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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 5 – Pilot project to develop a model of geographic spread of drug misuse in the European Union

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Final Report: Part 5 – Pilot project to develop a model of geographic spread of drug misuse in the European Union

EMCDDA / P1/ TSER Network/ 2002

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The important input of all network participants and invited experts is fully acknowledged. For a list of network participants per working group and email contacts see Final Report Part 1, Annex A.

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Executive Summary

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: Website
http://www.northampton.ac.uk/aps/env/dipep/dipep.htm

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.

1. Scientific overview

1.1 General Objectives

To develop models for estimating and forecasting geographical spread of problem drug use in the EU. The objectives for each of the 6 month periods of the project have been achieved as shown below.

First period objectives (1 December 1998 to 31 May 1999)	
Develop ARC INFO software and relational database for the EU	4
First small work-group meeting to define objectives	4
Map existing EU drug prevalence estimates.	4
Second 6-month period (1 June 99 to 30 November 99)	
Investigate data for relational database (e.g. Eurostat data)	4
Examine results from GIS modelling of drug misuse	4
Analyse and interpret on-going work by network participants	4
Develop forecasting model and link to GIS software	4
Third 6-month period (1 December 99 to 31 May 00) *– section 2*	
Hold Second Meeting of working group	4
Update local prevalence maps depending upon data supplied by contributors	4
Update and improve the Drug Incidence & Prevalence Estimation Program (DIPEP)	4
Integrate DIPEP and ARC-INFO	4
Describe data availability from Eurostat	4
Fourth 6-month period (1 June 00 to 31 November 00) *– section 3*	
Update local prevalence maps depending upon data supplied by contributors	4
Update and improve the Drug Incidence & Prevalence Estimation Program (DIPEP)	4
Further integration of DIPEP and ARC-INFO	4
Investigate possibility of mapping EU regional data from population surveys in collaboration with EMCDDA	4
24 month progress report of work completed up to December 2000	4
Fifth 6-month period (1 December 00 – 31 May 01)	
Update local prevalence maps depending upon data supplied by contributors.	4
Consider various models for geographic diffusion.	4
Integrate DIPEP and ARC-INFO	4
Continue working with EMCDDA to offer mapping services for geographic based data	4
Complete 6 month progress report of work completed up to June 2001	4
Sixth 6-month period (1 June 01 – 31 December 01)	
Launch GIS-DIPEP website	4
Summarise project achievements	4
Complete final report	4

1.2 Background

1.2.1 GIS and Drug misuse

Various disciplines (e.g. ecology and environmental health) are increasingly using Geographical Information Systems (GIS) to study associations between location, environment and behaviour. Advances in computing and graphical technology enable spatially referenced data to be linked to relational databases and epidemiological functions. GIS thus provide a powerful tool for analysing the spread of phenomena over time and space and GIS models have been used to predict disease spread from infected to susceptible populations (Hagget, 1994).

Drug use is both dynamic and social, spreading throughout populations and across regions. Pioneering work by Hunt and Chambers (1976) in the United States focused on two processes. The first process, called microdiffusion, refers to the spread of drug use among individuals within groups and depends on known drug users' propensity to 'transmit' drug use to new users, in a similar manner to infectious diseases. The second process, macrodiffusion, refers to the transmission of drug use across geographical boundaries. By analysing incidence data from drug treatment programmes, Hunt and Chambers were able to create a map showing the spread of heroin epidemics in the United States during the 1970s (Figure 1).

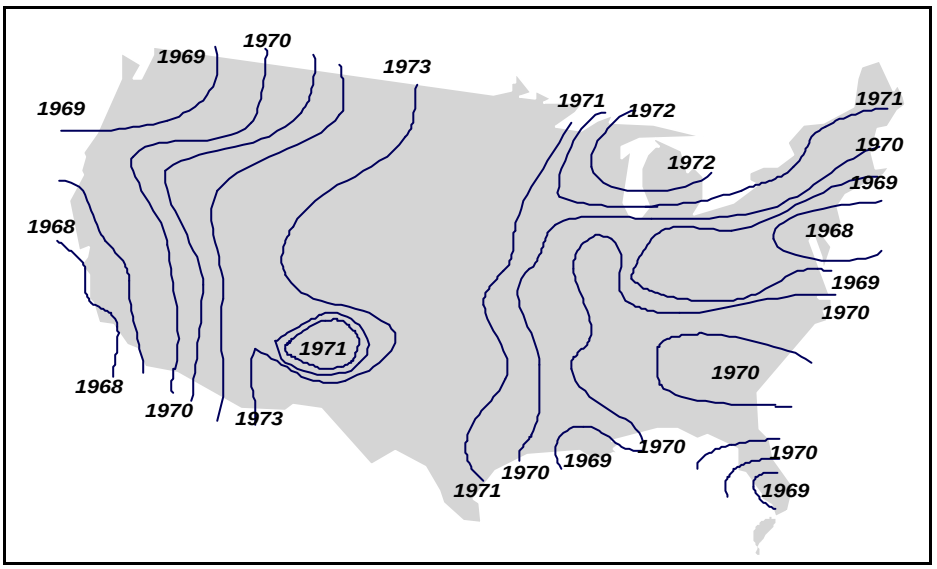

Figure 1. Isochrony of peak heroin use in the United States, 1968-1973. (Adapted from Hunt and Chambers, 1976).

Heroin use appears to have begun on the North East Coast along the chain of cities from Boston to Washington, and in Southern California. Large inland and Gulf Coast cities were also early centres of epidemic use. From the continental margins, heroin moved to the interior, spreading sequentially from cities in regions of high population density to those of lower density.

1.2.2 Forecasting the spread of drug use- Drug Incidence & Prevalence Estimation Program (DIPEP)

The Drug Incidence & Prevalence Estimation Program (DIPEP) forecasts incidence and prevalence based on the assumption that drug misuse spreads in a similar manner to infectious diseases. Epidemics occur where there is a rapid increase in the number of new cases relative to a stable endemic baseline. This is caused by changing circumstances which in turn lead to the number of 'susceptible' people being exposed to the infectious agent (or in the cases of drug misuse, individual and social contacts). A key assumption of this model is that only a certain proportion of the population is susceptible and that the epidemic will have a life cycle because eventually the pool of potential drug users will be exhausted. In this situation, the distribution of the time of disease occurrence often follows the pattern shown in figure 2. Graphically this means that drug epidemics will be negatively skewed.

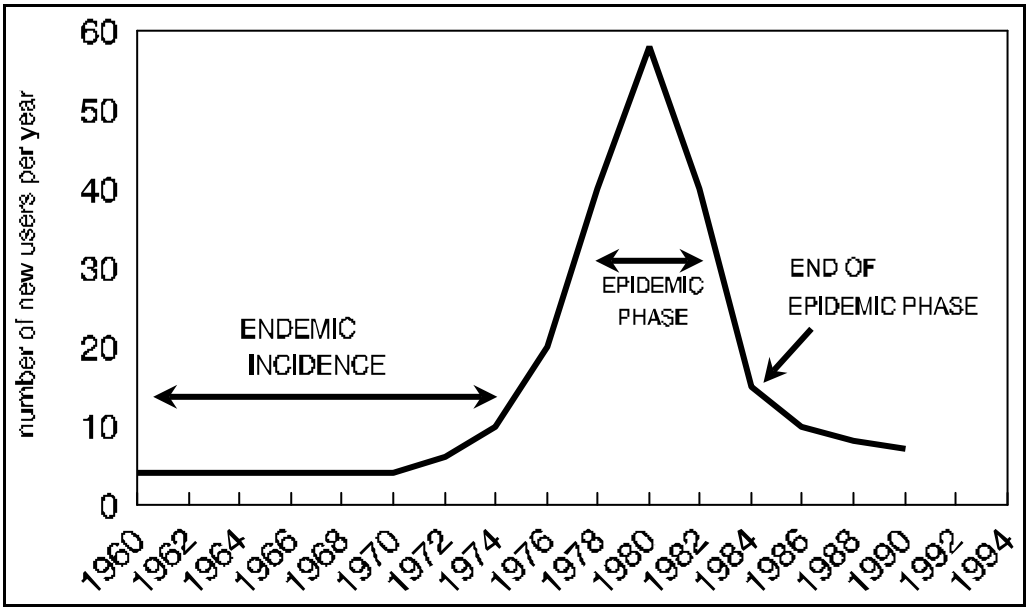

Figure 2. Schematic model of a drug epidemic.

In DIPEP the epidemic is represented by a simple distribution e.g. (1,2,4,8,10,8,1,1 etc) and the parameters shown in table 1 [See Ditton and Frischer (2001) for further details]. The program is linked to a database that contains information on population distribution for the UK and socio-economic status for Greater Glasgow.

Table 1. Parameters in the Drug Incidence & Prevalence Estimation Program.

MODEL PARAMETER	PARAMETER VALUES (EXAMPLE)
Year epidemic trends were first observed.	1978
Length of epidemic cycle.	20
Estimated peak prevalence (can be variable over town size: highest in large towns).	1-2%
Speed of spread across types of area.	1 year between town sizes
Duration of addicts' drug using career.	10 years
Population of the various areas (graded 1 to 15 in terms of town size).	Total population: 2,405,543

The parameter values were chosen from previous research and are intended to be illustrative. Parameter 1 was derived from an unpublished paper documenting the explosive increase in psychiatric referrals for drug abuse in Glasgow, starting in 1979. Parameter 2 is an empirical observation by Hunt and Chambers from their observations of US heroin epidemics. Parameter 3 is derived from a capture-recapture study of injecting drug use in Glasgow. Parameter 4 is the quickest spread speed that the model in its current form permits and was thought to most accurately reflect the epidemic spread. Parameter 5 is another empirical observation from Hunt and Chambers. The results of applying these parameters to the known population distribution (parameter 6), at least from 1989-1998, correspond fairly closely to what is known about the diffusion of drug use in the West of Scotland.

A central aim of this project has been linking the output from DIPEP to a GIS program.

2. The Groups work in 2000/1.

The work conducted made in the first two periods (December 98-99) is described in previous progress reports. This section describes the work undertaken in 2000 and 2001

2.1 Second meeting of working group

A meeting was held in Jersey on Thursday 13th April 2000. Following review of the project's progress the following participants attended the meeting.

