowed the first ever wastewater study of regional differences in illicit drug use in Europe (Thomas et al., 2012). That study also included the first intercalibration exercise for the evaluation of the quality of the analytical data and allowed a comprehensive characterisation of the major uncertainties of the approach (Castiglioni et al., 2014). Following the success of this initial study, comparable studies were undertaken over the following four years, covering up to 21 European countries in 2015. A standard protocol and a common quality control exercise were used in all locations, which made it possible to directly compare illicit drug loads in Europe over a one-week period

Full edition of this article with interactive features available online at

emcdda.europa.eu/topics/pods/waste-water-analysis

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Analytical Data (Wastewater analysis)

- Currently undertaken in >70 cities from 26 EU countries
- Sampling undertaken for one week in March each year
  - Some cities have longitudinal sampling undertaken
  - Analysis for benzoylecgnoine (cocaine), MDMA, amphetamine and methamphetamine
  - Results reported as mg drug used/1,000 people/day
  - Data is available since 2011 from this network
- Additional *ad hoc* analyses for a wider range of illicit drugs and NPS
  - Reliability of additional analyses more problematic

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European Drug Report 2016
31 May — EU drugs agency, Lisbon

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Wastewater analysis and drugs — a European multi-city study

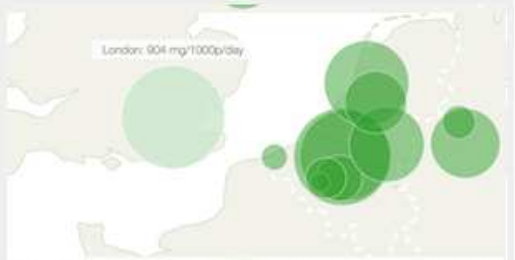
Intro | 1. Analysis | 2. Interactive | 3. Terms and definitions | 4. Methods and ethics | Find out more

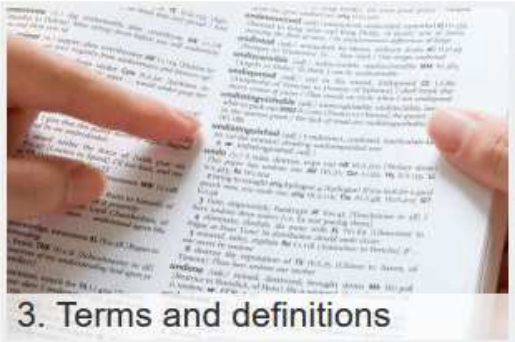
Introduction

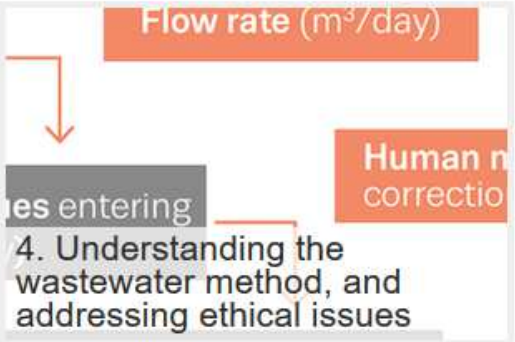
Last update: 31.05.2016

The findings of the largest European project to date in the emerging science of wastewater analysis are taken up in this 'Perspective on drugs'. The project in question analysed wastewater in over 60 European cities and towns (hereinafter referred to as 'cities') to explore the drug-taking habits of those who live in them. The results provide a valuable snapshot of the drug flow through the cities involved, revealing marked geographical variations*.

Part of the Perspectives on drugs *(PODs) series, launched as part of the European Drug Report package, these designed-for-the-web interactive analyses provide deeper insights into a selection of important issues.*







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*In total, 67 cities in 27 countries worldwide participated in the 2015 SCORE wastewater monitoring campaign. For the purpose of this analysis data was analysed from 44 cities in 18 countries (EU and Norway). Additional data from other countries and cities can be found in the POD interactive element.

