BACKGROUND AND AIMS

- "The drug market size refers to the estimated value and quantity of specific illicit drugs that are available to, or consumed by, a given population during a specified period"1
- Useful indicator when combined with other metrics2,3
  - Relative "importance" of different drugs
  - Prioritise interventions, aid policy decisions
    > and later evaluate impact of interventions/new policies
  - Provides comparative measure to law enforcement activities
    > seizure of product (e.g., is 1 kg cocaine significant?)
    > dismantling of drug network
  - Provides revenue estimation of organised crime networks
- Aim: assess the use of wastewater-based epidemiology (WBE) as a complementary approach to traditional techniques of estimating the illicit drug market size

(TRADITIONAL) ESTIMATION TECHNIQUES

Consumed = Drug Produced – Seized – Loss * Purity
Market Value = Consumed * Price

- Starts from quantity of drug produced (e.g., geoimaging)
  > little evidence-based
  > many uncertainties (e.g., yield, fertiliser used)

Consumed = Number of Users * Frequency of Use * Average Used Each Time
Market Value = Consumed * Price

- Starts from drug consumers (e.g., surveys)
  > uncertainties: misreporting, non-response, hidden population, ...

More similar to demand-based approach
≈ consumption; at least fraction that ends up in the sewer

• high spatial resolution compared to other techniques
• other data sources are needed for purity and price
• measuring retail market size of cities (no extrapolation to country level)

WASTEWATER-BASED EPIDEMIOLOGY

- Influent wastewater contains a wealth of information about the population connected to a wastewater treatment plant (WWTP)
  - After humans have been exposed to xenobiotics, metabolic excretion products (biomarkers) are released, transported, and pooled in the sewer system
  - Daily, 24-h composite, influent wastewater samples are analysed for these biomarkers, and measured concentrations are back-calculated to mass loads

BACK-CALCULATION

Pure drug consumed = concentration x wastewater volume x excretion

EXTRAPOLATE TO ANNUAL LEVEL
Multiply with price / dose
Divide by drug purity

LEVEL 1
Amount of used pure drug
kg/year

LEVEL 2
Amount of used retail drug
(meth)amph, cocaine: kg/year MDMA: million tablets/year

LEVEL 3
Estimated market size
Euro/year

MATERIALS AND METHODS

- Yearly annual baseline estimates from influent wastewater obtained through score network (score-network.eu)
- 137 cities in Europe analysed

Analysed period: 2015-2021

<table>
<thead>
<tr>
<th>Drug Pricing and purity data</th>
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<td>Statistical bulletin 2022 published by EMCDDA, data until 2020</td>
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RESULTS: COCAINE IN 2020

DISCUSSION AND CONCLUSIONS

L1: calculation pure drug

- "Normal" week to assess baseline consumption ⇒ likely underestimation
  - E.g., drug tourism, seasonal drug consumption, COVID-19
  - Overlapping metabolisation pathways (methamphetamine ⇒ amphetamine)
  - Influence of licit drug use (e.g., amphetamine for ADHD)

L2: calculation retail drug

- Drug purity ⇒ based on limited number of seizures

L3: calculation market share

- Drug price ⇒ based on limited number of studies, or simply not available

Challenges to improving spatio-temporal comparison

- Drug purity and pricing at country level
- Different priorities: e.g., law enforcement focussed on different tasks
- Legislation: e.g., tolerated drug use vs "crackdown"

Recording of data: e.g., only if exceeded certain amount seized

Conclusion

- Need for more, and more representative, price and purity data
- WBE has potential as complementary approach to traditional, demand-based techniques

References

2. L2: calculation retail drug
3. WBE has potential as complementary approach to traditional, demand-based techniques