Attendees:

Ken Field (GIS expert – University College of Northampton)
Martin Frischer (TSER-GIS network co-ordinator – Keele University
Heath Heatlie (GIS expert – Keele University)
Mathew Hickman (Imperial College, London)
Petra Kuemmler (National prevalence estimation project IFT)
Giovanna Jona Lasinio (Universita' di Roma)
Torbiorn Carlquist (Eurostat GISCO)
Alberto Teixeira (Universidade Nova de Lisboa)
Lucas Wiessing (Epidemiology Department (EMCDDA))
Denise Walckiers (Head of the Focal Point of the Belgian Information REITOX Network)

A range of topics were covered including:

- 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 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).

The major areas of work are:

1. Development of software for prevalence estimation and mapping.
   Keele and Northampton Universities in the UK have now developed this.
2. Ecological analyses of drug use using GIS.
   Mapping of drug related phenomena in Lisbon to help planners to visualise the nature of the problem and the impact of interventions.
3. Statistical analyses of mapped data sets.
   Work in Rome and London highlights the importance of statistical considerations in interpreting mapped data, to avoid erroneous interpretation of geographical variation.

2.2. Update local prevalence maps depending upon data supplied by contributors

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.

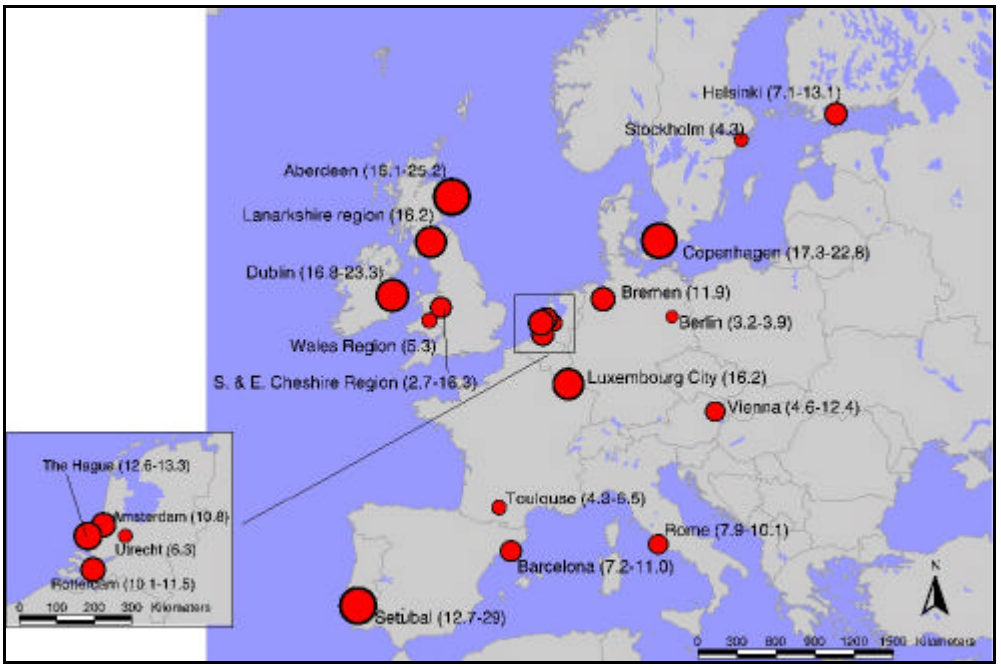

Figure 3. Local prevalence estimates in Europe

2.3. Update, improve and integrate Drug Incidence & Prevalence Estimation Program (DIPEP) into a geographic information system (GIS).

Work has been undertaken link the DIPEP to a GIS by Dr Ken Field, Northampton University. The results of this work can be seen in section 2.5. This work initially converted the DOS program into a windows environment (figure 4).

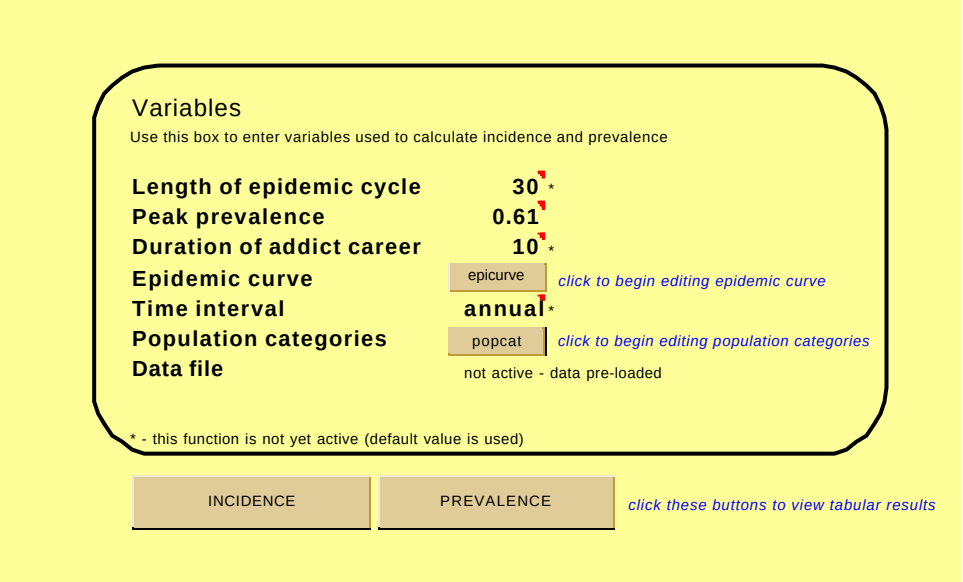

Figure 4: Variable setting page taken from the Windows version of DIPEP

2.4 Investigate mapping EU regional data from EMCDDA survey data.

Three EMCDDA reports have been examined to investigate the availability of geographic data from EMCDDA. Each are outlined below.

2.4.1 Comparability of general population surveys on drug use in the European union. (EMCDDA, 1997a)

Geographical variation is not usually included in European surveys (Table 2). Those regions that are included reflect national situations, and are not applicable as categories for cross-national comparison. German studies report prevalence rates for Western and Eastern

Germany separately; England and Wales are divided into five regions (London, South, Wales, North, and Midlands).

Table 2. Geographic Characteristics Reported in Relation to Illicit Drug Use

Country	Region	Population Density	Neighbourhood
Finland	no	Yes	No
4 Nordic countries	no	Yes	no
France	no	Yes	no
Germany	yes	No	no
Netherlands *Amsterdam*	no[a]	no[a]	yes[b]
United Kingdom *England and Wales*	yes	no[c]	yes

a = data only refer to a local situation (Amsterdam)

b = only applied in one publication (Sandwijk et al., 1988)

c = only indirectly, via A Classification Of Residential Neighbourhoods (ACORN)

Drug use by geographic area type is also seldom reported, not all reports include level of urbanisation or *population density* in the analyses. *Type of neighbourhood* is included only occasionally. The British Crime Survey is the only study that systematically employs a 'classification of residential neighbourhoods'.

The Dutch study (Abraham et al, 1997) illustrates the potential for geographical analysis (see table 3). The report outlines 'average' drug use prevalence in the Netherlands as a whole, and monitors distinct drug use prevalence for the four large cities and the five population density strata separately. In general, the report notes that many indicators are similar, irrespective of city or density sample.

Table 3. Lifetime prevalence of drug use in the Netherlands by geographical location and address density

lifetime drug use

drug	highest address density municipalities: 1) Amsterdam	2) Rotterdam	3) The Hague	4) Utrecht	5) other	address density: highest	6) high	7) moderate	8) low	9) lowest	national average
Tobacco	71.8	65.8	64.4	69.9	69.0	68.4	69.2	66.7	67.2	67.6	67.9
Alcohol	88.7	86.2	84.5	89.0	91.9	88.4	90.7	90.5	90.4	90.5	90.2
Hypnotics	23.8	19.0	17.7	19.3	18.8	20.0	17.6	18.0	16.4	14.8	17.4
Sedatives	22.9	19.6	17.7	22.2	22.0	21.0	21.5	21.1	17.0	16.5	19.6
Cannabis	36.7	18.5	20.1	27.3	23.3	25.5	17.2	12.6	12.3	10.5	15.6
Cocaine	9.4	3.4	3.4	3.6	3.2	4.9	1.8	1.5	1.4	1.0	2.1
Amphetamines	6.0	2.7	2.2	2.6	3.3	3.6	1.9	1.6	1.2	1.1	1.9
Ecstasy	7.0	2.2	2.6	3.2	2.4	3.6	1.5	1.7	1.3	1.2	1.9
Hallucinogens	6.3	1.8	2.8	3.0	2.7	3.5	1.7	1.2	1.4	1.1	1.8
Mushrooms	6.6	2.4	2.5	.	3.1	3.8	1.7	1.1	0.9	1.0	1.6
Opiates all	21.4	12.5	10.0	8.4	13.2	14.3	11.7	13.4	10.3	8.4	11.7
Codeine	16.0	7.5	4.8	4.7	7.8	9.1	8.2	8.4	6.2	4.0	7.3
Heroin	1.8	0.4	0.5	0.3	0.4	0.8	0.1	0.2	0.1	0.3	0.3
Inhalants	1.9	0.6	0.5	0.7	0.5	0.9	0.3	0.3	0.6	0.3	0.5
Doping	1.5	0.8	0.7	.	0.8	1.0	1.0	0.9	0.9	0.6	0.9
Difficult drugs	14.3	5.3	5.9	6.8	6.3	8.2	3.8	3.2	2.9	2.4	4.1
No drugs	6.0	6.7	8.5	5.9	4.4	6.1	4.6	5.3	5.0	5.0	5.2
Total sample	*3,710*	*2,320*	*2,279*	*2,198*	*2,289*	*12,796*	*2,295*	*2,276*	*2,288*	*2,304*	*21,959*

Difficult drugs are cocaine, amphetamines, ecstasy, hallucinogens (mushrooms excluded), heroin.
No drugs is *not* of the above drugs

2.4.2 Drug-related death data. (EMCDDA, 1998)

Data on drug-related death can be obtained from national Statistics of Causes of Deaths or General Mortality Registers (GMRs) and/or from Special Registers (SR) or drug-reporting systems hold by the police or forensic institutions (see table 4). When both types of registers are available, the Special Registers are commonly seen as the most reliable and complete source.

