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EMCDDA SCIENTIFIC REPORT

European Network to Develop Policy Relevant Models and Socio-Economic Analyses of Drug Use, Consequences and Interventions

Final report: Part 1 - General Overview

EMCDDA / 2002

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Final Report: Part 1 – General Overview

EMCDDA / P1/ TSER Network/ 2002

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Final Report Part 1: General Overview

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Final Report Part 3	Work group 1b – Local Level Prevalence Estimation
Final Report Part 4	Work group 2a – Modelling Time trends and Incidence
Final Report Part 5	Work group 2b – Modelling Geographic Spread and Geographic Information Systems (GIS)
Final Report Part 6	Work group 3a – Modelling Costs and Cost-effectiveness of Interventions
Final Report Part 7	Work group 3b – Modelling Drug Markets and Policy options

1 General aims of the network

This framework project brought together and consolidated existing European networks of experts in prevalence estimation and dynamic modelling of drug use. The overall goal was to stimulate the development of tools to analyse data on drug use, its consequences, underlying social, economical, and health factors and processes and to explore the feasibility of applying them to evaluate policy options or interventions. According to the European Union funding conditions, funding was available for meetings and network coordination only. Therefore all work described was funded by other sources, including several EMCDDA funded projects that preceded or overlapped with the TSER network duration. The participating experts benefited from the presentations, discussions and contacts established at the meetings generated by this project.

The project had the following general objectives: a) Stimulate and consolidate newly existing multi-national networks of experts. b) Integrate complementary disciplines essential for studying drug use. c) Develop statistical and dynamic models of drug use, leading to improved prevalence estimates and analyses of spread, consequences, causes and interventions, and enhanced European comparability. d) Explore the feasibility of applying these models to evaluate policy options or interventions. e) Generate scientific publications and proposals for further research.

The network was subdivided in three areas: 1) Prevalence, 2) Dynamics and 3) Economic aspects of drug use. Two workgroups were formed within each area. These workgroups are: 1a “National level prevalence estimation”, 1b “Local level prevalence estimation”, 2a “Time trends and incidence”, 2b “Geographic spread”, 3a “Costs and cost-effectiveness”, and 3b “Drug markets and policy options”.

2 Objectives per working group

Prevalence

1a) Work group on national level prevalence estimation:
To develop more reliable national estimates of problem drug use using the Multivariate Indicator Method (MIM).

1b) Work group on local level prevalence estimation:
To examine the related assumptions and their effect on the prevalence estimates when applying the capture-recapture method or the truncated Poisson method.

Dynamics

2a) Work group on time trends / incidence estimation:
- To analyse latency time between 1st drug use and treatment (as a prerequisite for using the back-calculation method for estimating incidence)
- To develop the back-calculation and other methods for estimating incidence of problem drug use
- To develop system dynamic models to perform scenario analyses and to propose Structural Analysis Models to assess the impact of possible risk factors.

2b) Work group on geographic spread:
To develop software and a relational database for application of a geographic information system (GIS) for mapping data on drug use and consequences.

Economic aspects

3a) Work group on costs/cost-effectiveness:
To estimate the 'cost of illness' of drug-related infectious diseases (and later widening to estimating all health and social costs of drug use).

3b) Work group on drug markets/ policy measures:
To develop criteria for a systematic review of economic studies as a basis for setting up market models.

3 Overview of the main results

3.1 Workgroup on national level prevalence estimation

The basic objective of the project work was to explore and to develop the multivariate indicator method. The method introduced by Person, Retka and Woodward (1977, 1978) and modified by Mariani (1999) estimates drug use by combining several population-standardized indicators directly corresponding to problematic drug use. With the use of principal component analysis, the complex information of the number of variables is reduced by extracting one single latent variable that is assumed to underlie all drug-related indicators, and that explains as much as possible of the variance of the original indicators. In a second step, the factor is used in a linear regression model with population-standardized prevalence estimates for at least two regions (the so-called anchor points). The linear regression results in population-standardized regional prevalence estimates. These are then used to calculate the national prevalence estimate. Additionally, some variants of the method have emerged that differ in the way of transforming the indicator values (e.g. taking the logs, ranking, using the original values instead of the population-standardized ones) as well as in the method of reducing the information (principal component analysis, based on correlation matrix, summing up). Some of these variants were applied to existing data sets. Moreover, a cross-validation was conducted with an Austrian data set.

In the following, the results of these analyses are summarized:

1. At least three anchor points should be available, that should be from both sides of the continuum from low prevalence regions to high prevalence regions. The more anchor points are available, the more stable the method becomes towards other variations (such as choice of indicators, data weaknesses). Implication: Small scale studies are needed to provide a variety of independently obtained estimates. These studies should not be limited to areas with great drug problems, but also to areas with an assumed low prevalence.

2. The choice of indicators influences the model as well, however, this concerns mainly the rank of the regional prevalence estimates. Implication: Data collection should be organised nationally providing data collection and coding procedures that are comparable between the administrative regions. The choice of the drug-related indicators utilised for the study, however, is not yet final.
3. The method is relatively robust towards systematic biases of the indicators, e.g. the use of event-based data instead of person-based data in some or all regions, the inclusion of previous drug users or report not by area of residence. Implication: The method can be applied in spite of systematic biases.
4. The choice of the set of indicators should be theoretically based. Drug-related indicators representing consequences of problem drug use as e.g. treatment admissions or number of offences, cannot be easily replaced by social indicators. Aspects, such as face validity and basic assumptions, such as a monotonous relationship between drug prevalence and indicators should not be violated. Implications: Data on consequences of problem drug use should be made more easily available. If more indicators should be utilised, there should be empirical evidence that the indicator is drug-related.
5. Different variants of the method may result in a wide range of estimates. Implication: Different variants should be applied. In the case of rather different estimates it should be tried to find an explanation for the differences. At present, no recommendation for a certain variant can be given. The properties of the variants need further exploration.
6. As indicators are often not broken down by age group the choice of the age group is rather arbitrary. The choice of different age groups results in nearly the same regional and national prevalence estimates. Implication: To get prevalence estimates for the age groups recommended by EMCDDA a breakdown of the indicators and the anchor point estimates by age group is needed.
7. Overall the method seems to be appropriate for national prevalence estimation, but not for regional prevalence estimation. The choices of different sets of anchor points or indicators seem to effect more the regional prevalence rates than the national ones. In the sensitivity analysis and the cross-validation with capture-recapture estimates it turned out that changes of anchor points or indicators lead to high variations of the regional estimates – even if the national estimates are close to each other. Implication: Do not rely upon regional prevalence estimates obtained by the multivariate indicator method – especially if the regions are no anchor points.

Conclusions

From the effects above can be concluded, that the method works. The choice of the anchor point is crucial for the method but also the indicators should be selected carefully. The method is rather robust towards data flaws of the indicators, but it seems to be important that the indicators are consequences of problem drug use. However, there are still some properties of the method that could not be studied with the available data sets, such as the effects of anchor points estimates derived by different estimation methods and with different target groups or the effect of drug-related indicators not matching exactly to the target group of the anchor point estimates. It seems nearly impossible to analyse the latter problem as in practice no set of indicators will fit exactly to a the same, well-defined target group.

The influence of different methods for the anchor point estimates could, however, be analysed if at least two prevalence estimates derived with different estimations methods and/or different target groups were available for at least one of the anchor points. Even if the target groups are

the same one method may be superior to the others, maybe due to obsolete multipliers or coverage errors.

Furthermore, at present we are unable to recommend the application of a certain variant of the multivariate indicator method. To create recommendations it would be to necessary to apply the different variants of the method to many appropriate data sets, to compare the results and to conduct sensitivity analyses. Because of the high correlation between indicators it was impossible to apply the correlation variants to the Austrian data set whereas the German data set is inappropriate since all anchor points are high prevalence regions. Unless enough appropriate data sets were unavailable simulation studies could be conducted. To enable the simulation of realistic situations, profound examination of the distribution properties of commonly used indicators in many empirical data sets is necessary.

