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# Development of Methods to Estimate Incidence of Drug Use in Spain

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# Epidemiology

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## Summary

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<sup>1</sup> .

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.

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<sup>1</sup>(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).

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## Summary

- 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)

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Summary

## 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

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## 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)<sup>2</sup>.

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<sup>3</sup>.

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<sup>2</sup> L Ravà et al. Incidence indicators or policy making: models, estimation and implications. Bulletin on Narcotics LIII, Nos. 1 and 2. United Nations. New York. 2001. 135-155

<sup>3</sup> LG Hunt and CD Chambers. The Heroin Epidemics: A Study of Heroin Use in the United States, 1965-75. New York. Spectrum. 1976



# Aim of this presentation

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

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## 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

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Paper under review<sup>4</sup>.

Background:

- *Gfroerer et al.(1992)*<sup>5</sup> 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.

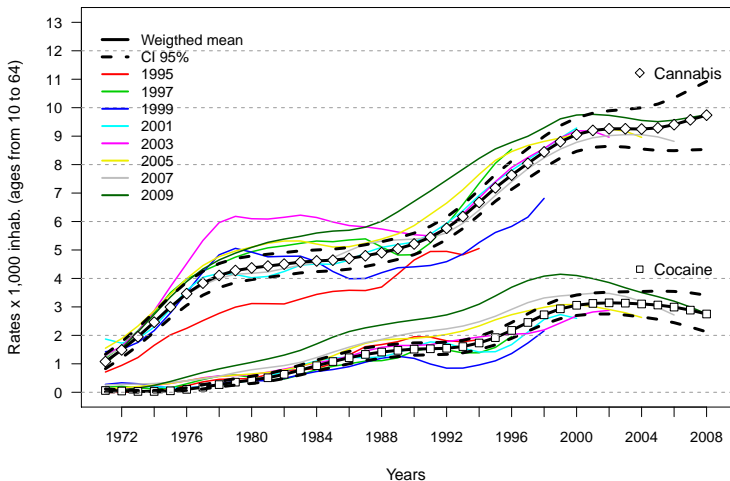
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<sup>4</sup> Sánchez-Niubò, Sordo L, Fortiana J, Brugal MT, Domingo-Salvany A. Incidence Trends of Cannabis and Cocaine Use from Periodic Spanish GPS's: effect of standardising results by age structure.

<sup>5</sup> Gfroerer, J. and M. Brodsky. "The incidence of illicit drug use in the United States, 1962-1989." *British Journal of Addiction* 87 (1992): 1345-51.

Figure: Estimated incidence curves on cannabis and cocaine consumption.

### Standardized Rates of Incidence



## 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

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## Summary

Published paper<sup>6</sup>.

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.

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<sup>6</sup> Sanchez-Niubo A, Fortiana J, Barrio G, Suelves JM, Correa JF, Domingo-Salvany A. Problematic heroin use incidence trends in Spain. *Addiction* 2009; 104: 248-255.