Table 4 shows that most countries have national registers based on the ICD (9th or 10th edition) to record causes of death. However, only four use these data actively to monitor drug-related deaths: Finland, Ireland, The Netherlands and Sweden. Data from Special Registers have been obtained from some twelve countries, nine of them having a national coverage. Ten countries consider their Special Register as the most reliable instrument in reporting data on drug-related deaths. Luxembourg has neither ICD-based data (system on vital statistics is incomplete) nor data from special registers. The UK (Home Office) had a special register until 1994, but it fell in disuse following the introduction of charges by one of the information providers. Overdose data from France has been obtained from police records

(OCRTIS), but more data is potentially available on contributory causes of death (INSERM) and AIDS (RNSP).

Table 4. Availability of data from National Causes of Deaths Statistics (ICD-9) and Special Registers (SR)

	ICD-data	Regular ICD reporting	Special Register	Cover-age SR	SR-data available	Most reliable
Austria	Yes	no	yes	national	yes	SR
Belgium	Yes	no	yes	national	yes	SR
Denmark	Yes	no	yes	national	yes	SR
Finland	Yes	yes	yes	national	yes	SR
France	Yes	no	yes	national	partly	SR
Germany	Yes	no	yes	national	yes	SR
Greece	Yes	no	yes	national	yes	SR
Ireland	Yes	yes	no	-	no	GMR
Italy	Yes	no	yes	national	yes	SR
Luxembourg	No	no	yes	national	no	none
Netherlands	Yes	yes	yes	local	yes	GMR
Portugal	No	no	yes	national	yes	SR
Spain	Yes	no	yes	local	yes	SR
Sweden	Yes	yes	no	local	yes	GMR
United Kingdom	Yes	no	yes	35 juris-dictions	no	none

GMR = General Mortality register, SR = Special Register

Data was only available for sub national areas in The Netherlands, Spain, Sweden and The United Kingdom.

Sources of epidemiological data available to the focal points of the fifteen member states of the European union.

Treatment data* - *Availability at regional level

Two countries report on the existence of treatment data at regional level: Belgium and the United Kingdom. Belgium has four sources of which two are reporting systems. The

Belgian Focal Point actively obtains the data routinely from two of the sources. On the whole, the Belgian information sources collect information from public health services, private centres and NGOs and include detoxification units, therapeutic communities, hospital outpatients, day care centres and local health specialised services, as well as general inpatient psychiatric hospitals, general practitioners, and methadone prescriptions. The regional sources from the United Kingdom do not collect information recorded by non-national sources, the exception being methadone prescription.

At least one of the regional sources in Belgium collects information on the gender, age, nationality, and toxicological characteristics of clients in treatment, while they have limited information on the infectious diseases.

Availability at local level

In addition to national or regional systems, four sources of local data in Austria, Belgium and the Netherlands are reported. They constitute reporting systems in Belgium and the Netherlands. The Austrian Focal Point actively obtains the data on a routine basis, while the Dutch Focal Point receives the data in a passive way. All of them record the gender, age and nationality of clients in treatment, while only two have information on their geographical distribution. They all collect information on the main drug used, how it is used, and the consumption of licit products. Very limited information on infectious diseases suffered by clients in treatment is recorded.

Hospital data - Availability at regional level

Three countries (Belgium, Portugal and the United Kingdom) have hospital data from a region or a group of major cities, in addiction to national data in the United Kingdom. The Portuguese Focal Point collects the data on request, while the British Focal Point actively obtains it on a routine basis.

Belgium collects information on psychiatric in and outpatients, while the United Kingdom records information on inpatients, both at general and psychiatric hospitals. Both countries follow the ICD and Belgium includes secondary diagnoses. Portugal records information on cases of overdose attended at ambulances.

Belgium and the United Kingdom collect information on the gender and age of patients, and the United Kingdom also includes information on their geographical distribution. The Belgian system records the main drug and licit products used by hospital patients.

Availability at local level

In addition to national or regional sources, Austria and Belgium have local sources of hospital data, actively obtained by the Focal Point in the case of Austria. The system in Belgium records the gender, age and geographical distribution of patients, as well as the infectious diseases such as AIDS, Hepatitis B and C, endocarditis and tuberculosis suffered by them.

Public Health data - Availability at regional level

Two countries (Belgium and the United Kingdom) collect infectious disease data at regional level, in the case of the United Kingdom in addition to a national source.

The United Kingdom records patients' age, gender, geographic distribution and drugs route of administration. Both sources record information on AIDS, identifying injecting-related cases, and the study in the United Kingdom monitors HIV seroprevalence and Hepatitis B among injecting drug users.

Availability at local level

Belgium has one source of information on infectious diseases in Brussels. This source records information on the patients' gender, age, nationality, geographic distribution, total number of AIDS cases and deaths, number of AIDS cases among IVDU, and total number of HIV tests and percentage of positivity.

Deaths related to drug use - Availability at regional level

Sweden and the United Kingdom collect data on drug-related deaths at regional level, in addition to national data. In both cases direct and indirect deaths are recorded in accordance to ICD and toxicological analyses are performed. The deceased's gender, age, nationality and geographical distribution are recorded in both cases, and the Swedish source also notes the way drugs were taken.

Availability at local level

Austria, Belgium and the United Kingdom collect information on drug related deaths at local level. The deceased's gender, age, nationality and geographical distribution are recorded in all cases.

Other social or educational data - availability at regional level

Belgium, Germany and Portugal have some regional sources of other health data. Belgium collects information on methadone dispensing, syringe exchange and telephone helplines. Germany records information on methadone dispensing at a regional level in addition to the national level, and a source in Portugal collects social service data from several major cities. In the two cases where this information is provided, the Focal Points actively obtain the data on a routine basis.

These sources tend to record the clients' gender and age and in some cases also their nationality or geographical distribution. In addition, the telephone helpline and methadone dispensing information sources in Belgium also record the main drug and associated products consumed as well as how these drugs were used.

Availability at local level

The Netherlands has one source collecting information on methadone dispensing in Amsterdam that records the clients' gender, age and nationality. Sweden's information system on syringe exchanges in Stockholm includes the gender, age, geographical distribution and HIV status of injecting drug users exchanging syringes. In both cases the Focal Points receive the data in a passive way.

Survey data - Availability at regional level

Belgium has conducted school and youth surveys at regional level, while the United Kingdom has carried out general population and school surveys at regional level in addition to a school survey conducted at national level. No information was available from Belgium on how the Focal Point accesses these data. The British Focal Point collects general population data and school data on request.

Availability and quality at local level

Belgium, Greece, the Netherlands and the United Kingdom report on the availability of local

surveys. In these cases the Focal Points tend to receive the data in a passive way. Multi-source, case-finding type studies and prevalence estimates of hidden populations at local level are slightly more frequent than at other levels, reported by five countries (Finland, France, the Netherlands, Sweden and the United Kingdom). Finland conducted a multisource case-finding study, as well as Sweden, which mapped drug abusers in Stockholm and simultaneously carried out an ethnographic study and prevalence estimate. Prevalence estimates of drug misuse in Dundee and injecting drug users in Glasgow and Edinburgh were conducted in the last year. Ethnographic studies on cocaine/crack consumption and sexual works were conducted in Paris, and Rotterdam runs a drugs monitoring system which includes ethnographic studies.

2.4.4 In summary - availability of local and regional data

The availability of local drug data appears to vary widely across the European Union. Where regional data is included in the studies, analysis is mainly restricted to describing differences in prevalence rates between regions. There is greater availability of other epidemiological data such as hospital treatments data and public health data, available through the focal points, however the coverage of this data is also variable.

A second problem for displaying geographic data is that it aids interpretation if the data is available in standardised spatial areas. Torbiorn Carlquist discussed the importance of this in the previous network meeting (detailed in the previous periodic progress report). He described the EUROSTAT GISCO project, which is a link between statistics and geography. Its aim is to ensure standardisation and harmonisation in the geographical information exchange process between Member States and Eurostat. EUROSTAT's standard geographic areas key concept is NUTS (Nomenclature des Unités Territoriales Statistiques). Table 5 shows the NUTS structure. Ideally future analysis of drug use would be linked to the NUTS classification. However at the present time, drug data have to be accessed at whatever level they are available.

Table 5. Analysis of NUTS classification

Territorial Unit	Level	Number of regions
Major zones	1	78
Macro regions	2	211
Smaller regions	3	1093
Districts	4	(1446)
Municipalities	5	98544

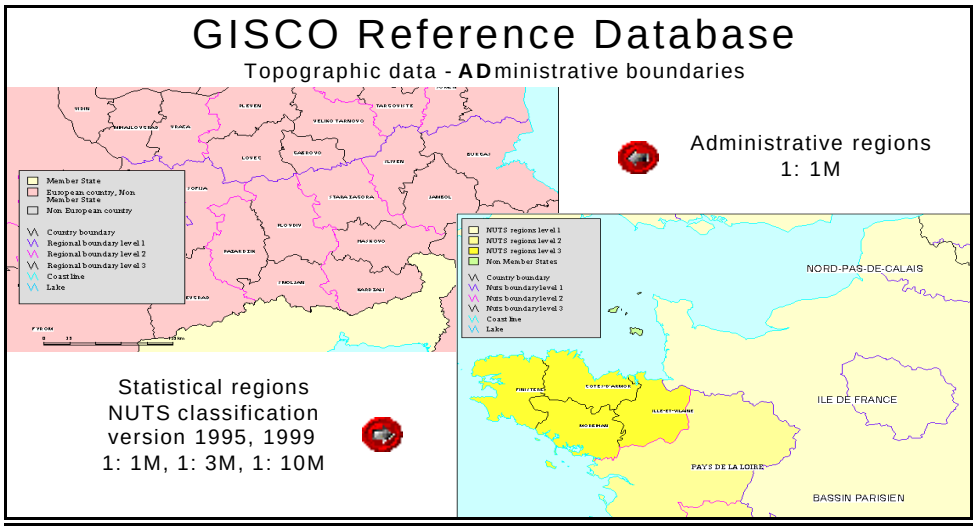

Figure 5. Example of NUTS classification

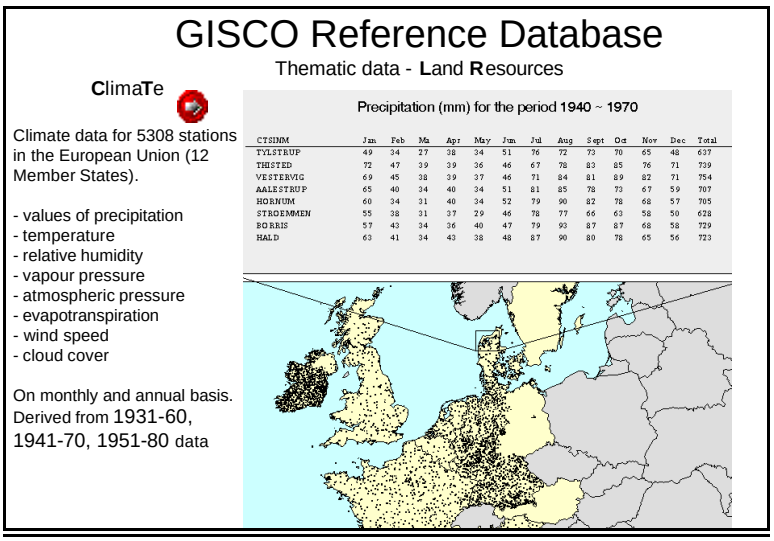

Figure 6. Example of mapped data using GISCO reference database

2.5 Models of geographic diffusion.

The Oxford University Dictionary of Geography defines diffusion as the widespread dispersal of an innovation from a centre or centres. This innovation may be anything from an epidemic disease to a political belief. However various types of diffusion have been recognised.