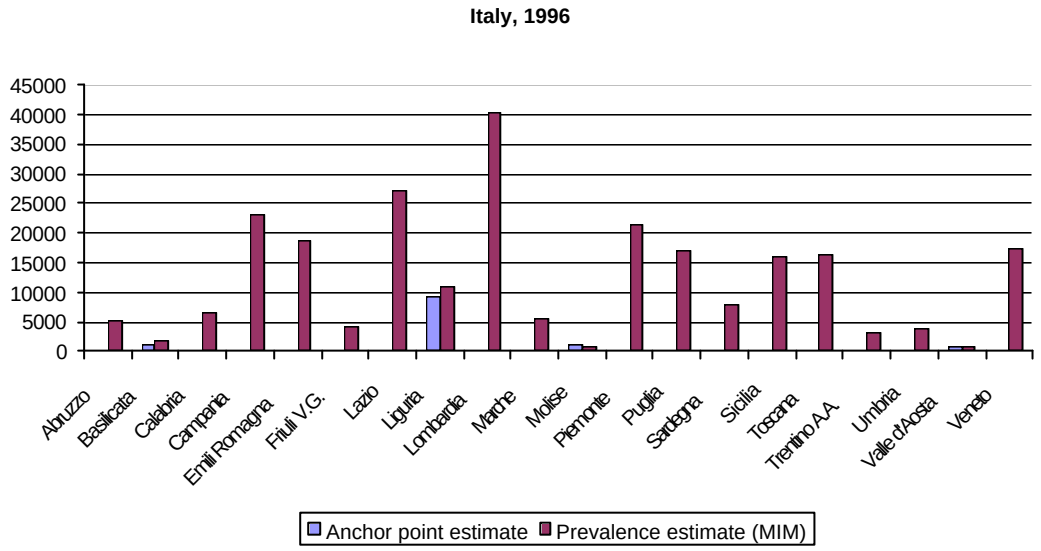


Figure 1: Regional prevalence estimates, Italy 1995

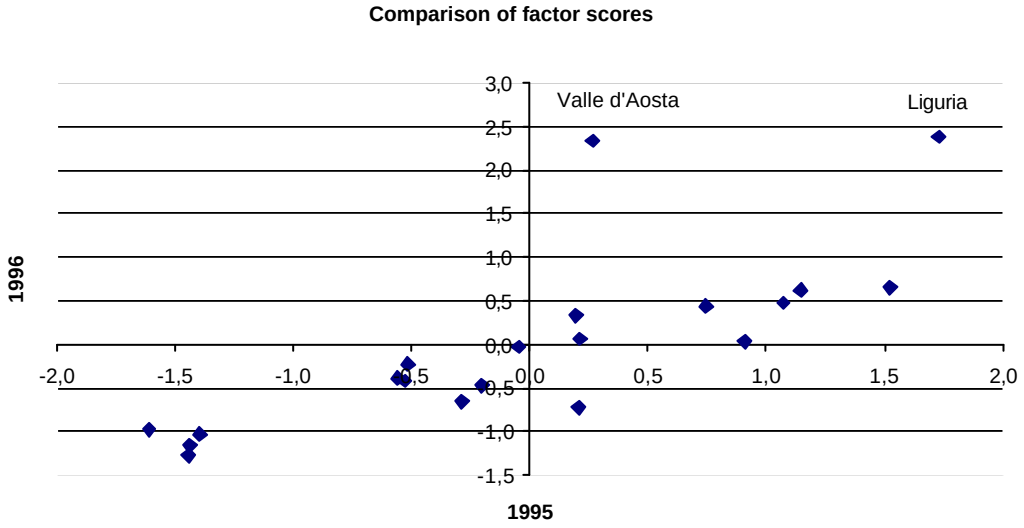


Figure 2: Scatterplot of factor scores, Italy 1995 and 1996
This comparison of results from two adjacent years from the same country demonstrates the high sensitivity of the multivariate indicator method towards indicators and prevalence estimates of the anchor points.

3.2 Workgroup on local level prevalence estimation

The work group was formed to consolidate EMCDDA-funded and other methodological research into estimating the prevalence of drug use at the local level and also to provide advice and scientific support to researchers wishing to apply the methods in their area. New prevalence estimates have been obtained in areas where research has not previously been carried out and updated estimates have been obtained in existing areas. Advice and scientific support was given to researchers wishing to use the capture-recapture method in Copenhagen, Luxembourg and Matosinhos (Portugal). A new prevalence estimation project was initiated in Scotland (UK) where the capture-recapture method was used to provide an estimate for each of the 32 local government areas.

The results of the prevalence studies have been useful for policy makers and those planning the provision of services. For example, the results of the Scottish research have influence the government's Drug Action Plan including the allocation of funding to local areas of the country. Future prevalence studies will benefit from the experience gained over the course of the project, scientific papers and other reports and from the development of computer routines to assist in analyses.

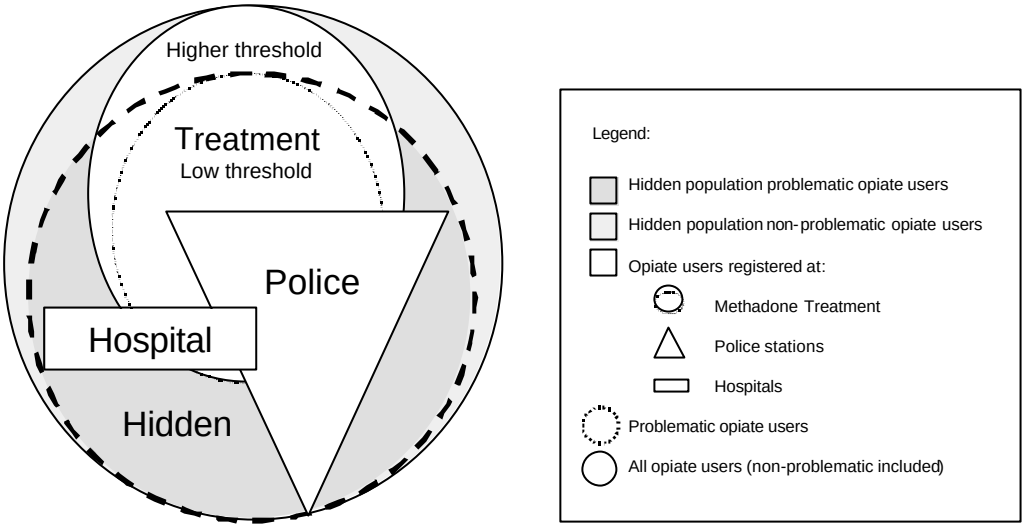
Members of the group are experienced in applying the methods in their geographical areas and have therefore addressed many of the relevant issues within their research. The work group was therefore a vehicle to exchange ideas about prevalence estimation, particularly the methodological aspects of this type of research, and was a resource available for those interested in undertaking prevalence research in other areas within Europe. Links were made between this workgroup and the National Prevalence workgroup, particularly with respect to analyses in Austria, Finland and Ireland where researchers carrying out local prevalence research were also undertaking research at the national level.

Two main methods have been considered; the capture-recapture method and truncated Poisson. The capture-recapture method employs data on drug users identified from two or more sources, such as hospital admissions, methadone registers, police, prison or treatment agency data. Although prevalence estimates can be obtained using two samples, there are certain assumptions that may be violated leading to biased estimates therefore it is preferable to employ three or more samples. The method examines the overlap between sources and uses log-linear regression modelling techniques to provide an estimate of the hidden population, i.e. those not identified from the available sources. The truncated Poisson method employs data from one source and examines the number of times each individual appears within the source. As the number of times a person appears once, twice, three times etc can be assumed to follow a statistical distribution such as the Poisson distribution, the number of people who appear zero times can be estimated. 95% confidence intervals can be found using either method.

In Amsterdam, the Netherlands, the differing case definitions of contributing sources was examined, particularly with respect to the effect on the estimates. Figure 1 shows how the samples used in a typical capture-recapture analysis relate to the estimate populations. Similar issues were faced within research in Dublin, Ireland. Each source which contributes to a capture-recapture analysis will employ a different case definition of what constitutes the population of interest. This is particularly relevant when considering a definition such as problem drug use. Those who are in contact when hospitals or who have had medical emergencies can perhaps be seen as more problematic than those who are only in contact with low-threshold agencies or have only been identified from police sources. If the capture-recapture analysis is restricted only to high-threshold sources such as hospitals, then the resultant estimates may refer only to a subset

of more problematic drug users, rather then quantifying a broader spectrum of drug use in the city.