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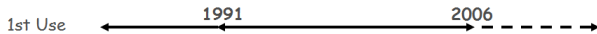
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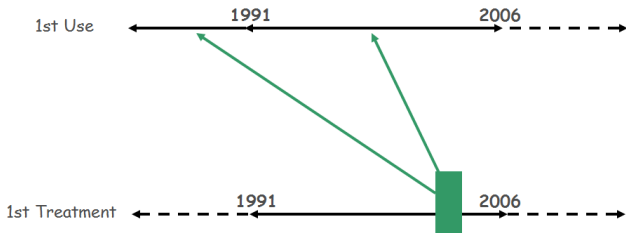
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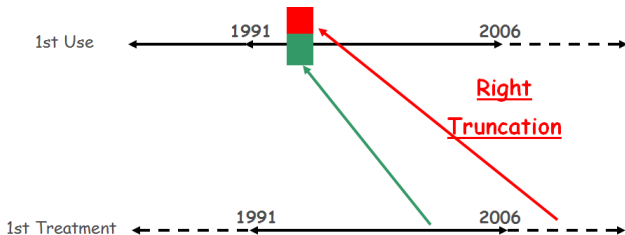
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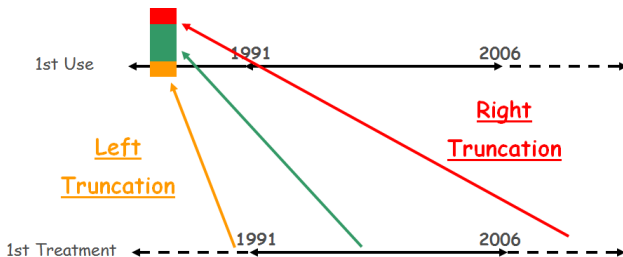
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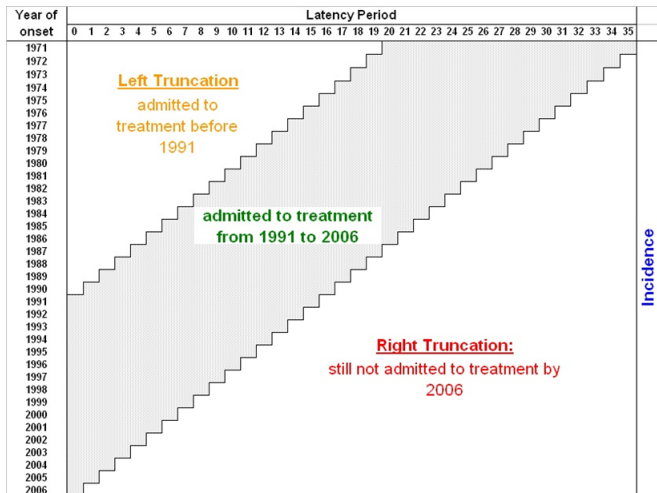
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# Incomplete table of frequencies:



All cells are estimated.

# Estimated incidence of heroin and cocaine use in Spain

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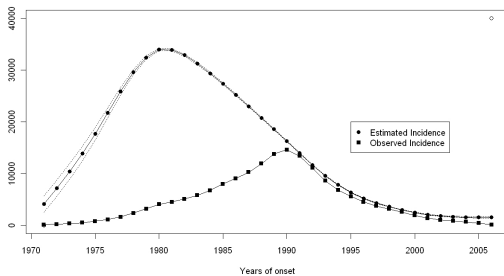
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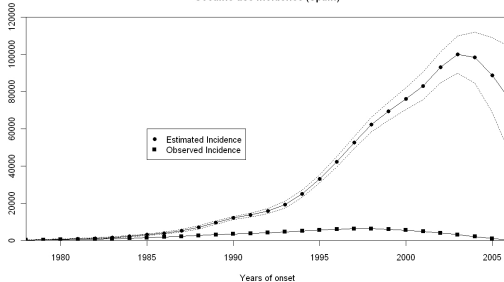
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## Summary

Heroin use incidence (Spain)



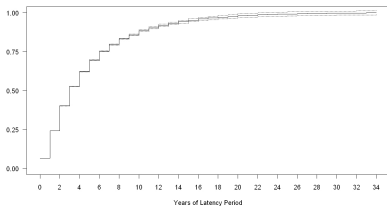
Cocaine use incidence (Spain)



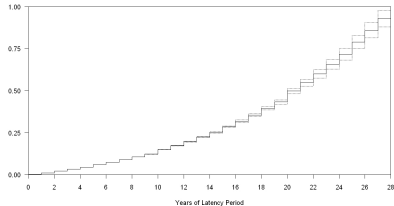
## Limitations:

- 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.**

Latency Period Distribution



Latency Period Distribution



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Published paper<sup>7</sup>.

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

First appearance was from *Hunt (1976)*<sup>8</sup> and later from *Hickman et al. (2001)*<sup>9</sup>.

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

Easier to implement.

Limitations are the same as *Poisson regression*.

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<sup>7</sup> 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

<sup>8</sup> LG Hunt. Recent spread of heroin use in the United States. *AJPH Supplement*, 64, 1974.

<sup>9</sup> M Hickman, S Seaman, D De Angelis. Estimating the Relative Incidence of Heroin Use: Application of a Method for Adjusting Observed Reports of First Visits to Specialized Drug Treatment Agencies. *Am J Epidemiol*. 153,7, 2001.