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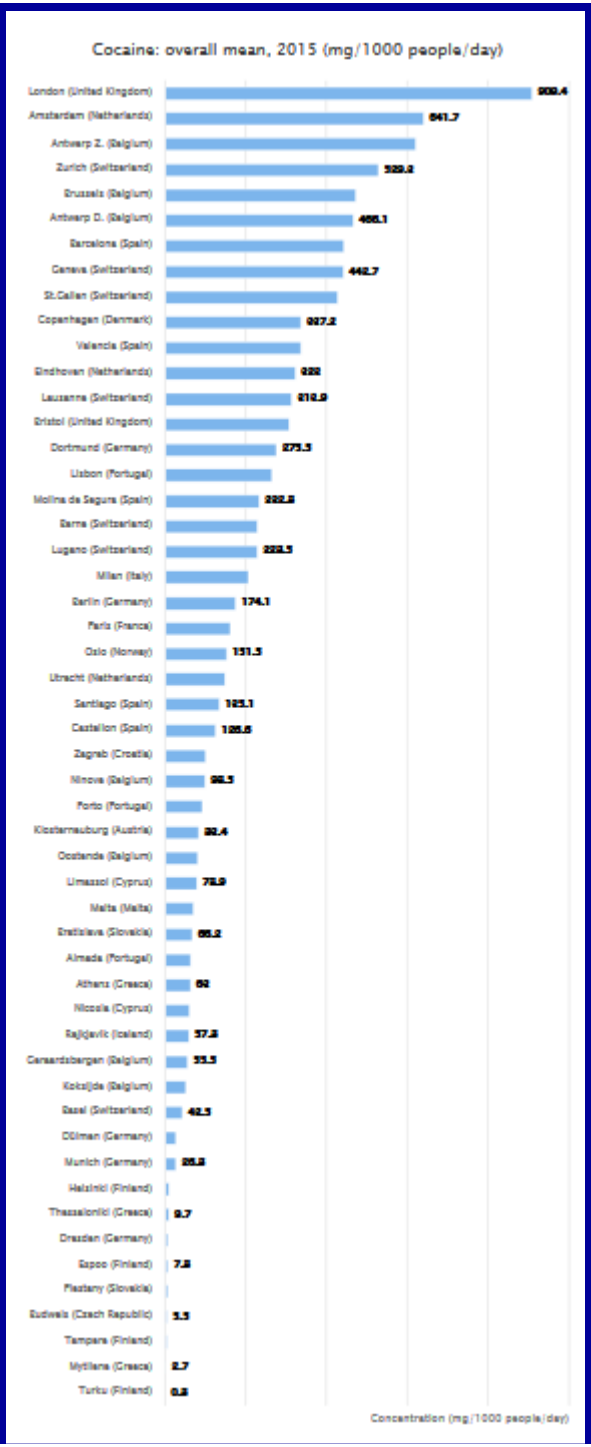

