Development of Methods to Estimate Incidence of Drug Use in Spain

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1 Introduction

   Epidemiology

   Sources of Information
   - General Population Surveys
   - Administrative Reports

   Types of Incidence

2 Methods used with Spanish data

   Composite Retrospective Estimator
   Poisson Regression
   Reporting Delay Adjustment method
   Parametrical Approach to RDA method
   Multi-state Model

3 Summary of Incidence estimates
1 Introduction

Epidemiology

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3 Summary of Incidence estimates
Epidemiology

The spread of drug use in the population is considered similar to the spread of infectious diseases. So, assuming its epidemic nature, concepts of incidence and prevalence are operationally valuable\(^1\).

However, definition of case is unclear: drug user who develops a health and/or social problem (i.e. problematic user)? An occasional user who is not problematic can spread to other susceptible persons.

Illicit drug use entails consumers are hidden in the population, so standard calculations seem not appropriate.

\(^1\)LT Wu et al. Use of Incidence and Prevalence in the Substance Use Literature: A Review. Substance Abuse and Mental Health Services Administration, Office of Applied Studies. 2003 (Rockville).
Sources of Information

- General Population Surveys

- Administrative Reports: available when a consumer establish contact with any administrative center (emergency, treatment, police, prison, death registration, . . . ).
General Population Surveys (GPS)

Strength:
- We can obtain epidemiological measures, population based, of drug use (lifetime, 12 month, 30 days,...).

Difficulties:
- Illicit use $\Rightarrow$ Low response rate
- GPS are usually home-based + marginal life style or institutionalized condition difficult to locate $\Rightarrow$ Lower probability to reach drug users.
- Cost-effectiveness is doubtful.

Substances:
- Less problematic substances like *cannabis* may be more adequate than, for example, heroin.
Administrative Reports

Strength:
- We can obtain epidemiological measures of problematic users.

Difficulties:
- Quality of reports is difficult to assess.
- Coverage.
- May be expensive as emergency room data.

Substances:
- Not all drug users have similar chances to be detected. For example, **heroin** users are more given to be problematic.
Types of Incidence

Incidence provides an indication of trends in the spread of drug use to understand whether the phenomenon is growing (epidemic phase), falling or stable (endemic phase).

Possible types:

- first ever drug use
- first regular use
- first entry in a period of drug use even not new (relapse)

First ever drug use can be:

- easier to remember by the users and,
- suitable measure of the tendency of new individuals to become involved in the problem.

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Aim of this presentation

Present an overview of the methods we are working with Spanish data.
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Epidemiology

Sources of Information
  General Population Surveys
  Administrative Reports

Types of Incidence

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Spanish Sources and Methods

Home-based GPS on alcohol and drug use

- Substances: **Cannabis** and **cocaine** *(lifetime use)*
- Method: Composite retrospective estimator

Treatment registers of detoxification

- Substances: **Heroin** and **cocaine** *(problematic use)*
- Methods:
  - Poisson regression
  - Reporting Delay Adjustment (RDA) method
  - Parametric RDA
  - Multi-state model
Composite retrospective estimator

Paper under review\(^4\).

Background:

- *Gfroerer et al. (1992)*\(^5\) developed this method to estimate yearly incidence rates for several substances using periodical surveys from United States.

Data:

- Eight biennial GPS of drug use from Spain from 1995 to 2009 with similar sample designs.

Method is just a proper *weighted mean* of the incidence figures of each survey.

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Figure: Estimated incidence curves on cannabis and cocaine consumption.
Strength:

- Long series of periodic GPS provide composite estimates which are more robust and have a wider coverage of retrospective ages of drug use onset.

Limitations:

- Underestimation by biases due to memory errors (forward telescoping), differential mortality and fear to disclosure.
- Drug use initiation does not imply a subsequent habitual use. Nevertheless, it can provide the path to problematic use.
Poisson Regression

Published paper\(^6\).

Method included in the EMCDDA’s *Guidelines for Estimating the Incidence of Problem Drug Use*.

Data:

- New admissions to first ever treatment with the required information about *first drug use*.
- Observed period of first treatment admissions were from 1991 to 2006.