Figure 3: Samples and estimated populations from analyses in Amsterdam



Methodological advances were also made in Helsinki, Finland where the capture-recapture analysis was undertaken within a Bayesian framework. Thus prior information on the likely size of the drug using population in the city, derived from previous prevalence estimation research, was employed with data from 3 sources to provide new estimates. Using prior information can help in model selection and can make comparisons between estimates in different years more valid. Bayesian estimates can, however, be harder to interpret therefore the application of this method has currently been limited to Helsinki. This methodological development has been worthwhile, and it will be of use in other areas where sufficient data and prior information is available.

In Austria by the use of simulation methods to examine the effect that some of the assumptions inherent in the capture-recapture methodology, such as equal probability of detection in each source, would have on estimates. The use of the truncated Poisson method was compared and contrasted with the capture-recapture method in the Netherlands and in Scotland.

In summary, the workgroup has served two main functions; further contributing to the development of the methodologies and their application in estimating the prevalence of drug misuse and also providing scientific support to new prevalence estimation projects across Europe.

3.3 Workgroup on time trends and incidence

In the 1st 12-month period Kaplan Meyer and Cox Regression models were used to estimate the latency time between first drug use and first treatment. The group applied a Back-Calculation Model to estimate the incidence of problem drug use from the observed incidence in treatment, using the latency time. Latency time was remarkably similar in Amsterdam, London and Rome (on average between 6 and 8 years). However, this depended strongly on age at first drug use, latency

time being longer in drug users who started at a younger age. This has important consequences for treatment centres, which might not be reaching young drug users sufficiently. Incidence curves were also estimated in the three cities on the basis of treatment data, using an updated version of the Empirical Bayesian Back Calculation procedure, showing important differences in the dynamic of the drug use epidemic. Data for Lisbon were analysed as well and showed similar results, despite being not from drugs treatment but from other services and therefore difficult to compare.

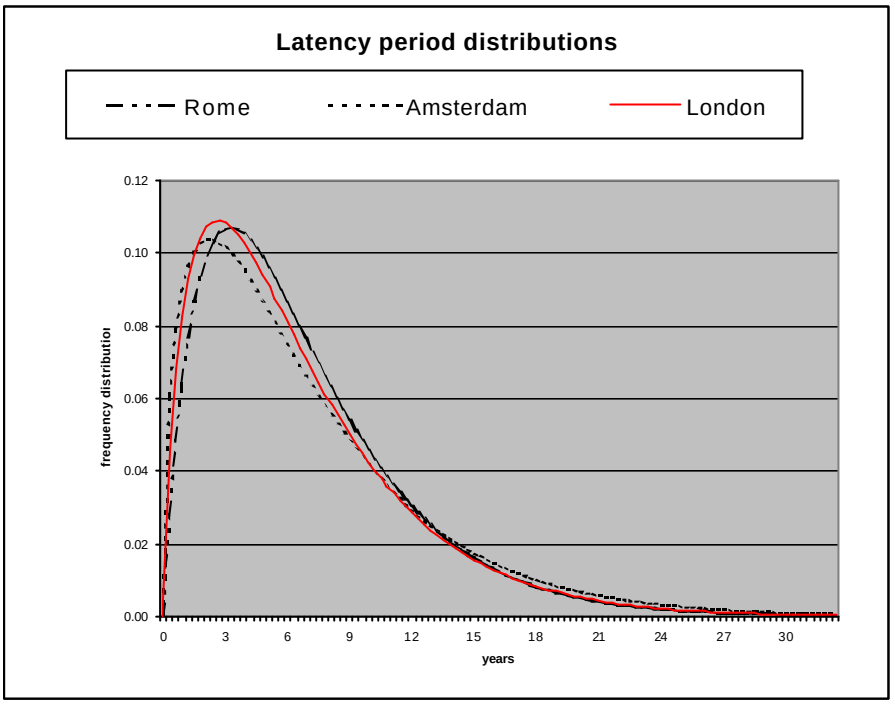


Figure 4. Gamma functions related to the latency period distributions of the three capital cities

In the 2nd 12-month period Kaplan Meyer and Cox Regression models were used to estimate the latency time between first drug use and first treatment introducing epidemiological information about the phase of the sub-epidemics concerning the sub-groups defined by discrete covariates (ethnicity, gender, route…) in order to correct possible biases due to the different starting point of the sub-epidemics. The group generalised the Empirical Bayesian a Back-Calculation Model to estimate the incidence of problem drug use from the observed incidence in treatment, using the latency time as incubation distribution. User friendly interfaces were produced for the BC procedure written in S+ language. Incidence curves were estimated for London, Amsterdam and Italy, showing important differences in the dynamic of the drug use epidemic.