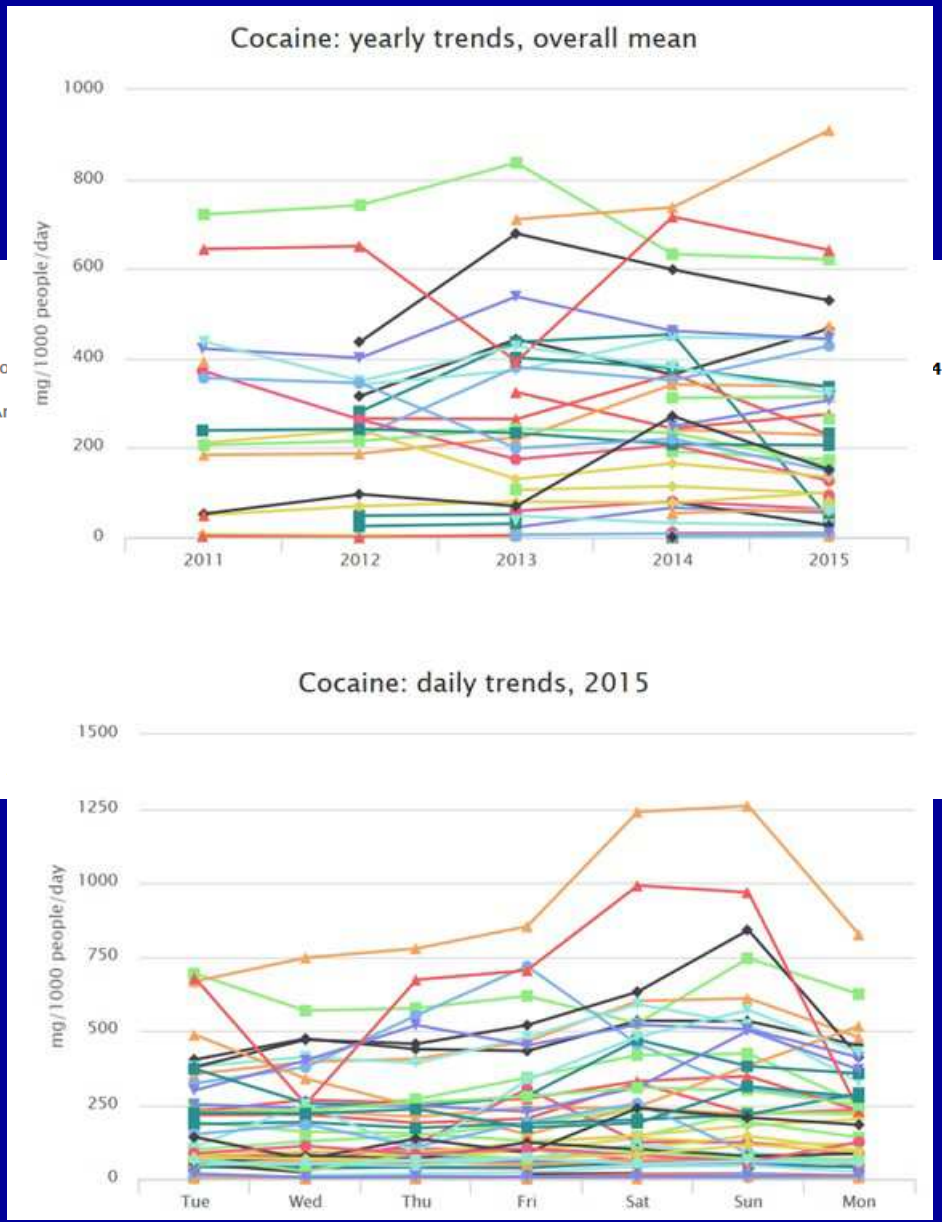

Hospital Emergencies Data

Clinical Toxicology (2014), **52**, 1005–1012

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informa
healthcare

RESEARCH ARTICLE

Current European data collection on emergency department presentations with acute recreational drug toxicity: Gaps and national variations

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- Confirmed limited systematic data collection in Europe on acute drug toxicity presentations to the ED
  - Data coding systems not sensitive enough to detect drugs
  - Hospital emergencies coded under disease rather than drug

COMMENTARY

Clinical Toxicology (2014), **52**, 239–241

The European Drug Emergencies Network (Euro-DEN)

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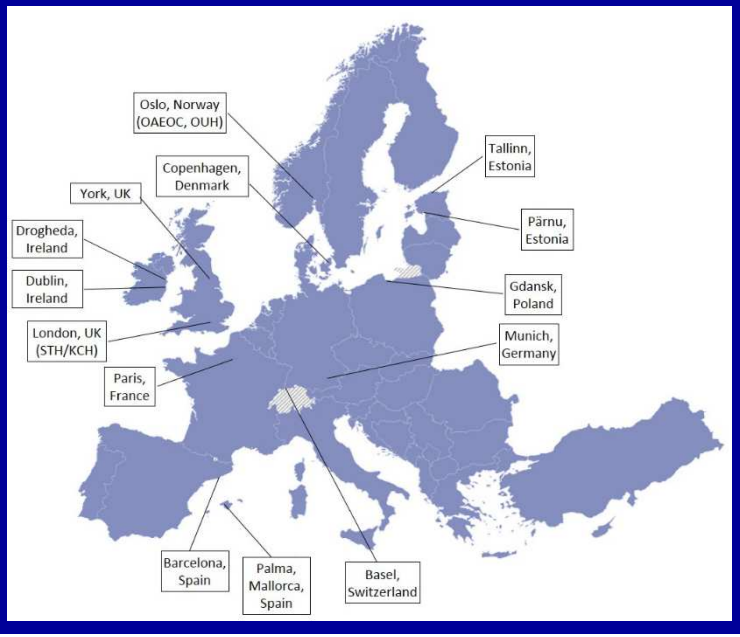
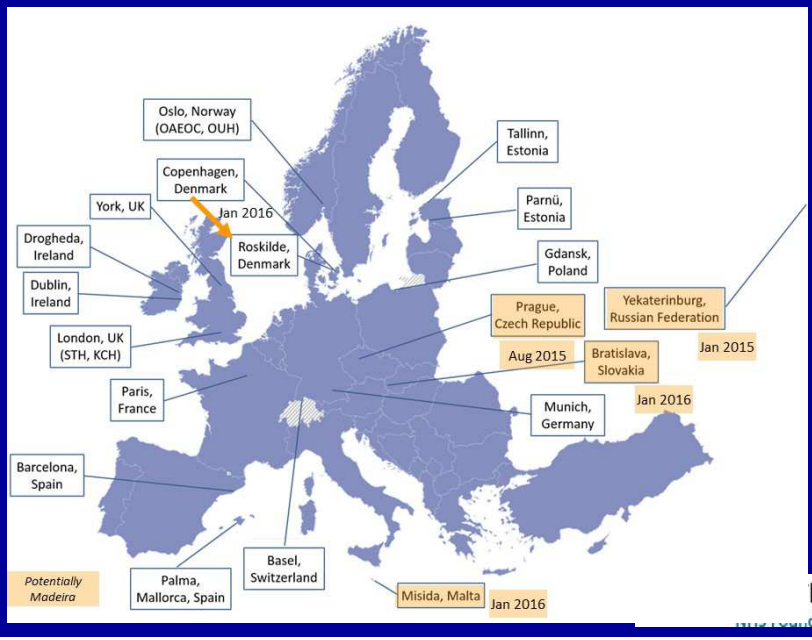
- Euro-DEN project set up in 2014
- Initial network of 16 sentinel Emergency Departments across 10 European / neighboring countries
- Collection of standardized data
  - Illicit drug(s) / NPS used, clinical features and outcomes
  - Drug(s) used based on self-report and/or clinical interpretation