Hierarchic diffusion passes through a regular sequence of orders as when an innovation in a metropolis spreads out to cities, then towns, and finally to villages. The DIPEP model currently operates using a hierarchic diffusion process. The spread is assumed to start in the largest population area, and then spread with equal speed to similarly sized population centres. At present the diffusion is determined solely by the size of the population centre. However now that the model has been incorporated into a GIS, it will be possible to alter the method of diffusion.

Other possible diffusion models that could be used are either an expansion or relocation diffusion. Expansion diffusion is the spread of a factor from a centre with the concentration of the things being diffused also remaining, whilst intensifying, at the point of origin. Relocation diffusion similarly spreads from a centre but the innovation moves outwards, leaving the centre.

Although the selection of a specific model will be difficult, as it is not known which method occurred in reality, various models can now be tested and the results compared.

DIPEP has recently been fully integrated into the GIS (figure 7 to 9). These alterations will allow DIPEP to be run for any geographic area where population information is available. The incorporation of DIPEP into ARCVIEW also allows the addict span and the susceptible populations to be altered (figures 7 and 8).

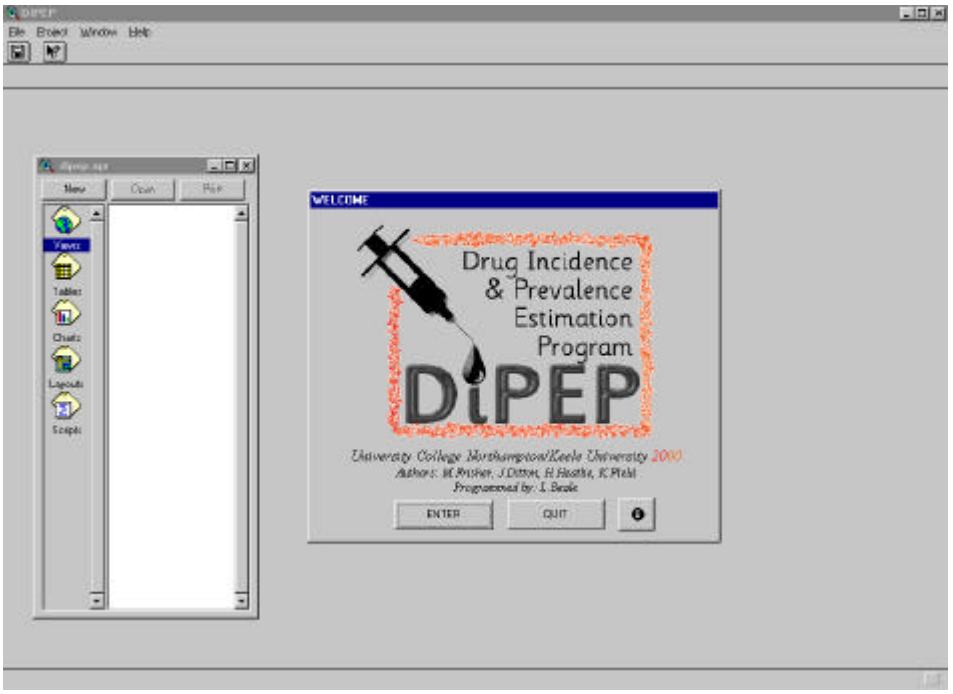

Figure 7: ARCVIEW GIS and DIPEP opening screen

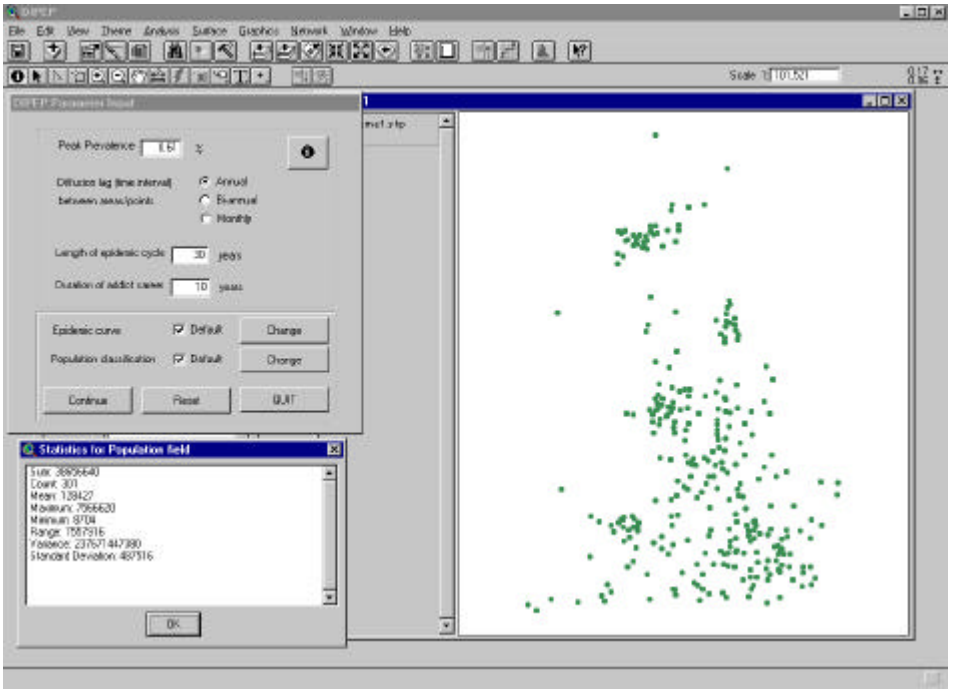

Figure 8: DIPEP Point population data for the United Kingdom

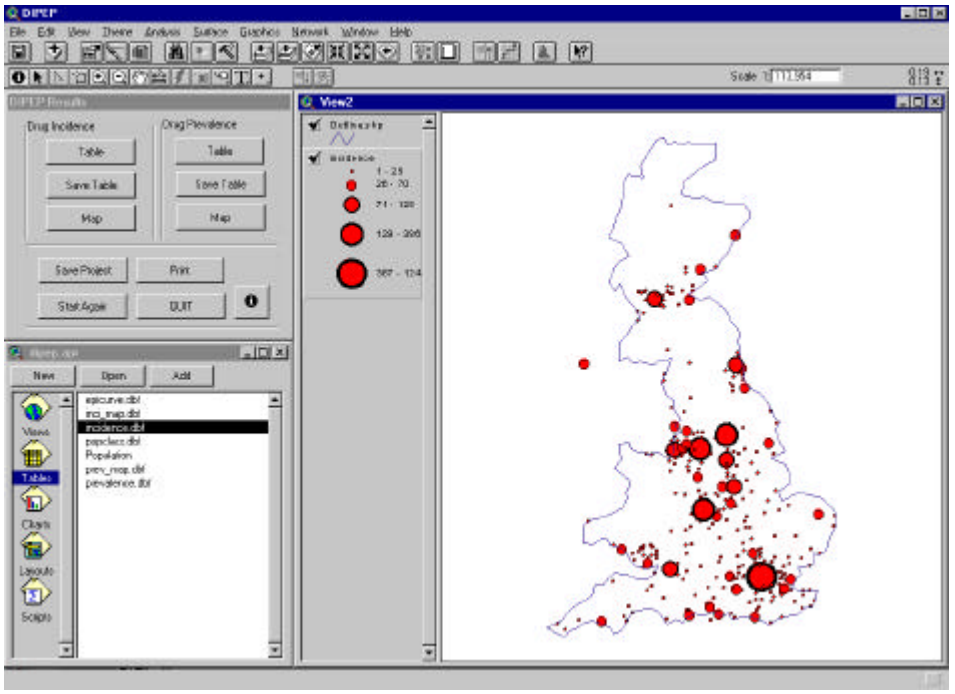

Figure 9: DIPEP Point incidence map for population centres in the United Kingdom

Two of planned the DIPEP alteration have still to be achieved, these being a) allow for variations of geographic diffusion, and b) addition of demographic factors to the DIPEP program. The selection of a method to model geographic diffusion, discussed briefly in section 4.2, is still not clear, although it is now possible to experiment with various methods. Both these previous objectives will be carried forward into the next six month period. These together with the other objectives for the network were listed previously in section 1.

3. Dissemination of results

3.1 Publications

1. Ditton J, Frischer M. Computerised projection of future heroin epidemics: a necessity for the 21st century? *Journal of Substance Use and Abuse*. 2001; 36(1-2), 151-66
2. Frischer M, Heatlie HF. (Keele University) 2001 Modelling drug misuse in Europe using geographical information systems. In Godfrey C, Sutton M. Modelling drug use: methods to quantify and understand hidden processes, EMCDDA Scientific Monograph Series No 2. Council of Europe, Lisbon, EMCDDA, ISBN 92-9168-056-7
3. Frischer M, Anderson S, Hickman M, Heatlie H. Diffusion of drug misuse in Scotland: Findings from the 1993 and 1996 Scottish Crime Surveys. *Addiction Research* (in press).
4. Rossi C, Wiessing L (University of Rome and EMCDDA) Incidence indicators for policy making: models, estimation and implications.