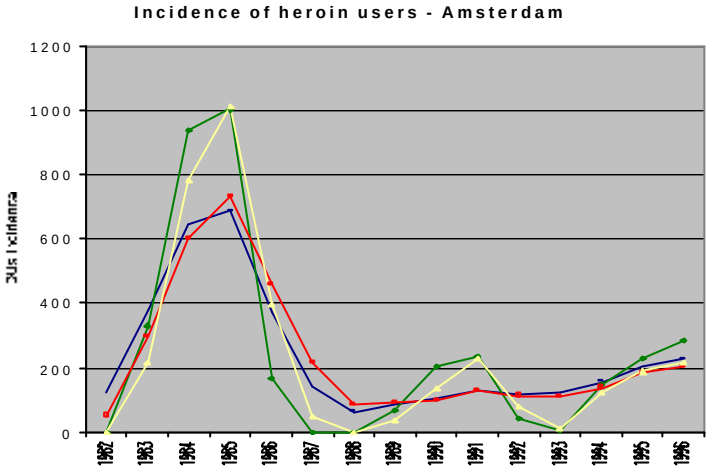


Figure 5 Relative incidence of heroin use in Amsterdam

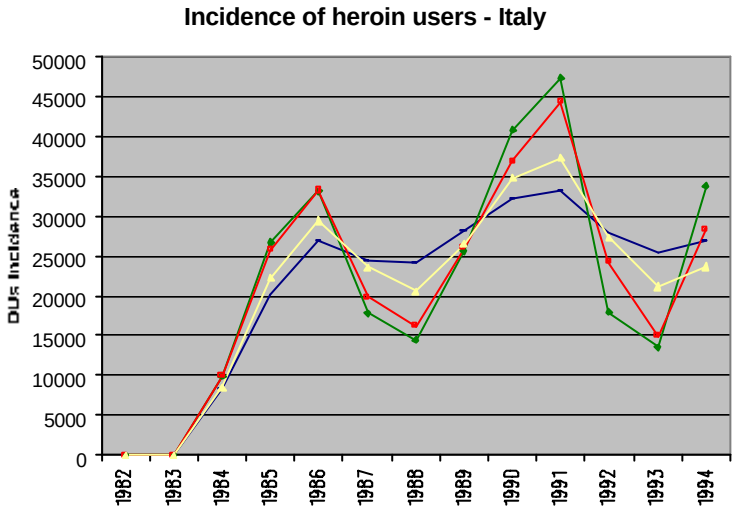


Figure 6 Relative incidence of heroin u se in Italy

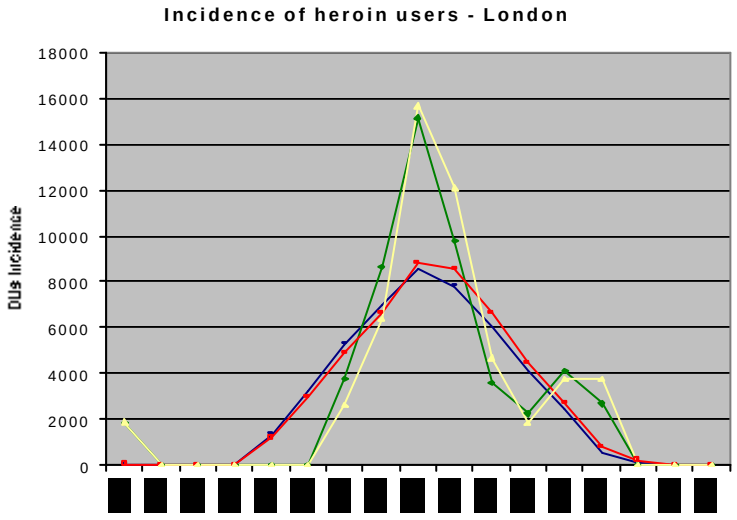


Figure 7 Relative incidence of heroin use in London

For Italy it was also possible to estimate some incidence curves at local (regional level). Data for Lisbon were analysed as well and showed similar results, despite being not from drugs treatment but from other services and therefore more difficult to compare. The incidence curve for Lisbon was estimated using a special snapshot method, namely the onset delay adjustment method (ODAM). Recent work from Dublin indicates that the situation might be very different, latency time on average about 2 years and not related to age at first use.
This might however be related to the stage of the drugs epidemic, which appears to be still in its early phase in Dublin, while already endemic in most other European cities. Unfortunately data from Dublin presently comprises only one year of treatment, thus it is not possible to check for the phase of the epidemic. Data from the French Community of Belgium were also analysed estimating the latency period with results comparable to the other sites (except Dublin). The incidence curve was estimated by the ODAM model. Similarly data from Budapest were also analysed producing results similar to those of Dublin. In this latter case, however, the phase of the epidemic could be considered due to the completeness of the data-set, which comprises more years of treatment. During the period 4 papers were written to be submitted to International Journals (2 of them are in press on UN Bulletin on Narcotics). Other papers related to the local analyses, results and policy implications were also produced. Preprints related to 3 of the 4 International papers can be presently downloaded from the website: http://mat.uniroma2.it/biometria/. A system dynamic model was developed and used to make some preliminary scenario analyses. A structural equation model was also developed to evaluate prevention interventions, some very preliminary analyses were performed. The results were also presented at national and International meetings, such as, for example, the Harm Reduction Conference held in Jersey and the Workshop on "Dynamic drug policy: Understanding and controlling drug epidemics", held in Vienna.

In the 3rd 12th month period the work was concentrated mostly on methodological developments and in summarizing all the results obtained in form of guidelines. Further local analyses were performed in order to obtain better estimates of the latency time distribution. Unfortunately new high quality local data are available for Italy only from the VE.de.TTE (Evaluation of Efficacy of Treatments for Heroin Addiction) multi-regional study carried out between 1998 and 1999 from ASP Lazio in different Italian regions, no further data were provided by the other partners. The group used again the Empirical Bayesian a Back-Calculation Model to estimate the incidence of problem drug use from the observed incidence in treatment, using the latency time as incubation distribution. Incidence curves were estimated for various areas in Italy (regional level). Further analyses considered regional aggregates obtained by spatial analysis and geographical aggregation. The incidence curves obtained for the aggregates show higher regularity and lower uncertainties due to increased sample sizes. A paper presenting the methods and analyses has been submitted.The system dynamic model already developed was studied in depth both from a qualitative point of view and from a numerical point of view by means of a simulation procedure developed using the language S-plus. Several scenarios were obtained. A paper presenting both analyses has been submitted. A structural equation model was also developed to evaluate prevention interventions, some analyses were performed on the basis of a large data set coming from 35,000 interviews to military conscripts in Italy. Such analyses permitted to identify 4 different causal models for 4 different primary use substances. Work is in progress to write a paper summarising the results. On the basis of the preliminary analysis a new survey among military conscripts in Italy has been designed in order to analyse time trends. The study will be developed in the next three years. Some of the various results obtained were presented at national and International meetings, such as, for example, the Harm Reduction Conference held in New Delhi. Further methodological developments allow to obtain correction of biases due to truncation in the estimates of the latency period. The experimental work performed within the project and the results obtained allow to set up a preliminary draft of guidelines .

3.4 Workgroup on geographic spread and geographic information systems (GIS)

The groups work began by considering a computerised model of geographic spread, developed based on the observation that macro spread of drug use may behave similar to infectious diseases (using 'infection rates' between cities and towns). At the XV international scientific meeting of the international epidemiological association, Florence, 1999 a paper (by Frischer and Heatlie) was presented which estimated and mapped the most likely spread of peak incidence of problem drug use in the West of Scotland. A key issue considered by the group was geographic data representation, e.g. crude rates, rate ratio's or rather the statistical significance of these. Maps were developed showing the increase over time of people entering drugs treatment in the different Italian provinces, suggesting that spread of problem drug use followed international trade routes. New developments include an improved (more user friendly and integrated) version of the GIS drug forecasting program, a discussion on the use of socio-economic indicators for prevalence estimates, presentation of the work and available data of Eurostat, a method to incorporate geographical links between regions into mapping, and a case study of a Lisbon neighbourhood. The Drug Incidence & Prevalence Estimation Program (DIPEP) has been updated from a DOS to windows environment.

One of the aims of drug prevention and treatment programmes is to help people to stop using drugs and slow down initiation of new drug use. However these aims are rarely operationalised into specific targets and it is difficult to subsequently gauge their impact at a population level. DIPEP was used to illustrate the potential effect of drug polices. In the first example a harm reduction programme which reduced the average career of a drug user from 10 years to 5 years, for an epidemic starting in 1990 would reduce the prevalence of drug use in England in the year 2000 from an estimated 251,000 to 112,000. In the second example, a prevention program which reduced the proportion of the population using drugs from 0.6% to 0.3%, for an epidemic starting in 1995 would reduce prevalence from 172,000 to 85,000 in 2005. These predictions depend on the validity of the model's conception of how drug misuse spreads among the general population. Obviously more complex scenarios can be envisaged and we hope to augment the programme to accommodate different forms of drug use that may diffuse in different ways. This work was presented at the national methadone conference. Melbourne, November 2000.

The DIPEP model may be viewed on the website:
http://www.northampton.ac.uk/aps/env/dipep/dipep.htm

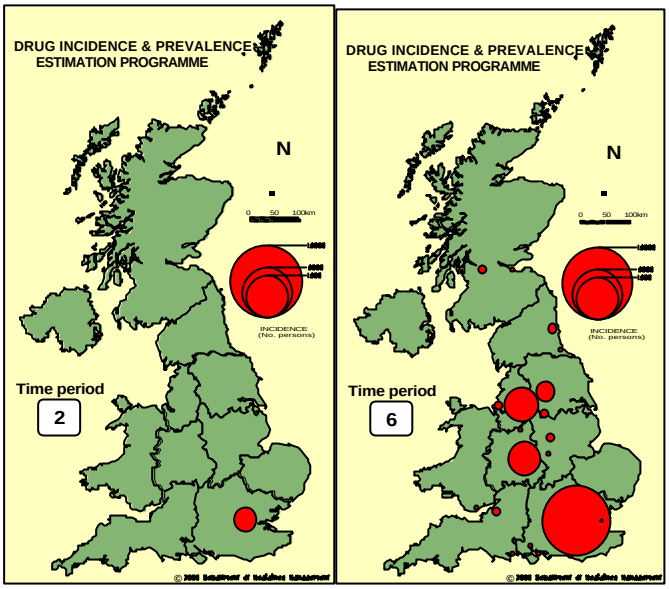


Figure 8. Years 2 and 6 of a projected UK drug epidemic.

European Data

In Europe there is greater availability of other epidemiological data such as hospital treatment data and public health data, potentially through focal points. However our investigations to date indicate that the coverage of this data is very uneven. Further harmonisation of this data is required across Europe before it can be meaningfully mapped.

Contributions from the network.

Two successful meeting were held in Lisbon and Jersey. Several participants presented their work on geographical aspects of drug use, which demonstrate significant advances in this area.

- Demonstration of the integrated GIS drug forecasting program (Ken Field)
- Using socio-economic indicators for prevalence estimates (Petra Kuemmler)
- Presentation of Eurostat data and GIS work (Torbiorn Carlquist)
- Exploration and modelling of drug misuse in Italy: a space-time approach" (Giovanna Lasinio)
- Thoughts for future drug misuse mapping..." (Mathew Hickman)
- Mapping the Incidence of Problem Drug Use in a Neighbourhood – The hardcore population of drug users in "Casal Ventoso" (Lisbon)" (Alberto Teixeira)

At the first meeting in Lisbon in December 1998, theoretical issues were foremost. At this meeting, it became clear that innovative practical work has been done in at least three centres (UK, Italy and Portugal).