Intro
Epidemiology
Sources
General Population Surveys
Administrative Reports
Types
Methods for Spain
Composite RE Poisson
RDA
Param RDA
M-S
Summary
Intro
Epidemiology
Sources
General Population Surveys
Administrative Reports
Types
Methods for Spain
Composite RE
Poisson
RDA
Param RDA
M-S
Summary

1st Use 1991 2006

1st Treatment 1991 2006

Left Truncation
Right Truncation
Incomplete table of frequencies:

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<th>Latency Period</th>
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</table>

Left Truncation: admitted to treatment before 1991

admitted to treatment from 1991 to 2006

Right Truncation: still not admitted to treatment by 2006

All cells are estimated.
Estimated incidence of heroin and cocaine use in Spain

Heroin use incidence (Spain)

Cocaine use incidence (Spain)
Limitations:

- Relative Incidence: estimates are conditioned to drug users who have ever been admitted to treatment in a limited period of time.
- As Poisson regression assumes independence between rows and columns, we have to assume treatment availability was stable throughout all years.
Reporting Delay Adjustment

Published paper\textsuperscript{7}.

Method included in the EMCDDA’s *Guidelines for Estimating the Incidence of Problem Drug Use*.

First appearance was from *Hunt (1976)*\textsuperscript{8} and later from *Hickman et al. (2001)*\textsuperscript{9}.

This method is equivalent to *Poisson regression* solving only the problem of *right truncation*.

Easier to implement.

Limitations are the same as *Poisson regression*.

\textsuperscript{7} Sanchez-Niubo A, Domingo-Salvany A, Gomez G., Brugal MT, Scalia-Tomba G. Two methods to analyze trends in the incidence of heroin and cocaine use in Barcelona. Gac Sanit 2007; 21: 397-403

\textsuperscript{8} LG Hunt. Recent spread of heroin use in the United States. AJPH Supplement, 64, 1974.

Estimated incidence of heroin and cocaine use in Spain.

Heroin use incidence (Spain)

Cocaine use incidence (Spain)
Parametric approach to the Reporting Delay Adjustment method

Study in progress\textsuperscript{10}.

New approach based on RDA method aiming to check the assumption of constancy over time of the lag-time distribution.

We consider that lag-time follows a truncated Weibull distribution $F_i(x)$ and fit one such distribution to each cohort of year of first drug use $i$.

This approach allows estimation of parameters for each cohort and thus changes in, say, average lag-time can be monitored.

\textsuperscript{10}This work is part of EU project: New methodological tools for policy and programme evaluation.
Medians and 95% CI of estimated non-truncated Weibull LP distributions

Years of First Heroin Use vs Years of LP

Work in progress!
Paper under review\textsuperscript{11}.

The method is based on the drug user’s trajectory. It incorporates drug users that do not show in treatment because death or abstinence of drug use (state 3):

\begin{align*}
\text{state 1} & \quad \text{heroin use} \\
\text{state 2} & \quad \text{first treatment ever} \\
\text{state 3} & \quad \text{left heroin use}
\end{align*}

Aim:

• Estimate heroin use incidence in Spain.

Data:

• Treatment registers: first treatment admissions from 1991 to 2006.
• Mortality rates: we used aggregated data from mortality studies in Catalonia.
• Cessation rates: we used lasting cessation rates from thorough review of long-term cohort studies\textsuperscript{12}.

Method:

• Back-calculation type approach.

Estimated incidence rates of heroin use per 1,000 inhabitants aged 10-44, in Spain.
Strengths:

- Estimates are wider in scope since by including mortality and cessation it is possible to account for almost all problematic heroin users after drug use onset.
- It avoids the assumption of stability of the treatment availability.

Limitations:

- The transition from state 1 to state 2 ($p_t$) is independent of the time starting drug use.
- Difficult to obtain accurate information on mortality and cessation $\Rightarrow$ too many assumptions.
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Estimated Incidence Rates – HEROIN

Calendar years

Poisson Regression
Multi-State model
RDA

Summary
Estimated Incidence Rates – COCAINE

Calendar years


Estimated Incidence Rates − COCAINE

0
1
2
3
4
5
6

Poisson Regression
GPS
RDA

Methods for Spain
Composite RE
Poisson
RDA
Param RDA
M-S

Summary
Thanks!!

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