3.2 Presentations

A paper entitled 'Modelling the impact of harm reduction on the incidence and prevalence of drug misuse' by Martin Frischer and Heath Heatlie was presented at the International Conference on Harm Reduction, Jersey April 2000.

While many harm reduction programmes aim to reduce the incidence and prevalence of drug use, their impact is rarely specified and often assessed through indirect methods such as population surveys. We have developed an approach to forecasting incidence and prevalence based on the premise that drug misuse spreads in a similar manner to an infectious disease and that harm reduction is analogous to an immunisation or treatment programme. The key parameters in the Drug Incidence & Prevalence Estimation Program (DIPEP) are the length and peak of the epidemic cycle, duration of addicts' drug use and the anticipated diffusion between population centres. The output can be linked to a Geographical Information System (GIS) to illustrate changes in drug misuse incidence and prevalence. The programme is currently being enhanced so that policy makers will be able to visualise the predicted impact of harm reduction programs on incidence and prevalence patterns. For example, a harm reduction programme which reduced the average career of a drug user from 8 years to 4 years, for an epidemic starting in 1990 would reduce the prevalence of drug use in England in the year 2000 from an estimated 208,000 to 164,000.

This theme was developed in a paper demonstrating the use of DIPEP for forecasting the effects of harm reduction policies was being presented at combined APSAD and national

methadone conference, Melbourne 20-22 November 2000. Full details of this presentation are given in appendix 8.

APSAD and national methadone conference, Melbourne 20-22 November 2000.

Title: Monitoring the impact of drug prevention and harm reduction on the prevalence of drug misuse in the population. (Martin Frischer, Jason Ditton and Heath Heatlie)

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. Based on empirical observations of the spread of drug use in the United States in the 1970s we have developed a computer program, which simulates the diffusion of drug use. The key parameters in the Drug Incidence & Prevalence Estimation Program (DIPEP) are the length and peak of the epidemic cycle, duration of addicts' drug use and the anticipated diffusion between population centres. 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 which may diffuse in different ways. The programme is currently being linked to a Geographical Information System which will help policy makers to visualise the effect of drug polices, both retrospectively and prospectively, throughout the country.

A paper demonstrating the GIS model was presented by Ken Field at the ESRI International User Conference 2001 in San Diego, USA. This is a large GIS users conference:
ESRI International User Conference 2001 in San Diego. Using a GIS to forecast the diffusion of drug misuse Ken Field, Heath Heatlie, Martin Frischer.

Current methods for estimating incidence, prevalence and spread of drug misuse tend to be retrospective and are not capable of forecasting spatio-temporal trends. Mapping of drug

misuse is therefore restricted to displays of incidence and prevalence rates. This paper details the development of a GIS drug misuse system to create a dynamic model for forecasting and displaying spatio-temporal trends and linking environment with behaviour. It includes a range of parameters to model drug misuse and its geographic spread across a population using data for the UK as a basis for developing a European wide forecasting system.

The GIS approach reported here provides the basis for examining more complex geographic diffusion scenarios such as the introduction of new practices by new users, the development of education and remedial initiatives, impacts of tourism and migration, cross-border contact, drug transportation, and increasing opportunities for economic and international contact.

4. Contributions by network members.

Presentations

Frischer M. & Heatlie H. (Keele University) New methods for estimating the prevalence of drug misuse, epidemiology for sustainable health, The XV international scientific meeting of the international epidemiological association, Florence, 1999, 1: p374

Heath Heatlie (Keele University) Using GIS For The Analysis And Estimation Of Drug Misuse, UN Journal special workshop, "Dynamic Drug Policy," Vienna, May 22-24 2000.

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 2001.

Martin Frischer (Keele University), Demonstrating the use of DIPEP for forecasting the effects of harm reduction policies. Presented at combined APSAD and national methadone conference. Melbourne 20-22, November 2000

Ken Field (Northampton University), Using a GIS to forecast the diffusion of drug misuse. San Diego, 21 June 2001

Publications

Ditton J, Frischer M. Computerised projection of future heroin epidemics: a necessity for the 21st century? *Journal of Substance Use and Abuse*. 2001; 36(1-2), 151-66

Frischer M, Heatlie HF. (Keele University) 2001 Modelling drug misuse in Europe using geographical information systems. In Godfrey C, Sutton M. Modelling drug use: methods to quantify and understand hidden processes, EMCDDA Scientific Monograph Series No 2. Council of Europe, Lisbon, EMCDDA, ISBN 92-9168-056-7

Frischer M, Anderson S, Hickman M, Heatlie H. Diffusion of drug misuse in Scotland: Findings from the 1993 and 1996 Scottish Crime Surveys. *Addiction Research* (in press).

Rossi C, Wiessing L (University of Rome and EMCDDA) Incidence indicators for policy making: models, estimation and implications.

Supply and mapping of local prevalence data

Lucas Wiessing (EMCDDA) Heath Heatlie (Keele University)

Investigate possibility of mapping EU regional data from EMCDDA survey data

Martin Frischer (Keele University), Heath Heatlie (Keele University), Torbiorn Carlquist (Eurostat GISCO)

Updating and improvement of DIPEP

Ken Field (Northampton University), Heath Heatlie (Keele University)

Compilation of report
Martin Frischer (Keele University), Heath Heatlie (Keele University)

Website http://www.northampton.ac.uk/aps/env/dipep/dipep.htm
Ken Field (Northampton University)

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Ditton J, Frischer M. Computerised projection of future heroin epidemics: a necessity for the 21st century? *Journal of Substance Use and Abuse*. 2001; 36(1-2), 151-66

European Monitoring Centre for Drugs and Drugs Addiction (EMCDDA). Improving the Comparability of General Population Surveys on Drug Use in the European Union. Lisbon: EMCDDA, December 1997

EMCDDA (1997) Second report on sources of epidemiological data available to the focal points of the fifteen member states of the European union, June 1997

EMCDDA (1997). Improving the Comparability of General Population Surveys on Drug Use in the European Union. Lisbon: EMCDDA, December 1997

EMCDDA (1998) Feasibility study of the implementation of the proposals given in the final report of REITOX sub-task 3.3 - to improve the quality and comparability of data on drug-related deaths, EMCDDA project CT.97.EP.08, July1998

Frischer M, Heatlie H. (1999) New methods for estimating the prevalence of drug misuse. XV *International Scientific meeting of the International Epidemiological Association.* Florence, Italy Volume 1, 374.

Haggett P. (1994) Geographical aspects of the emergence of infectious diseases. *Geografiska Annaler* B; 76, 91-104.

Hunt LG, Chambers CD. (1976). The heroin epidemics: a study of heroin use in the United States, 1965-1975. Spectrum Books, New York.

Ramsay M., Spiller J. (1997) *Drug misuse declared in 1996: latest results from the British Crime Survey.* A Research and Statistics Directorate Report. London: Home Office.

Sandwijk J.P., Westerterp I., Musterd S. (1988) *Het gebruik van legale en illegale drugs in Amsterdam. Verslag van een prevalentie-onderzoek onder de bevolking van 12 jaar en ouder.* Amsterdam: Instituut voor Sociale Geografie, Universiteit of Amsterdam.

Appendices

Working group no: 2b (Geographic spread of problem drug misuse)

Title: Pilot project to develop a model of geographic spread of drug misuse in the European Union.

Coordinators: Martin Frischer, Heath Heatlie

Participants: Mathew Hickman, Carla Rossi, Paulo Penna, Catherine Comiskey, Jaap Toet, Ken Field, Giovanna Jona Lasinio, Torbiorn Carlquist, Alberto Teixeira

SUMMARY OF KEY POINTS IN THE APPENDICES

1. Demonstration of the integrated GIS drug forecasting program (Ken Field)
2. Exploration and modelling of drug misuse in Italy: a space-time approach (Giovanna Lasinio)
3. Thoughts for future drug misuse mapping (Mathew Hickman)
4. Mapping the incidence of problem drug use in a Neighbourhood – The Hardcore Population of Drug Users in "Casal Ventoso" (Alberto Teixeira)
5. Using socio-economic indicators for prevalence estimates (Petra Kuemmler)
6. Presentation of Eurostat data and GIS work (Torbiorn Carlquist)
7. Dissemination Eurostat data and GIS work
8. Presentation of DIPEP for assessing harm reduction policies

SUMMARY OF KEY POINTS IN THE APPENDICES

- Appendix 1: An example of the group's computerised model of geographic spread of drug use is shown in Figure 2 (page 4). The model may be viewed at http://www.northampton.ac.uk/aps/env/dipep/whatis.htm.
- Appendix 2: By mapping influence regions we can picture how different counties interact with respect to a given phenomenon. Figure 6 (page 5) shows the influence regions in North West Italy. The method allows mapping of multivariate phenomena and their evolution in time and their spatial behaviour. We can include, simultaneously, qualitative and quantitative aspects in the analysis. The method allows a complete description of phenomenon using few dimensions and it gives us information on the spatial interactions.
- Appendix 3: Epidemiological analyses of other data sets (e.g. cancer registrations) have found that mapped differences depend on the unit of analysis chosen and often disappear when different units are chosen. A methodology for dealing with this problem has been developed known as Bayesian analysis. (see figure 5, page 7). Where national or regional patterns of drug use are presented, more consideration needs to be given to statistical techniques for smoothing data in order to eliminate the effect of the area of aggregation.
- Appendix 4: By examining Casal Ventosteo (Lisbon) , we can evaluate an intervention programme that happen in the site. At the present time a large number of buildings are demolished, and the families lodge in news apartments in the other side of the valley. Services in the neighbourhood have increase and are more diversified. Maps help in visualising the relationship between environment and drug use in this area (see figure 7, page 11).
- Appendix 5: Mapping of national and regional drug use depend on available estimates. In the long run, the most promising method seemed to be the multivariate indicator method, which integrates information from different sources. It requires a breakdown of this information (offences, drug-related deaths, treatment demands, etc.) by region. At the present time there is no evident connection between social indicators and drug prevalence.
- Appendix 6: Eurostat collects European data at regional level and has facilities for spatial mapping. GISCO promotes geo-referencing of statistics and encourage the integration of GIS 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.
- Appendix 7: Drug policy implementation needs to be evaluated, to set up more efficient control strategies of drug related phenomena and to forecast future service needs. In the northern and border regions of Italy, where the heroin epidemic is older, the most cost-effective interventions that should be planned are related to health care and rehabilitation, whereas in the regions where the epidemic started later, such as for example Sicilia, also prevention can still have a large impact.
- Appendix 8: The key parameters in the Drug Incidence & Prevalence Estimation Program (DIPEP) are the length and peak of the epidemic cycle, duration of addicts' drug use and the anticipated diffusion between population centres. 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.

