Problem Drug Use Estimation
European Monitoring Centre for Drugs and Drug Addiction (EMCDDA)

- Decentralised EU agency.
- Formally established in 1993.
- Based in Lisbon, Portugal (operating since 1995).
- Provides policy-makers, practitioners, professionals, scientists, researchers and other interested groups with the most relevant, accurate and up-to-date facts about the drug phenomenon in Europe.
- EU Member States, Norway and the EU candidate countries.
What EMCDDA does?

Provides the Community and EU Member States with:

‘factual, objective, reliable and comparable information at European level concerning drugs and drug addiction and their consequences’.

Main tasks:

• Collecting and analysing existing data.
• Improving data-comparison methods.
• Disseminating data.
• Cooperating with European and international bodies / organisations and with non-EU countries.
The PDU Key Indicator

The purpose of the PDU key indicator is to obtain reliable and comparable estimates of the prevalence of problem drug use (defined as injecting drug use or long-duration / regular use of opiates, cocaine and / or amphetamines) and injecting drug use at the local and national level. Information on the incidence of problem drug use or injecting drug use is also part of this key indicator.

These estimates are important for making comparison across (and within) member states, to help inform understanding of other indicators and to assist in the planning and provision of responses to problem drug use.
PDU - Objectives

- Epidemiological picture of PDU in the EU.
- Trends over time.

Also supports:
- Acting as a denominator to other key indicators, such as number of drug-related deaths or treatment demand.
Use of estimates

The estimates are important nationally:

• They allow trends in the prevalence of problem drug use to be explored.

• They allow comparisons within a country – if appropriate local estimates are available.

• At EU level they also allow comparisons between countries.
Case Definitions

The EMCDDA has an agreed case definition for problem drug use that encompasses frequent or high intensity use of opiates (such as heroin) or stimulants (such as cocaine or amphetamines). Drug injecting is also included in this case definition. There may be other patterns of drug use that may be considered problematic by member states, but the agreed case definition is important for making cross national comparisons.
Prevalence Estimation Methods

• Problem drug use is largely a hidden activity
• Information can be obtained from a sample of the population
• This information can be extrapolated to provide information on the entire population
General Population Surveys

- Not appropriate for estimating PDU as
- The sample may not be representative (e.g. prisoners, homeless, other hard to reach groups)
- Respondents may be reluctant to disclose problem drug use in a survey
- Low prevalence of problem drug use can result in low numbers of respondents of the survey reporting drug use leading to wide confidence intervals
Indirect Methods

• Instead of population surveys, a range of methods, known as indirect methods can be used. These include
  • Multiplier methods
  • Capture-recapture methods
  • Multiple indicator methods
Multiplier Methods

- Information can be obtained from a sample of drug users
  - Contact with treatment services
  - Mortality
- This information can be extrapolated to provide information on all drug users
Mortality Multiplier

- **Benchmark**
  - Number of drug-related deaths
    - Published mortality statistics
- **Multiplier**
  - Mortality rate
    - Anecdotal evidence (e.g. between 1% mortality per annum)
    - Derived from specific studies
Mortality Multiplier Example

- 1,505 problem drug users died in England (UK)
- A cohort study estimate the annual mortality rate to be 0.746%
- So for every one death there are roughly 134 drug users (100 / 0.746)

Therefore

- = 201,670 drug users in England (UK)
Multiplier Methods Assumptions

• The case definition of the benchmark figure must be the same as the multiplier rate
• For mortality multiplier
  • All problem drug users must have the same mortality risk
    • Drug injectors, young / old drug users
  • No under-reporting in the number of deaths of problem drug users
• More information in the EMCDDA Methodological Guidelines
Two sample capture-recapture method

• Simple idea:
  • Only a certain proportion of drug users are in contact with treatment services
  • Examine the overlap between those in treatment and a second sample (e.g. Police)
  • Find the proportion in treatment
  • Thus estimate the total number of drug users

• Method originally devised for estimating the size of animal populations
Two-sample capture-recapture example (Number of fish in a lake)

- Unknown number of fish in a lake
Two-sample capture-recapture example (Number of fish in a lake)

- Unknown number of fish in a lake
- Catch a sample and mark them
Two-sample capture-recapture example (Number of fish in a lake)

- Unknown number of fish in a lake
- Catch a sample and mark them
- Let them loose
Two-sample capture-recapture example (Number of fish in a lake)

- Unknown number of fish in a lake
- Catch a sample and mark them
- Let them loose
- Recapture a sample and look for marks
Two-sample capture-recapture example (Number of fish in a lake)

\[ n_1 = \text{number in first sample} \quad 15 \]
\[ n_2 = \text{number in second sample} \quad 10 \]
\[ n_{12} = \text{number in both samples} \quad 5 \]
\[ N = \text{total population size} \]

assume that
\[ \frac{n_1}{N} = \frac{n_{12}}{n_2} \quad \text{therefore} \quad \frac{15}{N} = \frac{5}{10} \]

or
\[ N = \frac{(10 \times 15)}{5} = 30 \]
Two-sample capture-recapture example (Problem Drug Use)

- Identify two sources, for example
  - Treatment data
  - Police data
- Find overlap
- Estimate population size
Two-sample capture-recapture example (Problem Drug Use)

\[ N = \frac{695 \times 76}{21} = 2515 \]
Two-sample capture-recapture method
Assumptions

• Samples are independent, for example
  • Police do not stand outside agency arresting people
  • Participation in treatment does not reduce the need to commit crimes

• Samples are often not independent
• Can use a third samples to correct for lack of independence or account for any relationships
Three-sample capture-recapture method

Assumptions

• Statistical analysis
  • Computer package (e.g. SPSS, STATA, R)
  • Log-linear models
  • Explain relationship between sources
• Estimate the size of the hidden population
• Estimate the total population size
Three-sample capture-recapture method
Overlap between data sources

Source 1  Source 2  Source 3
\[\begin{array}{ccc}
d & c & g \\
b & a & e \\
f & & x \\
\end{array}\]

Hidden Population
### Three-sample capture-recapture method

**Contingency Table**

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<table>
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# Overlap between data sources

Data table (for analysis in statistical package)

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<th>Count</th>
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</table>
Capture-recapture Analysis

- The capture-recapture analysis is a specific type of regression analysis known as log-linear analysis. It shares some similarities to the more widely used linear regression, where an independent variable can be described in terms of one or more dependent variable
Capture-recapture Analysis

There are four key elements of regression analysis that are relevant to CRC

- A statistical model is fitted to the overlap data
- A measure of how well this model fits the data is obtained (Goodness of fit)
- A predicted value for another set of values for the independent variables can be obtained (for CRC this predicted value will be the size of the hidden population)
- A 95% confidence interval can be obtained
Capture-recapture Analysis

- Different models (describing different relationships between data sources) can be fitted to the overlap data
- The best model can be found
  - Based on how well it fits the overlap data
- This best model can be used to estimate the size of the hidden population (and therefore total population)
- More information in the EMCDDA Methodological Guidelines
Capture-recapture key assumptions

- Population is closed
- Perfect matching
- Data sources should be representative
- Everyone has the same chance of appearing in any individual data source
- Presence in one source does not influence presence in another
  - Can be relaxed with log-linear models