EMCDDA SCIENTIFIC REPORT

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Executive summary

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This report was prepared by:

Lieven Annemans, Ghent University, Ghent, HEDM, Brussels
Nancy Vanoverbeke, HEDM, Brussels
Juan Tecco, Hospital Brugmann, Brussels
Fabienne Hariga, Modus Vivendi, Brussels
Chloé Carpentier, EMCDDA, Lisbon
Richard Hartnoll, EMCDDA, Lisbon

Key partners:
Nacer Lalam, International Research Centre on Environment and Development, Paris
Steve Parrott, University of York, York

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**Introduction**

Approximately 2 to 7 per 1000 people in the European Union are problematic users of opiates. This is a major concern to policy makers and therefore different measures are frequently proposed or under investigation. Currently, little information is available to provide a complete picture of the past, current, and expected future demand for heroin in different stages of addiction. Yet, such information would allow the analysis/simulation of the possible impact of different preventive and repressive measures to restrain heroin use and addiction.

**Objectives**

The objective of this study was therefore to develop a macro-economic model, simulating the career of potential heroin users and the accompanying demand for heroin. Additionally, the effects of different measures and changes in the settings of available substitution treatment were the subject of analysis. The secondary goal of this study was to identify the gaps in information, and consequently indicate the nature of data needed in future research.

**Methodology**

Based on the available literature and reports, the existing economic behaviour theories and different modalities of people using heroin were identified and discussed. These discussions provided a number of principles, but most of all a thinking-framework and background for the creation of a macro-economic model at a cohort level.

Practically, this was done by applying the methodology of a Markov state transition model, within which a (potential) cohort of heroin consumers makes transitions from one “state” to another within discrete time frames (here set at 6 months). The states presented in the model were: “non-user”, “has sampled”, “(non-dependent) user”, “ex-user”, “dependent-not treated”, “dependent-treated with methadone+other drug-intake”, “dependent-treated with methadone”, “abstinent”, and “death”. The model starts with a theoretical population of >12 year-olds (all non heroin users). After 10 years, a cross-sectional population may be obtained and broken down into different ‘states’.

Individual’s choices within the heroin market and the quantity of heroin consumed depend on consumer’s budgetary constraints (income and heroin price) and the price of other drugs (substitutes and complements).

The model was fed with estimated values on transition probabilities between different ‘states’ and economic factors (price and income elasticity). However, information on the dynamics of heroin use and substitution is scarce and, when available, mostly applies to non-EU populations. The challenge in the coming years will be to obtain such data from field studies carried out in the EU.
By calculating the model for a chosen time horizon of 20 years, an average demanded quantity of grams of heroin could be determined at a cohort level. Sensitivity and scenario analyses then showed consecutively the impact of variations in different parameters and the effects of different measures on the model results. By using a bottom-up approach, the basecase results at an individual level may be aggregated to model the heroin demand at the population level. Finally, mainly in order to take into account inter-country variability in heroin use, a number of additional analyses were performed.

After 10 years, the effect of changes in heroin price, income level, access to substitution treatment and incidence of persons experimenting with the drug was modelled and the impact on heroin demand over the next 10 years was assessed.

Results

Calculating the 20-year demand for heroin at cohort level generated an average demand estimate of between 5.96 to 20.45 grams per person, depending on different factors. On a European population level (>12 years), the estimated demand was between 1,920,000 and 6,595,000 kilograms (street purity) over 20 years.

Different measures were introduced in the model at year 10 and their effect on the cumulative heroin demand was modelled. The largest impact was observed when modelling changes in heroin price levels: according to the model developed, a 50% increase in the price level could have a negative impact of 72% on total heroin demand. Also the prevention of trying heroin could be a potentially effective measure: a decrease of sampling with 50% would generate an almost equal impact on total heroin demand.

Modelling the impact of substitution treatment indicated that an easier access to treatment would have a larger impact than the success of treatment itself in attaining abstinence. The possible reactions of the supply side, that is the possible effect of a decreased demand on price and supply, were modelled as well, but these seem to have little effect on the relative performance of the different proposed measures.

The model started with a closed cohort of non-users > 12 years old. At year 10, it is estimated that the population is cross-sectional according to the current situation in Europe regarding the different ‘states’ considered in the model. In the model used, it would imply a total 1-year demand between year 10 and 11 at the population level between 61,300 and 170,900 kilograms (street purity). These results are highly dependent on the value attributed to several parameters, and the range is especially due to taking into account a variation in heroin price.

Discussion

Developing a macro-economic model for heroin use was a challenging task. Many gaps were discovered in available information and a number of assumptions had to be made. Particularly, several parameter values had to be estimated, based on expert opinions. Other parameter values were often necessarily derived from scientific literature involving small samples, specific selected populations, and mostly North-American studies. This should be taken into account, since these data were also used for generalisation of results and
extrapolation in an European model. In addition, several assumptions should be tested with more extensive and up-to-date European data.

However, we believe that the current model gives some interesting indications of what might be the relative impact of different measures on the overall demand for heroin. Thus according to the model, measures focusing on prevention of trying heroin could have a large impact on heroin demand, while strategies targeting an increase in the heroin price, would seem to have a larger impact. Any conclusions such as these, need to be tested much more thoroughly, however, using more adequate European data.