Update local prevalence maps

New local prevalence estimates were sent to Keele and integrated into a new European map, This appeared in the 1999 EMCDDA annual report. Maps produced at Keele also feature in the 2000 report.

Objectives and Achievements

The groups objective was to develop models for estimating and forecasting geographical spread of problem drug use in the EU. Our final TSER report reviews the targets set in each six month period and how these were met.

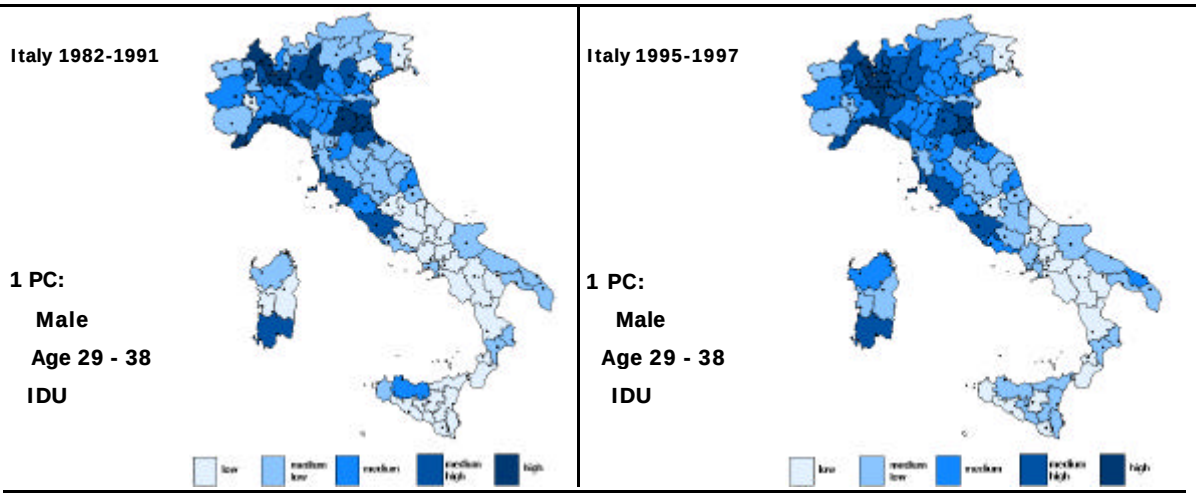


Figure 9. Diffusion of drug use across Italy

3.5 Workgroup on costs and cost-effectiveness of interventions

This group explored methods for estimation of direct and indirect costs of drug-related problems. The initial work has concentrated on estimating health care costs of infections with hepatitis C. At a first meeting available data were reviewed and an overview was produced of epidemiological, modelling and economic aspects, including a literature review. Also, a model was presented that has been developed for estimating cost-effectiveness of interventions on hepatitis B. This work is intended to produce estimates for all 'social costs' (direct and indirect) of drug use as well as cost-effectiveness and scenario analyses of interventions. Work was continued on mapping all social costs of drug use and links were made with an international network on this subject during a conference in Canada during which preliminary discussions were held for organising a European comparative study on the social costs of drug use. Further activities focussed on extension and elaboration of this work concerning

- further development of new method (model for indirect cost estimation - MICE) to standardise the estimation of indirect costs of drug use and interventions in different European countries,
- the literature search on impact and costs related to HCV infections (update),
- a systematic review of the literature on economic evaluation of hepatitis B vaccination strategies (De Wit & Welte, 1999),
- modelling the spread of HBV and analysing the cost-effectiveness of national HBV vaccination (De Wit et al, 2000a; De Wit et al, 2000b; Struijs et al, 2000),
- elaboration and international discussion (participation in several conferences, see below) of the methods developed to estimate (social) costs of HIV, HBV and HCV infections related to drug addiction (Antoñanzas, 2000).
- During the latest period activities focussed on the realisation of an EMCDDA Monograph presenting an overview of the state of the art of research, modelling and health policy

concerning Hepatitis C infections in injecting drug users. In accordance with the design of the book
- 17 authors (international experts) were invited to contribute a chapter to the book. All of them accepted the invitation,
- the review process has been started. It involves a review by two experts and a text editor,
- the final draft will be presented to the EMCDDA next year. The EMCDDA will finalise the publication of the monograph.

Aims

The global aims concerned:
(1) the estimation of costs for society of problem drug use, and
(2) the assessment of the cost-effectiveness of different forms of intervention using models.
The main questions explored by the project are:
- what is the cost-of-illness related to some infectious diseases (HepB/C and HIV) among IDUs?
- what is the influence of epidemiological developments on resulting health care costs for these diseases (cure/care/prevention)?
- what information is needed to ultimately construct cost-effectiveness scenarios for different interventions?

During the project the emphasis shifted to HCV specifically in view of the relatively little knowledge about this disease.

Results

The results of the workgroup's activities are presented in Annex 1 to 4, and in section *1.4 Monograph* of Part 5 of the present report.

Annex 1. Report Workshop: The impact and costs of HCV, HBV and HIV infection in injecting drug users in the European Union. Its main conclusions include:
- Basic epidemiological research trying to elucidate the dynamics of the spread of HCV in IDUs is still inconclusive and motivates further epidemiological study. Data needs and methodological problems concerning the epidemiology of HCV have been identified;
- A general overview of the spread of HIV/AIDS, HBV and HCV among IDUs in Europe shows that HIV, HBV and HCV constitute a major health burden for IDUs in Europe and are still not under control. Harm reduction has become an acceptable option in most EU countries, but coverage can be improved;
- Modelling approaches for transmission of HCV and related data needs have been defined. Modelling of the spread of HBV and subsequent economic evaluation of potential interventions (vaccination, screening) have already been elaborated. This work provides the format for the evaluation of interventions with respect to HCV;
- Further economic research should be devoted to prevalence-based estimation of costs, and the extension of the estimation of health care costs to social costs of drug addiction.

Annex 2. Wiessing LG, Hartnoll R, Houweling H, Jager JC, Downs AM, Hamers F: Impact and Control of AIDS, HIV, and Hepatitis B and C Among Injecting Drug Users in Europe: An Exploratory Overview. It presents amongst others:
- Estimates of historical HIV incidence derived by back-calculation from AIDS cases followed by recent data on seroprevalence of HIV, HBV, and HCV;
- A general impression of implementation and possible effects of harm-reduction measures in countries of the EU;

– Table 1. Prevalence of antibodies against hepatitis B and hepatitis C among injecting drug users in EU countries, EMCDDA 1998 (for more recent updated figures see EMCDDA 2001 Annual Report at http://annualreport.emcdda.org/en/sources/index.html)

	Hepatitis B			Hepatitis C		
	Year	Data	Percent anti-HBV +	Year	Data	Percent anti-HCV +
Austria (1)	1996	Vienna: Hospital, low threshold treatment	(50-56)	1996	Vienna: Hospital, low threshold treatment	(72-79)
Belgium	-	-	-	-	-	-
Denmark (2)	1995	Estimate	21	1995	Estimate	50
Finland (3)	1997	Helsinki: Needle exchange, self-reports	(34)	1997	Helsinki: Needle exchange, self-reports	(53)
France (4)	-	-	-	1995	Survey treatment centres, self-reports	53-70
Germany (5)	1996	Dortmund: Treatment	(48)	1996	Dortmund: Treatment	(63)
Greece (6)	-	-	-	1997	Methadone/drug free treatment	50-94
Ireland (7)	-	-	-	1992/93	Dublin: Treatment	(84)
Italy (8)	1997	Treatment	40	1997	Treatment	67
Luxembourg (9)	1997	Treatment, self-reports	22	1997	Treatment, self-reports	19
Netherlands (10)	1994/96	Rotterdam/Heerlen/Maas tricht: Treatment	(59-63)	1994/96	Rotterdam/Heerlen/Maas tricht: Treatment	(74-84)
Portugal (11)	-	-	-	1996	Treatment, self-reports	74
Spain (12)	1996	Treatment	59	1996	Treatment	83
Sweden	1997	Study 9 prisons, saliva (13)	55	1994	Stockholm: Study prison/treatment (14)	(92)
United Kingdom	1996	Unlinked Anonymous, England and Wales (15)	22	1994	Survey treatment centres (16)	48-77