Appendix 1: Demonstration of the integrated GIS drug forecasting program

Dr Ken Field, Lecturer in GIS & Cartography, University College Northampton

This presentation encompasses three topics:

1. Developing flexible DIPEP
2. Linking DIPEP to GIS
3. Preliminary results (map-animate)

1. Developing flexible DIPEP

The original DID was written in PASCAL for a DOS environment. The program is being upgraded to a Windows Environment using Microsoft Excel. Within the existing resources all the base parameters are now in Excel although some are currently fixed. Further resources are required for full functionality to be achieved. Figure 1 shows the programme interface.

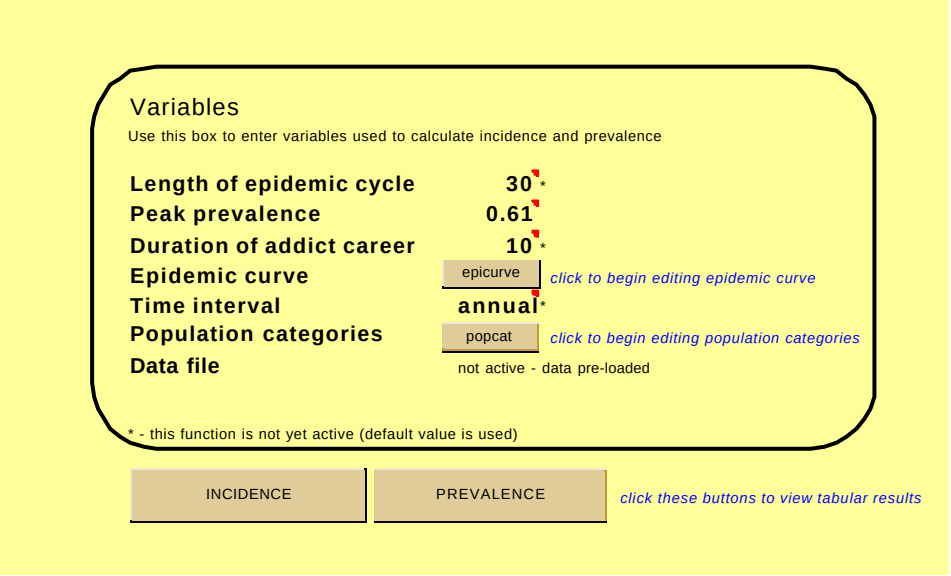

Figure 1. Excel program interface for drug prevalence estimation program.

2. Linking DIPEP to GIS

This process is not yet automated. At present the results of the Excel program are transferred to ARC-Info for further analysis.

3. Preliminary results

An extract of the dynamic presentation is shown below. As can be seen the program shows different stages of a drug epidemic. The symbols are proportional to the estimated number of drug user.

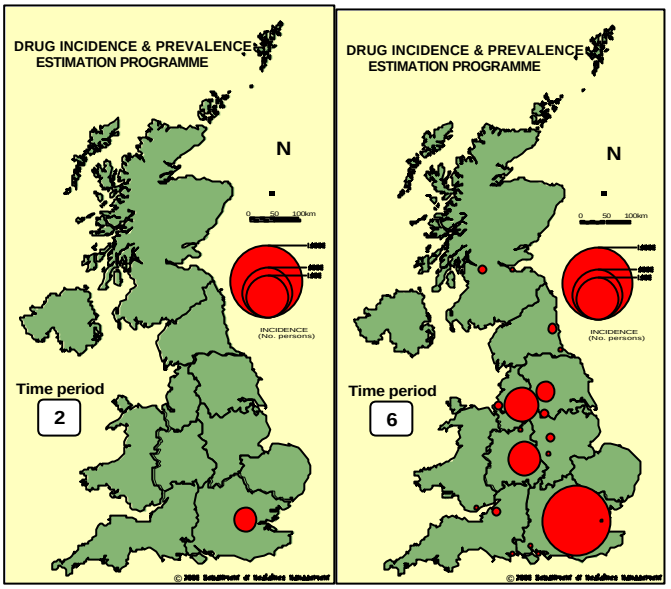

Figure 2. Years 2 and 6 of a projected UK drug epidemic.

Appendix 2: Exploration and modelling of drugs misuse in Italy: a space-time approach

Giovanna Jona-Lasinio University of Rome "La Sapienza", Silvia Artemi University of Rome "La Sapienza", Carla Rossi University of Rome "Tor Vergata"

Using the technique described below we are able to define regions around each observed location in which all the sites are highly correlated. We call these regions - influence regions. By mapping influence regions we can picture how different counties interact with respect to a given phenomenon. The influence regions are defined by the following equation:

$$R(s_i) = \left\{ s_j : d(s_i, s_j) \leq h_1^* \right\}$$

Three datasets have been built using incidence of AIDS classified by risk groups and few auxiliary information ("social status", sex, age groups) (COA - ISS). One refers to the county of residence of the patient and the second to the county where the diagnose has been registered. The time period is 1982-1997. By mapping influence regions we can picture how different counties interact with respect to a given phenomenon.

The dataset in this study is based on HIV among injecting drug users. We removed the variable on the income as the quality of the data is very poor and we added a finer classification for the heterosexual risk group.

This type of distance has been built defining as neighbours counties that are "easily" connected (good railroad service, highways etc.). We can include any kind of auxiliary information in the definition of neighbourhood and then we are able to take into account qualitative aspects that may help the understanding of interactions between observed sites.

Figure 3 shows the diffusion of drug use from northern Italy to central regions.

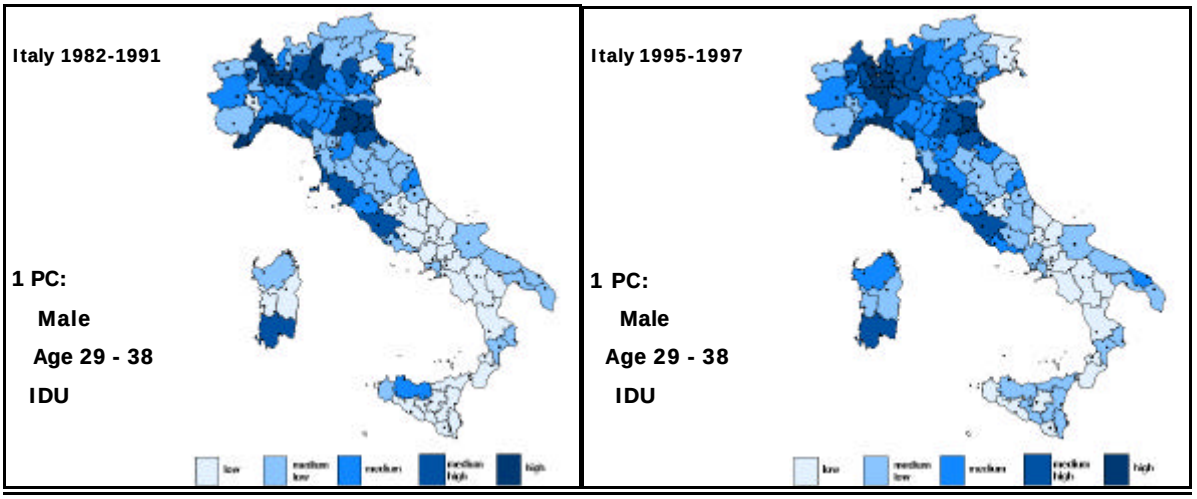

Figure 3. Diffusion of drug use across Italy

Our method allows to map multivariate phenomena and to describe their evolution in time and their spatial behaviour. We can include, simultaneously, qualitative and quantitative aspects in the analysis. The method allows a complete description of phenomenon using few dimensions and it gives us information on the spatial interactions.

Appendix 3: Using Bayesian analysis to smooth drug related data

Mathew Hickman, Imperial College, London

So far the presentations have assumed that variations in mapped data refer to real differences in incidence or prevalence of drug use. However, epidemiological analyses of other data sets (e.g. cancer registrations) have found that mapped differences depend on the unit of analysis chosen and often disappear when different units are chosen. A methodology for dealing with this problem has been developed known as Bayesian analysis. This involves 'smoothing' raw data by taking account of the data in surrounding regions. When UK heroin and methadone deaths are smoothed, areas of low mortality move towards the mean.

This technique can also be applied to localities. The figure below shows that in London, some areas of high heroin mortality, display lower levels after smoothing.

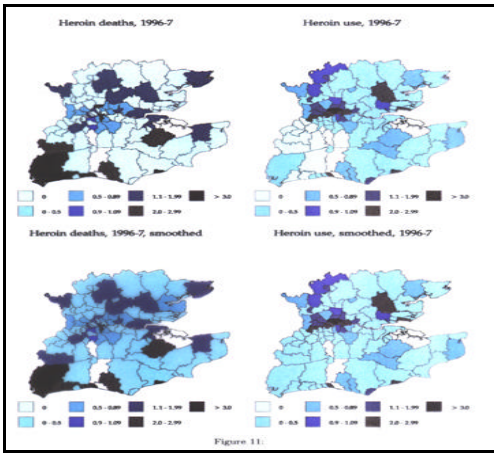

Figure 4. Smoothed drug related deaths in London

Summary

Where national or regional patterns of drug use are presented, more consideration needs to be given to statistical techniques for smoothing data in order to eliminate the effect of the area of aggregation.

Appendix 4: Mapping the incidence of problem drug use in a Neighbourhood. – The Hardcore Population of Drug Users in “Casal Ventoso” (Lisbon)

RIBEIRO, Jorge (Pilot Project)) TEIXEIRA, Alberto

Introduction

Local demographic factors, economics, social and organisational data’s, community attitudes, have a significant influence in the drug misuse problem and can be represented in a space-time model using GIS. This presentation is based on the Portuguese report by Prof. Jorge Ribeiro to the Pilot project to estimate time trends and incidence of problem drug use in the European Union CT.98.EP.07).