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RAPID COMMUNICATION

Hospital emergency presentations and acute drug toxicity in Europe

Update from the Euro-DEN Plus research group and the EMCDDA

August 2016

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Conceptual Framework

- Compare hospital emergencies in each city for each individual drug to the relative detection of that drug in wastewater analysis in year 1 (2014) and year 2 (2015) in the *week and month (March)* that wastewater analyses was undertaken
- Compare trends (if present) between year 1 (2014) and year 2 (2015) for the detection of the individual drug(s) in wastewater and hospital emergencies presentations
- Compare wastewater findings and hospital emergency data with freely available data on prevalence of use
- Identify benefits and limitations of the proposed conceptual framework
- Propose future development of the conceptual framework

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Data Sources Used in Pilot Test

- Hospital emergencies data (Euro-DEN/Euro-DEN Plus)
  - Complete data for all centres for 2014 and 2015
  - London centres: St Thomas' Hospital, King's College Hospital
  - Oslo centres: Ullevål Hospital, Oslo Accident and Emergency Outpatient Clinic
- Wastewater analyses
  - Incomplete data set for drugs routinely screened for
  - London, UK: benzoylecgnoine/MDMA only in 2014 and 2015
  - Oslo, Norway: benzoylecgnoine, amphetamine, MDMA and methamphetamine in 2015 and benzoylecgnoine, MDMA and methamphetamine in 2014.