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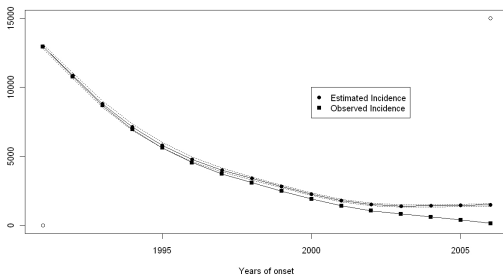
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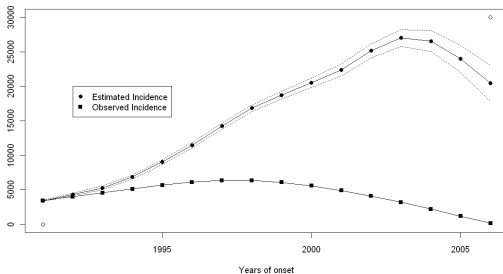
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Heroin use incidence (Spain)



Cocaine use incidence (Spain)





# Parametric approach to the Reporting Delay Adjustment method

Study in progress<sup>10</sup>.

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.

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<sup>10</sup>This work is part of EU project: New methodological tools for policy and programme evaluation

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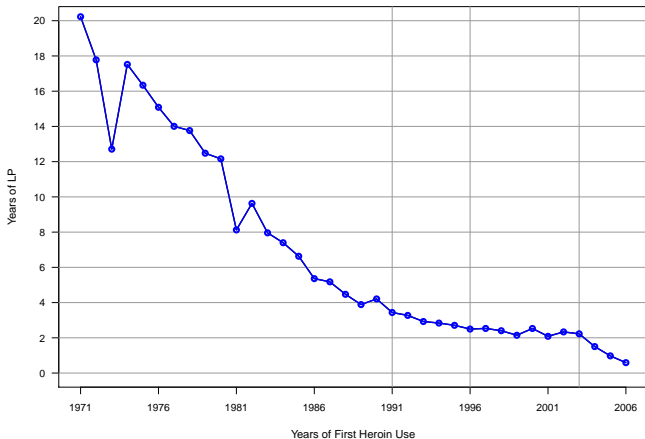
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Medians and 95% CI of estimated non-truncated Weibull LP distributions

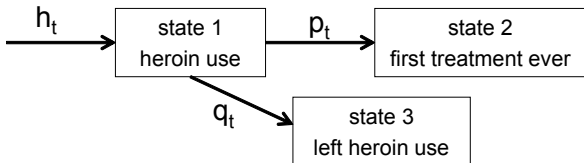


Work in progress!

# Multi-state model

Paper under review<sup>11</sup>.

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):



<sup>11</sup> Sanchez-Niubo A, Aalen OO, Domingo-Salvany A, Amundsen EJ, Fortiana J, Røysland K. A multi-state model to estimate incidence of heroin use.

## 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<sup>12</sup>.

## Method:

- Back-calculation type approach.

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<sup>12</sup> Amundsen EJ, Bretteville-Jensen AL, Kraus L. A Method to Estimate Total Entry to Hard Drug Use: The Case of Intravenous Drug Use in Norway. *Eur Addict Res.* 2011;17(3):129-135.

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

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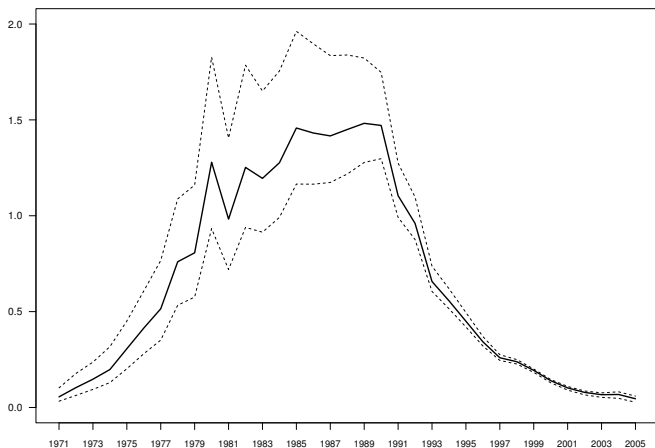
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## Strengths:

- 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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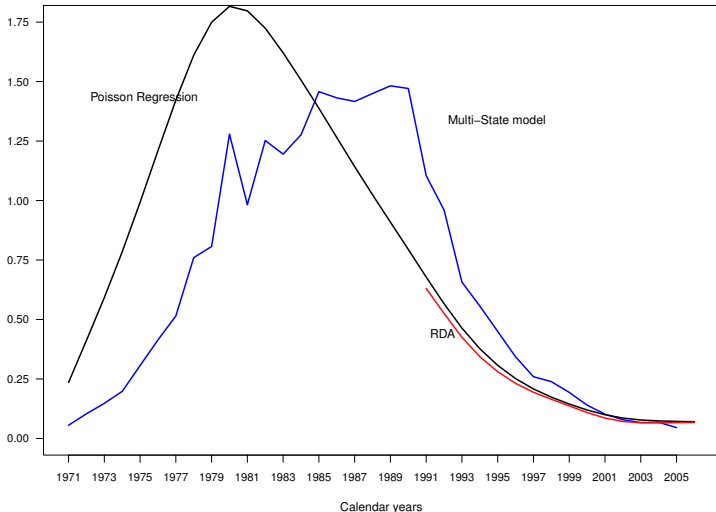
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Estimated Incidence Rates – HEROIN





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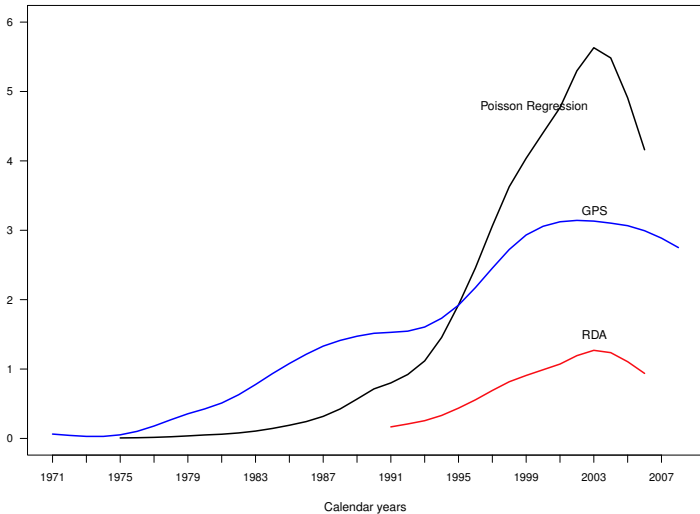
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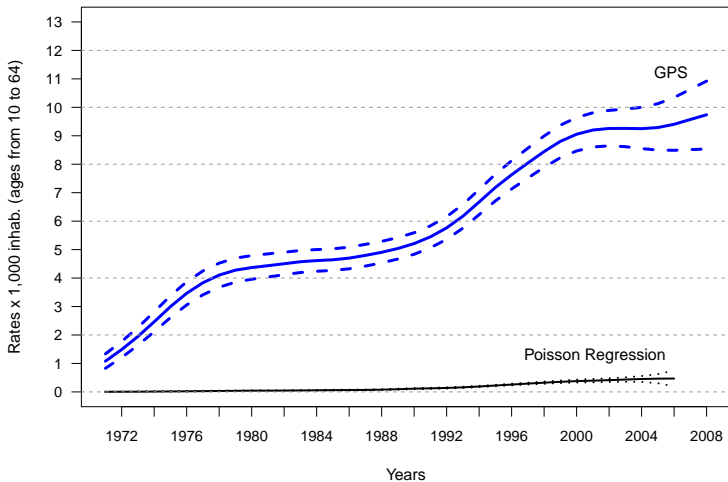
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Estimated Incidence Rates – COCAINE



## Estimated Incidence Rates – Cannabis



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# Thanks!!

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Institut Hospital del Mar  
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Plan Nacional  
sobre Drogas



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