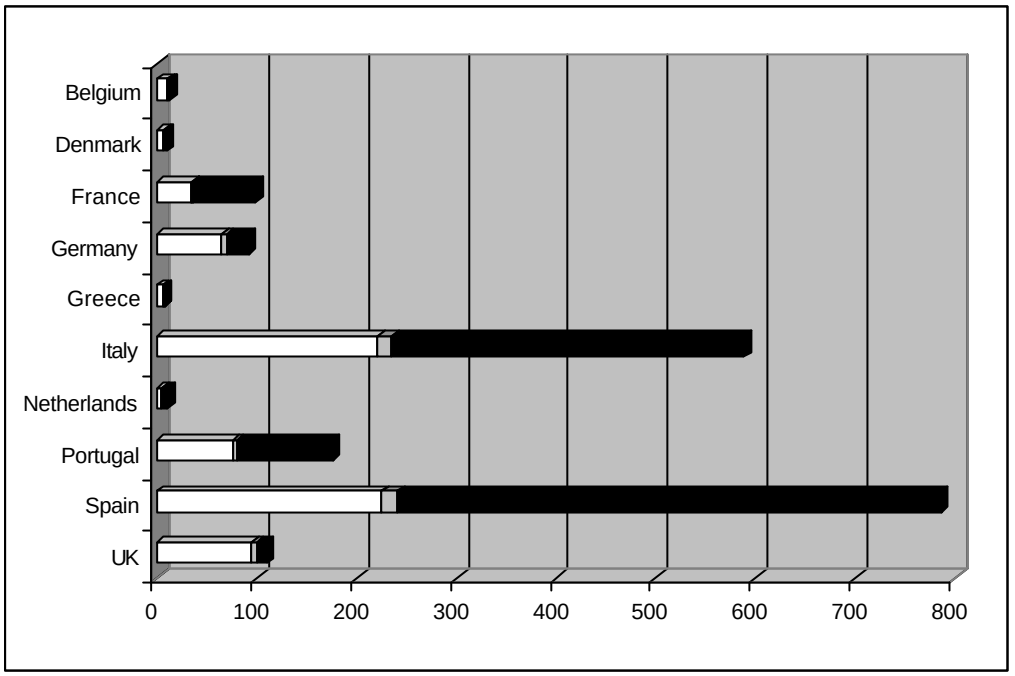
Annex 3. Jager JC, Achterberg PW, Wiessing L, Hartnoll R, Postma MJ: Infectious diseases and drug abuse: conceptual modelling of consequences and interventions. Poster presentation. It presents amongst others:

– a conceptual model covering the field of infectious diseases and drug abuse. Its five basic components are drug use, drug use-related policy, determinants of drug use and effects, individual effects of drug use and the social burden of drug use.

Annex 4. Postma MJ, Wiessing LG, Jager JC: Pharmaco-economics of Drug Addiction; Estimating the costs of HCV, HBV and HIV infection among IDUs in EU-countries. It presents amongst others:

– estimated costs for drug-addiction related HCV, HBV and HIV amounting to EUR1.89 billion in the baseline with HCV taking account of approximately 40% of these costs;
– the distribution of these costs over the ten countries considered: Spain and Italy make up 72% of total EU-costs (± EUR1.4 billion) with relatively large shares for drug-related HIV costs. Estimated drug-related costs in the UK and Germany are primarily caused by hepatitis;
– estimated lifetime costs of HIV-infection for the ten EU countries. These vary from EUR42,500 for the UK to EUR90,800 for France;

– Figure 10: Costs of HCV (white), HBV (grey) and HIV (black) in € (millions) for ten EU-countries.



1.4 Monograph

Jager JC, Wiessing LG, Limburg LCM, et al. Impact and costs of Hepatitis C in injecting drug users. (Lisbon: EMCDDA, 2002).

The monograph is very much an elaboration and extension of the work as reported on in the annexes. It presents amongst others:

- a conceptual model of the drugs problem, which is an elaboration of the model presented in Annex 3. The model structures the complexity of the drugs problem and the interrelationships between the subject matter of the parts of the book.

Part 1

- information on the latest developments in the diagnostic and treatment modalities of HepC and more specifically in IDUs. In the last few years major advances in the treatment of HepC have been made. IDUs, however, seem as yet to profit little from them;
- epidemiological data on the spread of HepC in IDUs in Europe and European data on coverage of prevention responses;

Part 2

- the results of a mathematical model for HepC transmission dynamics and of a model of the population of IDUs in the European Union;

Part 3

- estimates of the health care costs related to injecting drug use-related HepC, (HIV and HepB) calculated by means of an incidence/prevalence model;
- outcome of a comparison of no antiviral treatment to antiviral treatment in IDUs with histologically moderate HepC. Initial combination therapy in this group should reduce the risk of cirrhosis, prolong life and be cost-effective.

Part 4

- estimates of indirect costs by means of the market approach and human capital approach and of the social costs of injecting drug use in particular in France by means of the cost-of-illness method and in Switzerland by means of a newly developed valuation method;

Part 5

- policy options for the prevention and management of HepC in IDUs and estimates of the cost-effectiveness of treatment and prevention, in particular methadone maintenance program;

- models that enable the relative weighing of various drug control programs thereby providing a tool for the division of scarce resources among these programs.

What still needs to be done

Models used for the analysis of transmission and prevention of HCV in IDUs or for estimates of drug abuse-related costs need to be build and elaborated.
Methods to estimate the costs need to be further developed.
Building models is an iterative process, better data enables better models, which in turn enable more adequate estimates. Better data need to be obtained on

- HepC disease stages, and their determinants and risk factors in IDUs;
- HepC-related health care utilization by IDUs;
- HepC prevention strategies, in particular their efficacy, efficiency and costs.

3.6 Workgroup on markets and policy measures

The objective of the working group 3b was to develop criteria for a systematic review of economic studies as a basis for setting up market models.

A review of the empirical estimates of factors influencing supply and demand has been completed by Christine Godfrey and presented at the meeting of the working group (23-24 Oct. 2000, Lisbon). This review found that there was a number of empirical studies but these were mainly conducted using data from the United States and few European estimates were identified. It was found that there was a growing literature indicating that the demand for drugs is influenced by prices. Increases in drug prices leads to a decrease in demand for these drugs. These impacts had been found across a range of "hard" and "soft" drugs. These findings give support for attempting to build drug market simulation models, such as those being constructed by two of the partners in the project, Juan Tecco and Gernot Tragler. A few studies have investigated whether different types of drugs are complements or substitutes. These type of studies have considered the relationship between legal and illegal drugs as well as the relationship between different illegal substances. The results suggest that there are more examples of complements than substitutes.
A number of studies were identified which provided estimates of the impact of law enforcement on demand for illicit drugs. Little data was found on the role of income or other economic factors on demand.
Few studies were found that provided empirical estimates of different aspects of the supply of drug markets. Most studies have been analyses of the effect of enforcement and most of these have been partly constructed for modelling work rather than using direct observation and analyses. There are different views on the impact of changing enforcement activities and street level prices. A few studies have looked at market interactions and the results suggest as expected spending on drug control impacts on supply and demand. There are data in Europe on prices and different aspects of law enforcement as presented by Toon van der Heijden at the Expert meeting.

The review suggests there is potential to develop empirical research within and across Europe. Economic models demand significant amounts of certain kinds of data and a theoretical understanding, such as the work developed by Giovanni Trovato. There is also a need to understand the markets, which produce these data. Describing different markets and relationships that exist through qualitative studies of the kind being conducted by Nacer Lalam and Letizia Paoli is an essential part of developing such models and interpreting any results.

The meeting of the group was held at the EMCDDA in Lisbon on October 23-24, 2000. It allowed the partners of the working group 3b to present their current work related to drug markets and/or modelling.

Nacer Lalam presented results from a current research on drug trafficking and money laundering in France, with a special focus on the links between poor areas in big cities and criminal organizations. He also referred to other empirical researches carried out by the same team (CIRED) on the supply system of illicit drugs in France: from the final segment (where the user meets the street dealer) to the highest level (export, distribution…). He underlined two complementary logics associated with the motivation to enter into drug trafficking: the logic of socio-economic integration, which concerns mainly the young native from deprived neighbourhoods, and the logic of accumulation which applies to members of criminal organisations.