The site of study -CASAL VENTOSO (Lisbon)

In the context of drug use, in Portugal, as described above, there is a site in Lisbon, called “Casal Ventoso”, that is the specific object of this pilot project.

To get an idea of its immediate scenario where the "hardcore" population of drug users move and live, it is important to have some contextual data. In Portugal, this site is a paradigmatic place of this type for "hardcore" drug users. Dr. Jackob Hartman, a psychiatrist from the Netherlands with experience in dealing with drug abusers, noted that he had never seen anything like this in Europe. "It can only can be compared with what I have seen in The Bronx, in the City of New York, many years ago."

“Casal Ventoso” is a neighbourhood of the Parish of “Santo Condestável”, located in the city of Lisbon. It is well known because of drug traffic and drug use activity. There, you can find many "hardcore" drug users. Some are of the type of "come and go"; others live there in huts, or as homeless. Lately, some of those huts have been demolished.

The area is characterised by high population density in relation to other parishes and proximity to the river. It is crossed by important roads and a railway, in a context of poverty, exclusion, and a very old household area, with lowest household prices in hard accessibility;

closed by the old harbour, a wood park for prostitution, bar and pubs for alcohol consumers - are all the necessary ingredients to the emergence of an alternative economy.

Of the dwellings in Casal Ventoso, 74% were built before 1945, and 18% between 1985 and 1991. A large number of households have no toilets (18%), electricity (20%), water (32%) or a bathroom (45%). Curiously the critical zone – a place inside the neighbourhood, who the traffic is more intense – has relative better conditions.

Data

Emergency phone calls because of overdose

In 1997, the "Instituto Nacional de Emergência Médica" (INEM), through its division, "Centro de Operações de Desintoxicação e Urgências" (CODU), in the enlarged Metropolitan area of Lisbon, registered 1 041 emergency phone calls because of overdose. The parishes "Santo Condestável" and the contiguous one, "Alcântara", in which the neighbourhood "Casal Ventoso" is located, account for 42.8% of the total emergency phone calls that is, 445 of 1041 calls. However, if you estimate the percentage of those 445 calls in the context of the emergency calls for that reason only in the city of Lisbon (680), they represent 65,4% of them that is, almost 2/3 of such emergency requests. The maps clearly show how the concentration of requests comes from that site of "Casal Ventoso".

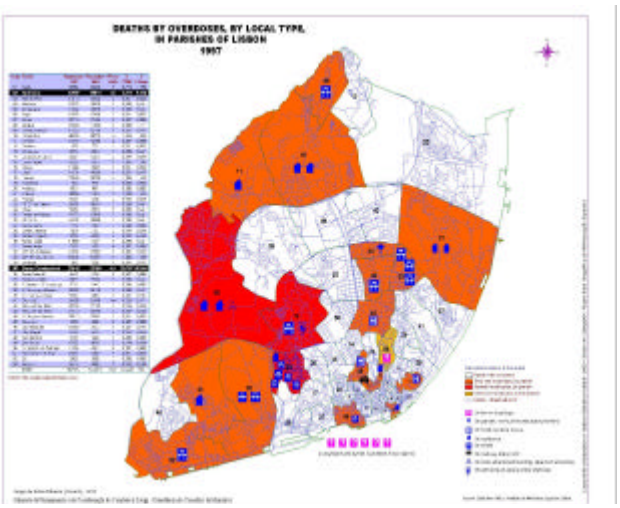

Figure 5. Overdose deaths in Lisbon, 1997

Deaths by overdose

The residences of 59 deaths in 1997, at metropolitan area, are, essentially, from parishes with degraded residential areas. 19% of those deaths have occurred in the site: 5 in the street, 5 in abandoned buildings or huts and 1 in a residence.

Time analysis

By examining Casal Ventosteo, we can evaluate an intervention programme that happen in the site. At the present time a large number of buildings are demolished, and the families lodge in news apartments in the other side of the valley. Services in the neighbourhood have increase and are more diversified. Maps help in visualising the relationship between environment and drug use in this area.

Appendix 5: Using socio-economic indicators for prevalence estimates.

Petra Kuemmler, IFT, Munich

Mapping of national and regional drug use depend on available estimates. This presentation illustrates the potential for using the output of another EMCDDA project (CT.97.EP.04) for GIS mapping. The table shows national prevalence estimates based on a variety of methods. The multiple indicator has potential for GIS analysis as the national estimates are based on the cumulation of regional estimates.

Table 1. Summary of results for the different methods used in the study: Prevalence rates per 1000 inhabitants in the age range 15-54

Country	Multiplier Treatment data	Multiplier Police data	Multiplier Mortality data	Capture-recapture	Multivariate Indicator	Back calculation (BC)	Other Methods
Target group	**Problematic opiate users**	**Problematic opiate users**	**Problematic opiate users**	**Problematic opiate users**	**Problematic drug users**	**Intravenous drug users**	
Austria							
Belgium							3.6[c)]
Denmark			4.1[7)]			3.4	
Finland[6)]	0.6-0.8		1.4-2.9	3.0-5.0			
France	4.8	5.1				3.8-4.8	5.4[d)]
Germany	2.1-3.1	3.1-3.7[3)]	1.8-2.5				
Greece							
Ireland			2.3-3.8	3.1-6.7[2)]		4.2	
Italy	9.3	5.3		9.1	7.7[5)]	10.1	7.4[d)]
Luxembourg		8.2[1)]					8.6[1,d)]
Netherlands	2.8-3.2						
Norway			2.9-4.2[8)]				
Portugal							
Spain[a)]							
Sweden				0,4-0,7[3,b)] 1,9-2,6[4,b)]			
UK	8.3-10.5		2.7-5.5		8.4-8.9		8.1[d)]

In the long run, the most promising method seemed to be the multivariate indicator method, which integrates information from different sources. It requires a breakdown of this information (offences, drug-related deaths, treatment demands, etc.) by region. This causes problems because the administrative structures in a country do not always support this type of breakdown. Additionally, for two or three regions reliable prevalence estimates are necessary.

The multiple indicator method can also use social indicators rather than drug indicators. As such data are more readily available (eg from Eurostat) this would faciliate mapping. However initial analyses are not encouraging. The national prevalence project has not found that SE variables are good surrogates for drug use. Second, the presentation from Eurostat did not promise immediate benefits. The table below shows large discrepancies between estimates based on drug indicators and those based on social indicators. Whereas the drug indicators are intercorrelated those for social indicators are not. At the present time there is no evident connection between social indicators and drug prevalence.

Table 2. Influence of socio-economic variables of drug prevalence estimates.

		West-Germany	
Indicators used	**Variables**	**Prevalence**	**Difference**
Number of offences, drug-deaths, number of clients	A-E		
Number of AIDS cases, drug-related convictions		97,833	ref.
A-E + unemployed persons	A-E + K	78,345	-19,488
A-E + housing density	A-E + H	103,145	5,312
A-E + crimes against property	A-E + I	81,318	-16,515
A-E + mobility	A-E + J	72,514	-25,319
A-E + housing density, crimes against property			
Mobility and unemployed persons	A-E + H-K	61,059	-36,774
Social indicators	H-K	210,470	112,637
Social indicators without unemployed (=NL)	H-J	147,853	50,020

Appendix 6: Presentation of Eurostat data and GIS work

Torbiorn Carlquist

Eurostat collects European data at regional level and has facilities for spatial mapping. This presentation described the GISCO project, which is a link between statistics and geography

GISCO promotes geo-referencing of statistics and encourage the integration of GIS. Its aim is to ensure standardisation and harmonisation in the geographical information exchange process between Member States and Eurostat and co-ordinates the participation of European statisticians in GI and GIS activities. The structure and role of GISCO are shown in the figures below.

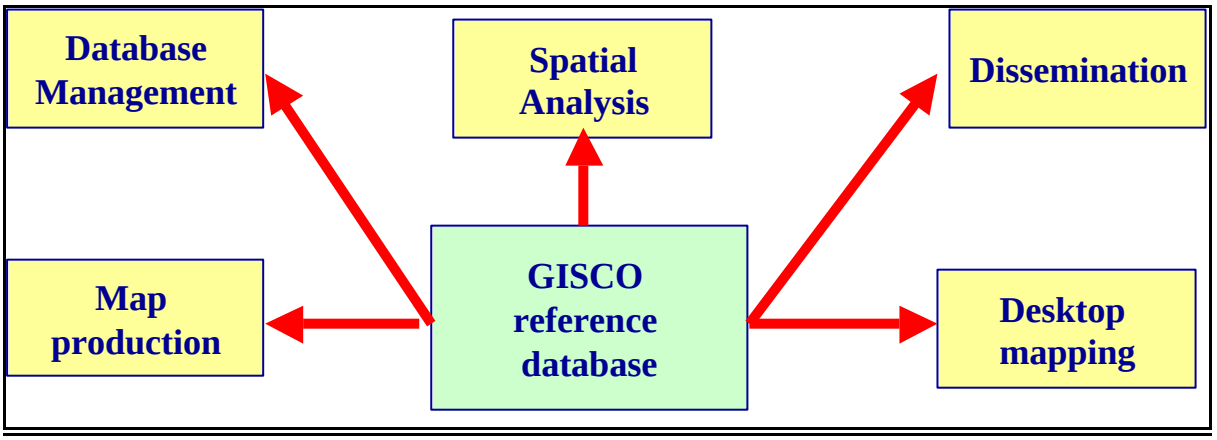

Figure 6. The role and remit of GISCO within Eurostat.

