Wastewater analysis and drugs: a European multi-city study

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• But what is drug monitoring? – why bother?
• to help understand the nature and extent of drug problems and better respond to them

• What are ‘established’ monitoring tools?
• prevalence surveys & studies, treatment data, DRD, DRID, seizures, DLOs etc

• And why might we need new, complementing ones?
Drug trends 1995–2020: more than two decades of change

- Heroin use, injection and HIV decline
- Nationally differentiated stimulants markets develop & stimulants become more important
- Poly drug use and consumers more permissive in their drug choices…diffusion and new developments occur more rapidly
- NPS emerge
- Cannabis market changes
- Unexpected events, eg COVID-19

Fit for purpose? - monitoring challenges in 2020

• Big gaps in our knowledge...
• Reliability of surveys, response rates, users unaware of what they are using
• Rapidly evolving situation...
• Increasingly globalised drug market
• Growth of online and virtual drug markets
• Constant appearance of new substances
Drug use in Europe – how to measure Shopping menu

Core: National household surveys
- Face-to-face
- National prevalence data
- Mainly ‘recreational’ use
  - Comparability
  - EMQ

- School surveys
  - Indirect methods (for those who use in a more ‘problematic’ way)
  - Targeted surveys
Wastewater analysis – how does it work?
WBE — how does it work?

• WBE in the general population
  Results from a European wide comparison study (SCORE)

• WBE – specific applications
  Application in schools, prisons, the work place, ...
  Pooled urine analysis
  Law enforcement applications
Strengths and limitations

**Strengths**
- Not subject to response and non-response bias
- Identification of the true spectrum of drugs being used
- Timely information
- Information on geographical and temporal trends
- Relatively inexpensive

**Limitations**
- No information on prevalence of use
- No information on patterns of use (routes of administration, frequency of use, etc)
- City data versus national data

Wide range of uncertainties: sampling of wastewater, different back-calculation methods, behaviour of biomarkers, etc.

Ethical issues?
Publicity!
Cocaine findings

Cocaine residues in wastewater in selected European cities: trends and most recent data

mg/1 000 population/day


Bristol Amsterdam Barcelona Paris Lisbon

Brussels Milan Berlin Zagreb

NB: Mean daily amounts of benzoylcgonine in milligrams per 1 000 population. Sampling was carried out in selected European cities over a week in each year from 2011 to 2018.
Source: Sewage Analysis Core Group Europe (SCORE).
Methamphetamine findings

**Methamphetamine residues in wastewater in selected European cities: trends and most recent data**

**Graph:**
- **Y-axis:** mg/1000 population/day
- **X-axis:** Year (2011-2017)
- **City lines:**
  - Orange: Budweis
  - Green: Oslo
  - Yellow: Barcelona
  - Red: Milan
  - Blue: Brussels
  - Greenish: Amsterdam

**Map:**
- **Legend:**
  - 200 mg/1000 population/day
  - 150 mg/1000 population/day
  - 100 mg/1000 population/day
  - 50 mg/1000 population/day
  - 25 mg/1000 population/day
  - 10 mg/1000 population/day

**NB:** Mean daily amounts of methamphetamine in milligrams per 1000 population. Sampling was carried out in selected European cities over a week in 2016. Source: Sewage Analysis Core Group Europe (SCORE).
Findings – temporal variation


Cocaine: daily trends, 2016
<table>
<thead>
<tr>
<th>Substance</th>
<th>Pooled urine (µg/L)</th>
<th>Oral fluid (%)</th>
<th>Self-reported &lt; 48h (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphetamine</td>
<td>4.9</td>
<td>n.d.</td>
<td>-</td>
</tr>
<tr>
<td>Methamphetamine</td>
<td>3.8</td>
<td>n.d.</td>
<td>-</td>
</tr>
<tr>
<td>Cocaine/Benzoylecgonine</td>
<td>46.2 / 13.4</td>
<td>4.0 / 1.8</td>
<td>1.3</td>
</tr>
<tr>
<td>MDMA</td>
<td>28.6</td>
<td>4.0</td>
<td>1.3</td>
</tr>
<tr>
<td>THC (cannabis) / THC-COOH</td>
<td>n.a. / 1.3</td>
<td>8.8 / n.a.</td>
<td>5.8</td>
</tr>
<tr>
<td>Ketamine</td>
<td>0.1</td>
<td>n.d.</td>
<td>-</td>
</tr>
<tr>
<td>Methcathinone</td>
<td>0.3</td>
<td>n.d.</td>
<td>-</td>
</tr>
<tr>
<td>4-chloro-α-PPP</td>
<td>+</td>
<td>n.d.</td>
<td>-</td>
</tr>
<tr>
<td>2-Phenethylamine</td>
<td>+</td>
<td>n.d.</td>
<td>-</td>
</tr>
<tr>
<td>α-PVP</td>
<td>n.d.</td>
<td>0.4</td>
<td>-</td>
</tr>
<tr>
<td>2C-B</td>
<td>n.a.</td>
<td>0.9</td>
<td>-</td>
</tr>
</tbody>
</table>
Frequently-asked Questions!

• Is WBE representative for the whole country? The whole year?

• What does an increase for one city mean?
  • More people using
  • Drug more pure
  • Less people using more intensively

• Are we sure it is not dumping and only ‘use’?

• Will it replace the ‘established’ methods measuring drug use? NO!
Frequently-asked Questions!

- How much does it cost?
  - depends on the size/design of the study
  
  - largest cost associated the time taken to establish contact with your local sewage treatment plant and laboratory
  
  - Costs of analysis vary from country to country, but a fair estimate is approximately 100-200 Euro per sample
Drug monitoring in Europe

Illustration: Hans Møller, mollers.dk
Thank you

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