Letizia Paoli focused on the preliminary results of an ongoing research project on local drug markets (EMCDDA project) in Frankfurt and Milan. She argued that in both cities the distribution chain is often rather short and may be composed of only three levels: the importer, the dealer, and the final customer. In Frankfurt as well as in Milan, the great majority of drug deals, even those involving large quantities of drugs, seem to be carried out by numerous, relatively small, and often ephemeral enterprises.

Juan Tecco presented the work undertaken within an EMCDDA project to develop a macro-economic model to estimate the total demand for heroin. This model simulates the career of potential heroin users and their related demand for heroin at different stages of use or addiction. 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. Also the prevention of trying heroin could be a potentially effective measure.

Toon van der Heijden presented the results of a study to assess the trueness of the rumour that 15 to 30 tons of cocaine, would have been imported – but not seized – into the Netherlands between 1990 and 1995. Trends observed in seizures, prevalence and prices data all point to the Netherlands increasingly serving as a primary gateway for cocaine to the European market, but this phenomenon manifested itself before, during, and after the critical period. Having compared the expected changes against available data, it was concluded that the findings do not support the thesis on the importation in the first half of the nineties of 15 to 30 tons of cocaine which were not seized.

Giovanni Trovato's presentation was more theoretical and focused upon the development of a model – based on the Harrod-Domar (HD) mode, which allows to analyse the relations between the growth rates of two different kinds of economies. The standard HD tries to determine under which circumstances the economy is capable to obtain a steady state growth. Trovato's model tries to evaluate the growth's stability of the economic system when there is a sector (the drug sector) inside the economy which takes away resources for investment in the legal sector. The model studies the impact of the increase of criminal activity in the development of economic system.

Gernot Tragler presented the work carried out on dynamic models of illicit drug consumption by the members of the Department of Operations Research and Systems Theory at the Vienna University of Technology and international colleagues. Past work has mainly concentrated on the current U.S. cocaine epidemic, for which both descriptive and normative (in particular, so-called

optimal control) models have been developed and analysed. Current work started to involve age-specific aspects of drug epidemics. Future work will aim at validating existing models with European data and developing models of European-specific problems of drug use.

The discussions at the meeting during the presentations and at the final session suggested there was scope for considerable research in Europe around drug markets and policy options. There was currently, however, difficulties in both building research teams of the interdisciplinary nature required for such work and providing the necessary research funding. Several practical tasks were identified by the group including compiling data on prices, purity and seizures both at macro and micro levels. There was also some need to conduct some additional reviews on socio anthropological models, relevant epidemiological research, social costs and cost-effectiveness evidence on the different policies relevant to market models.

Papers from the expert meeting held in Lisbon on 23-24 October 2000 were asked to the participants and put together in a report that will be published as the Proceedings of the expert meeting. I will be made available on the EMCDDA website at the beginning of year 2002.

4 Comparison of planned activities and actual work accomplished

Work in the working groups has in general proceeded well according to schedule. Several meetings have been held within each working group (see specific working group reports). Furthermore, a coordinators meeting was held in September 1999 at the EMCDDA to which US experts attended (see Annex B). In April 2001, the EMCDDA organised a session on modelling, one on prevalence estimation, one on estimating coverage of prevention and one on costs, at the 12th International Conference on the Reduction of Drug Related Harm in New Delhi, India. Several network members gave presentations at this conference. On 9-10 July 2001, an expert meeting was held at the EMCDDA on the key indicator 'prevalence and patterns of problem drug use' to which 13 TSER participants attended (see Annex C). Final results of the working groups are being presented by 13 speakers from the network, at the 13th International Conference on the Reduction of Drug Related Harm, Ljubljana, Slovenia, 3-7 March 2002 (see Annex D).

5 List of Project Deliverables

Participants have been asked to include the following acknowledgement to the network:
"The work described in this publication has benefited from the European Network to Develop Policy Relevant Models and Socio-Economic Analyses of Drug Use, Consequences and Interventions, funded by the European Commission (TSER/DG12, project ERB 4141 PL 980030) and co-ordinated by the EMCDDA, Lisbon and – name work group co-ordinator –."

5.1 Scientific papers and reports that benefited from the network

Augustin, Mariani, Kümmler, Kraus. Background and application of the Multivariate Indicator Method (in preparation)

Buster MCA, van den Brink W (2001) Roaming through methodology. XXXI. Estimating partly hidden populations: heroin addicts in Amsterdam Nederlands Tijdschrift Voor Geneeskunde 145, 164-166.

Comiskey, C and Miller, R (2000) Drug use in young people and its effect on early school leaving. Department of Education, Dublin.

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Comiskey, C.M. and Barry, J. (2000). A capture-recapture study of the prevalence and implications of opiate use in Dublin. Eur J Public Health. 2001;11:198-200.

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European Monitoring Centre for Drugs and Drug Addiction (EMCDDA). Expert Meeting on drug markets and modelling 23-24 October 2000 – Proceedings, Lisbon: EMCDDA, 2001.

Flavell, J and Hay, G. (2001) Using Capture-Recapture Methods to Reconstruct the American Population in London in the Late Colonial Period. Journal of Interdisiplinary History, XXXII, 37-53.

Frischer M, Hickman H, Kraus L, Mariani F, Wiessing L. A comparison of different methods for estimating the prevalence of problematic drug misuse in Great Britain. *Addiction* 2001; 96, 1465-1476.

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Hay G., Bello, P-Y., Comiskey, C., D'Ippoliti, D., Freire, S, Partenen, P., Seidler, D., Uhl, A., Domingo-Salvany, A., Smit, F. and Wiessing, L. 'Estimating the prevalence of opiate use in six European cities.' (in preparation).

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Hickman M., Seaman S., De Angelis D. "Estimating the relative incidence of heroin use: application of a method to adjust observed reports of presentations at specialist treatment agencies", American Journal of Epidemiology, 2000, in press.

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JC Jager, LCM Limburg, MJ Postma, EJC van Ameijden, C Rossi, LG Wiessing. Project to analyse impact and costs of HCV, HBV and HIV infection in injecting drug users in the EU. EMCDDA Scientific Report CT.98.EP.06; RIVM report number 403505/02. Lisbon: EMCDDA, 2000.

Jager JC, Postma MJ, Achterberg PW. Developing multinational scenario analyses of health impacts of drug use. In: Modelling drug use: methods to quantify and understand hidden processes, Shap F, Neaman R, editors. Lisbon: EMCDDA, 2001: 183-200.

Kümmler, Augustin, Kraus, Comiskey, Domingo, Frischer, Rossi, Uhl. Comparing national estimates of problem drug use prevalence among EU member states (in preparation).

Lalam N. The drug trafficking in France : elements of functioning and motivations. (in preparation)

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Postma MJ, Wiessing LG, Jager JC. Pharmaco-economics of drug addiction; estimating the costs of hepatitis C virus, hepatitis B virus and human immunodeficiency virus infection among injecting drug users in member states of the European Union. Bulletin on Narcotics. (In press)

Postma MJ, Tolley K, Jager JC. Modelling the health care costs of drug-use-related disease. In: Modelling drug use: methods to quantify and understand hidden processes, Shap F, Neaman R, editors. Lisbon: EMCDDA, 2001: 205-220.

Partanen, P., Kinnunen, A., Leinikki, P., Nylander, O., Seppälä, T., Simpura, J., Virtanene, A., Välkki. (1999). Report on the number of amphetamine and opiate users in the Greater Helsinki area and in the whole of Finland in 1997. Aiheita19. States, Helsinki (in finnish).

Partanen P. 'Bayesian estimation of drug use from Finnish register data 1997.' (submitted)

Ravà L., Heisterkamp S., Wiessing L., Buster M, van Ameijden, Rossi C. "Estimating the Incidence of Problem Drug Use by Back-Calculation Methods, 2000, in preparation, the preprint can be downloaded from the website: http://mat.uniroma2.it/biometria/

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Ravà L., Heisterkamp S.H., Calvani M.G., Wiessing L., Rossi C. "The use of Back-Calculation for investigating temporal-geographic spread of problem drug use: nationwide and regional analyses in Italy", submitted, 2001;

Rossi C. "Il monitoraggio e la valutazione degli interventi di controllo nel campo delle droghe illegali: eventi e tempi critici", ITACA, IV no. 10, 2000, 13-21;

Rossi C. "Utilizzo di indicatori statistici per lo studio dei trend e della diffusione dell'uso di sostanze illegali per una migliore programmazione socio-sanitaria", Informa SER.T, III no. 3, 2000, 3-9;

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Rossi C. Joint estimation of the latency period distribution and the onset incidence of heroin use for monitoring drug policy interventions, preprint, 2002, accepted for oral presentation at the

Tragler G. Dynamics and control of illicit drug consumption: past, actual, and future research work from the "Vienna group" (in preparation)

Trovato G. Development and Drug Markets. (in preparation)

Uhl, A. and Seidler, D. (2000) 'Prevalence Estimation of Opiate Addiction in Austria', LBISucht, Vienna.