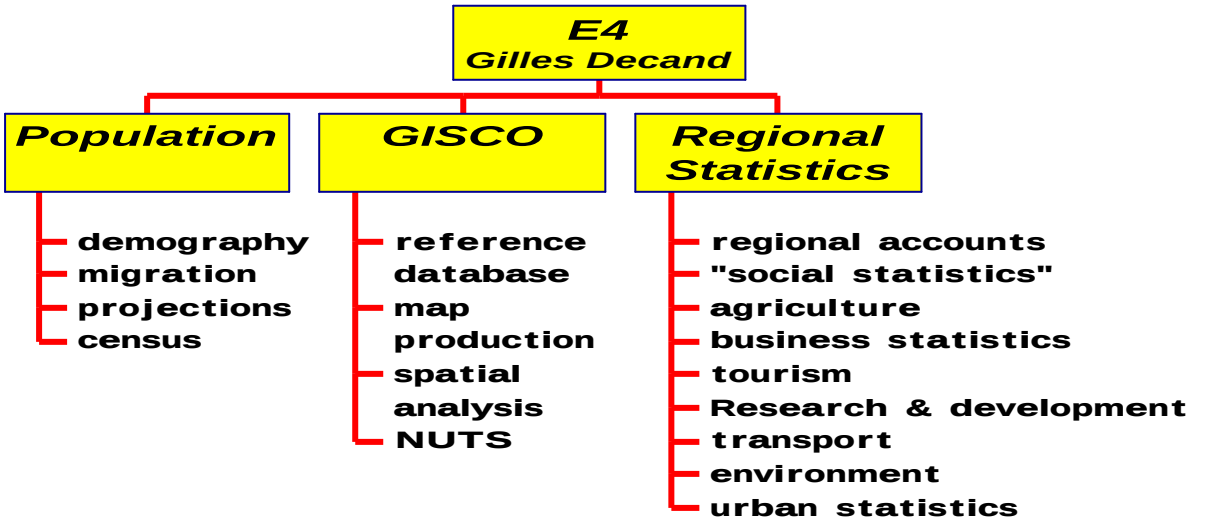

Figure 7. How GISCO relates to other Eurostat functions.

The key concept is NUTS (Nomenclature des Unités Territoriales Statistiques). Table 4 shows the NUTS structure. Ideally future analysis of drug use would be linked to the NUTS classification. However at the present time, drug data have to be accessed at whatever level they are available.

Table 3. Analysis of NUTS classification

Territorial Unit	Level	Number of regions
Major zones	1	78
Macro regions	2	211
Smaller regions	3	1093
Districts	4	(1446)
Municipalities	5	98544

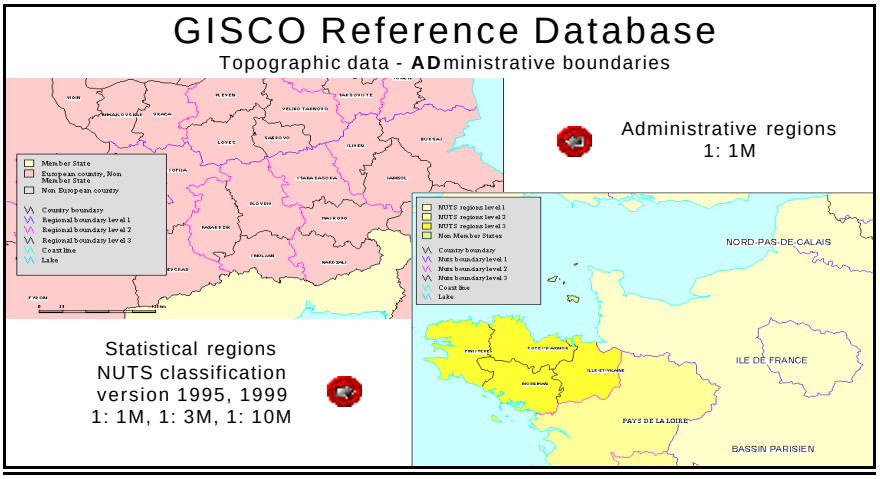

Figure 8. Example of NUTS classification

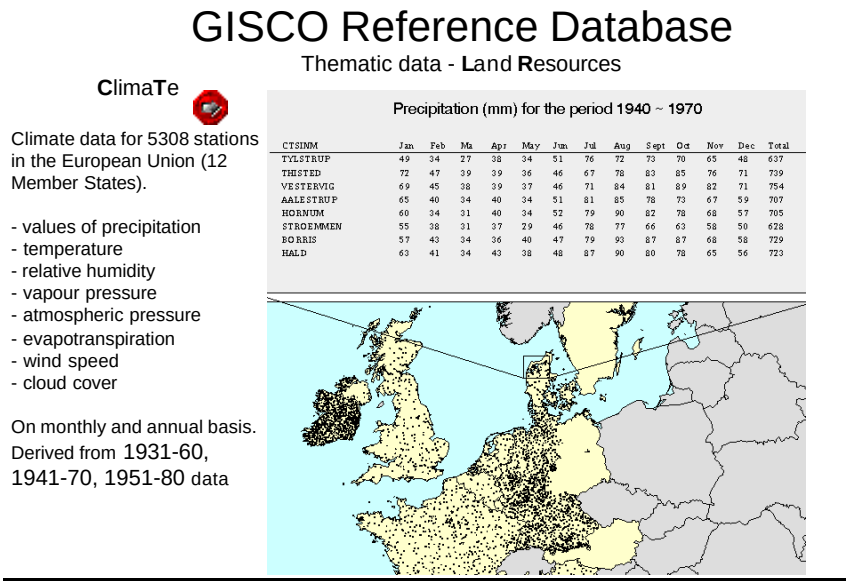

Figure 9. Example of mapped data using GISCO reference database

Appendix 7: Incidence indicators for policy making: models, estimation and implications

Prof Carla Rossi, University of Rome paper titled Incidence indicators for policy making: models, estimation and implications.

INCIDENCE INDICATORS FOR POLICY MAKING: MODELS, ESTIMATION AND IMPLICATIONS

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This extract describes the work relating to geographical mapping.

1. Introduction.

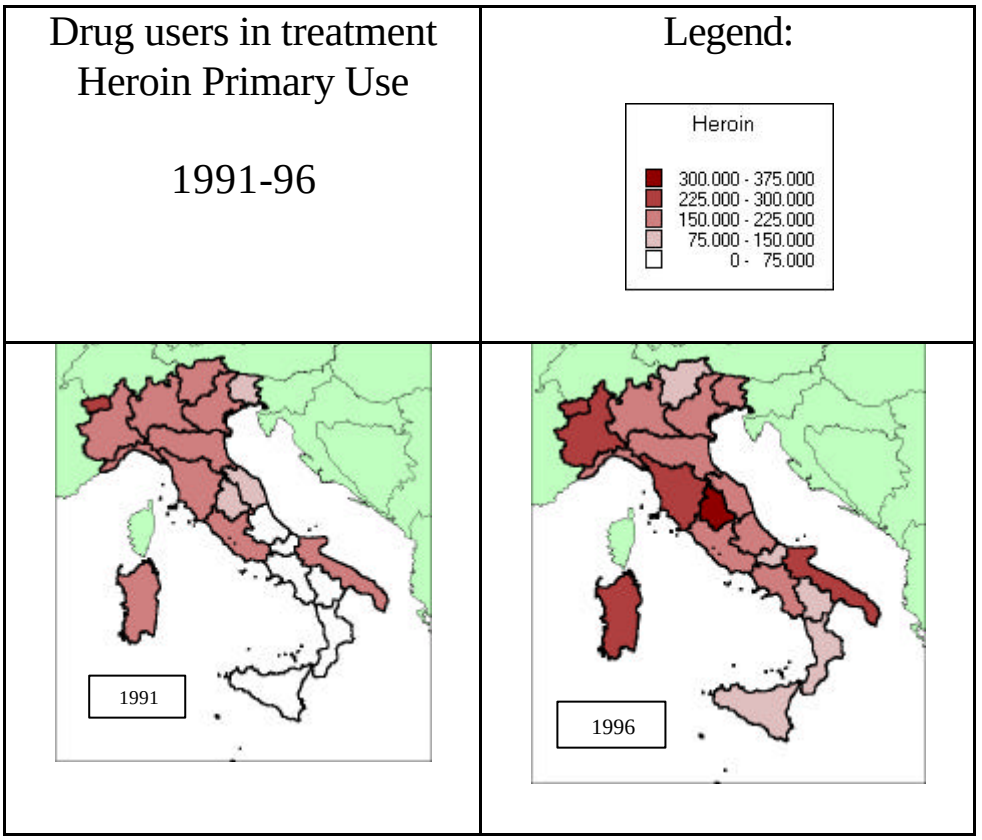
In the present paper one among the most recent methodologies to estimate hidden onset incidence is presented and used to describe the heroin epidemic in Italy. In Section 2 the basic concepts are presented. In Section 3 the method is developed and the data needed for the application are described. In Section 4 the method is applied to study the heroin epidemic in Italy.

2. A case study: the heroin epidemic in Italy.

Heroin by injecting caused, during the ‘80s and ‘90s, the majority of consequences for both health and criminal justice departments in Italy (EMCDDA, 1999b; UNDCP, 1997; Italian Focal Point, 2000). The number of people between the ages of 15 and 54 who have used heroin at some time in their life is estimated to be not less than 300,000 people (Ravà and Rossi, 1999; Rossi, 1999b). Thus, in the following a description of the heroin epidemic based on official statistics and an application of the EB-BC method is focussed on estimating the onset incidence curve of just heroin use, are reported.

Our results allow to state that, in the northern and border regions, where the heroin epidemic is older, the most cost-effective interventions that should be planned are related to health care and rehabilitation, whereas in the regions where the epidemic started later, such as for example Sicilia, also prevention can still have a large impact. Further comments on policy implication are reported elsewhere (Ravà et al, in preparation). The EB-BC method has been recently applied to therapy incidence data from Amsterdam obtaining quite interesting results and comparisons (Ravà et al., 2000).

Figure 10 Ratio of drug users in treatment, grouped by region, with respect to the population of the region. Stratification by drug of primary use. The values are multiplied by one million (e.g. 100.000 in the legend of a map means 0.1%).



Appendix 8: Presentation of DIPEP for assessing harm reduction policies

MONITORING THE IMPACT OF DRUG PREVENTION AND HARM REDUCTION ON THE PREVALENCE OF DRUG MISUSE IN THE POPULATION

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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. Based on empirical observaions of the spread of drug use in the United States in the 1970s we have developed a computer program which simulates the diffusion of drug use. The key parameters in the Drug Incidence & Prevalence Estimation Program (DIPEP) are the length and peak of the epidemic cycle, duration of addicts' drug use and the anticipated diffusion between population centres. 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 which may diffuse in different ways.