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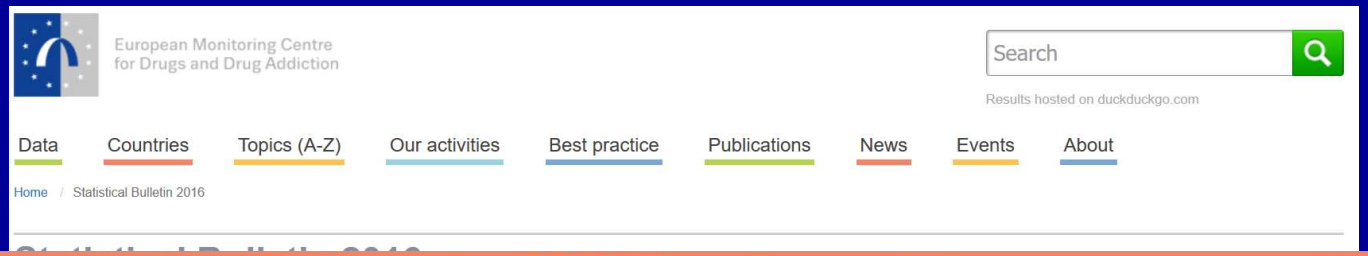
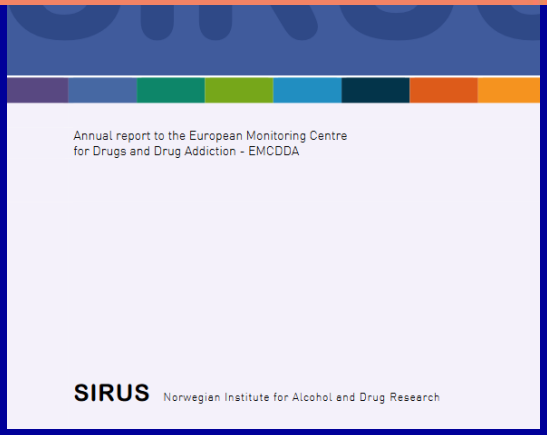
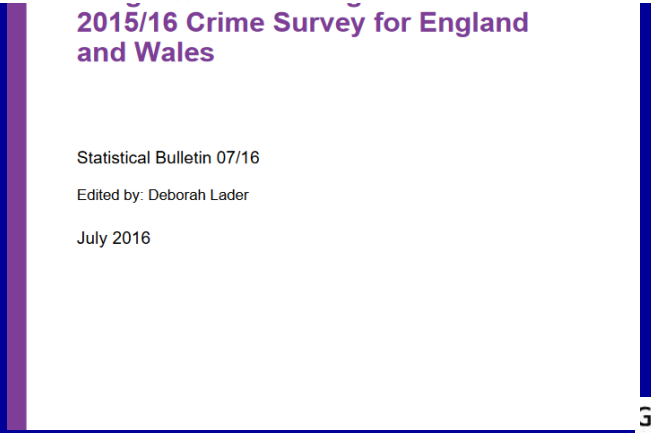
Prevalence of Illicit Drug / NPS Use







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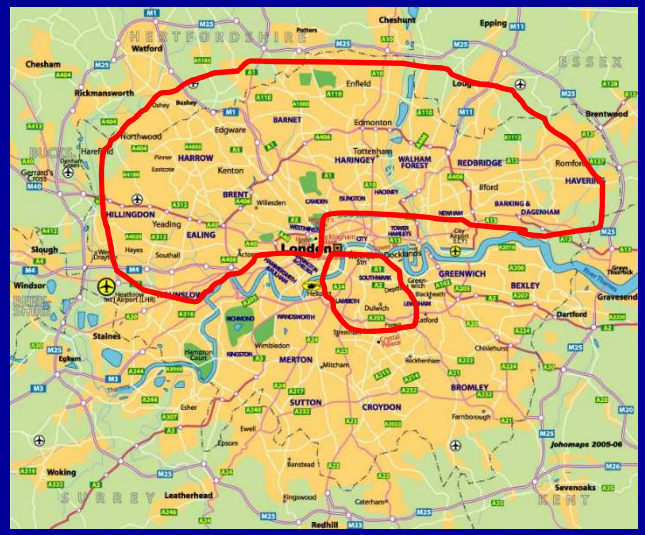
Testing of framework

- Initial testing suggested:
  - No linkage between hospital emergencies in Oslo or London and BE load in waste water
  - Possible linkage between hospital emergencies in both Oslo and London and MDMA in waste water
  - Insufficient data to enable comparison for methamphetamine and amphetamine
  - Additionally apparent correlation between hospital emergencies, load in waste water and Crime Survey England and Wales last month use data for MDMA

Limitations identified in testing conceptual framework

- Incomplete data sets due to analytical quality issues
  - Narrow range of illicit drugs consistently screened for
- Different time periods for data collection
  - Particularly population and sub-population level surveys
- Hospital emergencies data from hospital(s) not within the wastewater catchment area



Conceptual framework testing extension

- Further testing of conceptual framework in cities with existing Hospital Emergencies and Wastewater data:

Development of Conceptual Framework

- Co-ordinated time-comparable collection periods for wastewater, hospital emergencies data and prevalence of use data
- Investigation of collection of wastewater in cities where Euro-DEN plus data is available that have both a single hospital serving the population and a single wastewater treatment plant covering the catchment area
- Consideration of increasing the breadth of wastewater analytical screening undertaken to include additional established illicit drugs and NPS
- Integration of other datasets e.g. pooled urinals, oral fluid analysis, subpopulation survey data

Conclusions

- Integration of Wastewater and Hospital Emergencies Data with other complimentary datasets
  - Significant potential to improve our understanding of the implications of drug use in Europe
  - Comparisons between countries/cities and analysis of trends over time
- Further development needs to consider geographical matching of datasets, integration with additional datasets and targeting of drug(s) / NPS of interest

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