Wiessing L., Calvani M.G., Ravà L., van Ameijden E., Buster M., Hickman M., Ribeiro J., Rossi C."Analysis of the latency period from onset of heroin use to first treatment; comparisons among four European sites, possible implications for treatment services and for understanding the natural history of problematic heroin use", 2000, in preparation.

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Frischer M, Heatlie H. New methods for estimating the prevalence of drug misuse. XV International Scientific Meeting of the International Epidemiological Association. Florence, Italy Volume 1, 374.

Martin Frischer and Heath Heatlie. Modelling the impact of harm reduction on the incidence and prevalence of drug misuse. International Conference on Harm Reduction, Jersey, April 2000.

Frischer M. Can the spread of drug misuse be modelled using a Geographical Information System? Keynote address at the Combined APSAD and Methadone Conference, Melbourne, Australia, November 2000.

Hay, G 'Estimating prevalence of drug misuse in the North East of Scotland' Society for the Study of Addiction to Alcohol and other Drugs Annual symposium, 5th November 1999, Edinburgh.

Hay, G. Comiskey, C., Domingo-Salvany, A., Païvi Partanen, P., Smit, F., Uhl, A. and Wiessing, L. 'Estimating Prevalence of Problematic Drug Use at the Local Level in Countries of the European Union.' Abstract submitted to the 11th International Conference on the Reduction of Drug Related Harm. 9-13 April 2000, Jersey.

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Petra Kümmler, Ludwig Kraus, Rita Augustin, Lucas Wiessing, Richard Hartnoll, Catherine Comiskey et al. Estimating Prevalence of Problem Drug Use at National Level in Countries of the European Union. Abstract submitted to the 11th International Conference on the Reduction of Drug Related Harm. 9-13 April 2000, Jersey.

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Ravà L., Rossi C. "Estimating the size of a hidden population involved in the HIV/AIDS epidemic: a method based on Back-Calculation and Dynamical Models"."Medical Sciences Simulation Conference – WCM 1999" – San Francisco, California (USA), 17 – 21 January 1999.

Ravà L., Rossi C. "The use of Back-calculation and mover-stayer model for hiv/aids epidemic as a tool to estimate the size of the hidden population of injecting drug users". "IFORS '99 Conference" - Pechino, Cina, 16 - 20 August, 1999.

Ravà L., Heisterkamp S., Calvani M.G, Wiessing L., Rossi C. "The use of Back-Calculation for investigating temporal-geographic spread of problem drug use: nationwide and regional analysis in Italy"

Carla Rossi and Maria Grazia Calvani. Indicators for evaluating primary prevention programmes: a pilot application of Structural Equation Modelling. Abstract accepted at the 11th International Conference on the Reduction of Drug Related Harm. 9-13 April 2000, Jersey.

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Proceedings II. Publications II. The 7th International Conference on System Science in Health Care, Budapest, Hungary May/June 2000b 359-363.

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5.4 Project Internet site

http://www.emcdda.org/situation/methods_tools/modelling_network.shtml)
See outline on page 22 of this report

Work group 2b: Drug Incidence and Prevalence Estimation Program:
http://www.northampton.ac.uk/aps/env/dipep/whatis.htm

5.5 Data bases

The EMCDDA is developing a general European data base for data on drug use and consequences. This work has started by mid 2000. Databases developed through the network will be integrated with the European data base. A first set of tables is accessible at http://www.emcdda.org/infopoint/publications/annrepstat_00.shtml

5.6 Research proposals

Work group 1b: Gordon Hay has received a grant to estimate prevalence of problem drug use in Scotland at the national level using capture-recapture.

Work group 2b: Martin Frischer and Heath Heatlie have received a grant from the UK Home Office to produce maps of drug prevalence for England and Wales.

6 Policy relevance

The prevalence estimates are being used in cross-country comparisons by national and EU officials as well as in the lay press (about 500 press clippings on launch EMCDDA 1999 Annual Report). Local prevalence estimates are being used within Scotland, UK to assist in allocating funding for drug services and to inform other areas of the Scottish Executive's drug strategy. Prevalence estimates are being used as the basis for starting international work on crime, money laundering and drugs trafficking (Financial Assessment Task Force). Also, by comparison of numbers of drug users in treatment and prevalence estimates, some first ideas are being developed on the in-treatment rates in different countries. Furthermore, prevalence estimates corrected for injection rates are giving first information on the impact of health consequences such as hepatitis and HIV in injecting drug users. The work on time trends/ incidence and on geographic spread has been presented in the 1999 EMCDDA Annual Report and has thus been spread widely among policy makers. The analysis of latency time before first treatment showed that young drug users in several European cities are not well reached by treatment centres. The analysis of incidence showed different historical patterns of drug use in the same cities, e.g. a more constant, endemic situation in Italy versus epidemic spread in Amsterdam in the early 1980s with low incidence thereafter. The work on costs has shown that

different infectious diseases have different impact among injecting drug users, while several methods have been developed that can be used for estimating direct and indirect costs of drug use. In general the work is still in a very preliminary phase and results should be regarded with caution. The combination of geographical mapping and multiple indicator based prevalence estimates is being considered by the UK Home office for their strategic planning. The work on drug markets shows that there is increasing evidence showing effects of price on demand for drugs, that social integration motives may play a role in drug dealing at low level, that in Europe most drug deals may happen by small rather than large organisations, that it may be possible to estimate demand for heroin at macro level, that illegal economies may have large impact on the legal economy, among other findings.

Recommendations for improved data collection:

The work is leading to increased awareness of the importance of data quality and improved data collection. The EMCDDA/Reitox network of national focal points are showing much interest in these modelling activities and are actively stimulating the collection and analysis of drug-related data at the national level. The experts involved in the network are mostly also directly involved in expert groups at the national level in which the EMCDDA and focal points have a co-ordinating role. The EMCDDA is co-ordinating several projects to improve data collection on 5 key epidemiological indicators (population surveys, prevalence estimates, treatment demand, deaths/mortality and drug related infectious diseases). For most of these projects data at European scale are still scarce, but data requirements are being discussed and first standardised data sets are appearing and may be used in modelling work in the near future. Collaboration also exists with international institutions, which might provide important data (e.g. Eurostat) or increase the use of the techniques developed by the Modelling Network at a global level (e.g. UNDCP).

7 Exploitation and dissemination of results

- Potential for exploitation: Results have been presented in the 1999 to 2001 EMCDDA Annual Reports, the EMCDDA Scientific Monograph Series, and in the EMCDDA newsletter “DrugNet Europe”(national and local prevalence, geographic spread and incidence/latency time) as well at international conferences (see list of publications above).
- Contacts with potential users: this will be mainly through scientific journals. Users are likely to be found mostly in the scientific community, given the developmental and the technical nature of the work. However these users will most likely directly be serving policy makers and professionals at (inter)-national and local levels.
- List of publications: see under 'List of project deliverables'.
- An Internet page has been developed for presenting the network and future dissemination of results. The page only contains contact details and short summaries per work group (see page 34 and http://www.emcdda.org/situation/methods_tools/modelling_network.shtml). This final report of the project will be made available through this site.

8 Management and co-ordination aspects

- All work groups have been fully operational, communication was maintained mainly through email and the expert working group meetings
- A coordinators meeting was held at EMCDDA, Lisbon in September 1999 (See Annex B)
- Several complementary projects were funded by the EMCDDA (details have been provided to EU DG Research and are available on request)
- Several working group members participated in more than one working group, resulting in synergy and improved collaboration between working groups

The decentralised approach with six working groups allowed a large number of European experts to contribute to the network