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The prevalence of problematic drug use

Methodological aspects and feasibility in Belgium

by

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Abstract

Objective: *To assess the feasibility in Belgium of methods designed to estimate the extent of problematic drug use.*

Method: *The number of prevalent cases of problematic drug use may be estimated from information including data from police services, data from hospitals and specialised centres for the treatment of drug addicts, data from death certifications, data from the HIV/AIDS register, and data related to methadone consumption. The size of this population, at the national level, may be obtained with five calculation methods including (1) the multiplier method, (2) the capture-recapture technique, (3) the use of the basic relation between prevalence, incidence, and duration of a disease, (4) the use of methadone consumption data and (5) a multivariate method based on a principal component analysis of drug-related*

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indicators. Availability of theses data and feasibility of these methods in Belgium are investigated.

***Results**: Currently, the Belgian HIV/AIDS register appears to be the only source of data that could allow an estimate of the number of injecting drug users in Belgium. All the other sources of information do not provide enough reliable data. The major reasons for this situation are the law on privacy, which makes difficult to match persons appearing in different lists, lack of standardisation of the data on treatment demands recorded by the different monitoring systems operating in the different Regions and/or Communities of the country, and lack of knowledge of the coverage registration rate of these monitoring systems.*

***Conclusion:** A robust and consistent estimate of the prevalence of problematic drug use should ideally be based on estimates obtained by at least two different methods. Such robust estimate could not presently be achieved in Belgium and efforts must consequently be made to bridge this gap. In order to quickly obtain national prevalence estimates, the use of data on treatment demand appears to be the most promising approach in terms of feasibility.*

Keywords

Epidemiology, methodology, national prevalence, problematic drug use, Belgium.

Introduction

In the terminology of epidemiologists, the number of prevalent cases of drug use, or simply prevalence of drug use, refers to the number of drug users living at a given moment in a given area or country. The prevalence rate, i.e. the prevalence divided by the population at risk, gives the probability to be a drug user at a given moment in a given area or country. These prevalence indices thus assess the extent of the phenomenon of drug addiction and thereby provide relevant information to take decisions for public health actions, service provision and policy development. Indeed, the availability of this estimate reduces the energy wasted on arguments based on uninformed and unscientific points of view when a consensus about the dimension of the addiction phenomenon has to be established (1). Furthermore, the trend over time of the prevalence of drug use is another important epidemiological indicator

that has to be considered both in a public health perspective and in strategic considerations needed to implement a consistent drug policy.

The present paper focuses on the estimate of the size of the population of problematic drug users. It is divided into three main sections. The definition of the target group raises a problem which is the subject of the first section. Information traditionally used in the field of drug epidemiology include data from police services, treatment centres, hospitals, special databases such as the HIV/AIDS register and the register of patients under methadone treatment as well as data on mortality statistics, and methadone consumption. Availability of this information in Belgium is investigated in the second section. The population of problematic drug users, whatever its definition, constitutes a largely hidden population, i.e. a group of persons which cannot be exhaustively identified by classical sources of information (essentially repressive and health services data, and population surveys). Obviously prevalence surveys based on the classical sampling techniques used in epidemiology can not be applied to such difficult-to-reach populations. Alternatives strategies are therefore required to estimate the size of this population at a national level. Theses include the multiplier method, the capture-recapture technique, the estimate of prevalence from incidence data, the use of methadone consumption data and a multivariate method using a principal component analysis of drug-related indicators. Methodological details on these methods and their feasibility in Belgium are treated in the third section.

Target population

According to the tenth revision of the International Classification of Diseases (ICD) (2), problematic drug use may be defined as "the harmful use of or dependence on psychoactive substances". Harmful use refers to "a pattern of psychoactive substance use that is causing damage to physical or mental health". On the other hand, the dependence syndrome is defined as "a cluster of behavioural, cognitive and physiological phenomena that develop after repeated substance use and that typically include a strong desire to take the drug, difficulties in controlling its use, persisting in its use despite harmful consequences, a higher priority given to drug use than other activities and obligations, increased tolerance and sometimes a physical withdrawal state. The dependence syndrome may be present for a specific psychoactive substance, for a class of substances or for a wider range of pharmacologically different psychoactive substances".

However, a more operational definition of problematic drug use is needed because most of the available epidemiological information does unfortunately not allow the application of these definitions. Two problems immediately emerge in defining the problematic drug use at an operational level: what is a problematic drug use compared to a non-problematic drug use and which are the drugs to be considered ? It is obvious that different drugs cause different problems and the inclusion of all illicit drugs leads to a heterogeneous target group. One approach to define problematic drug use consists to refer to drug use which may directly or indirectly be a source of risk for medical, psychological and/or social problems (3). It may therefore represent different aspects of the drug addiction phenomenon: hard drug use, opiate use, heroin use, injecting drug use, etc...

Sources of Information and Data Available in Belgium

Police data

Presently repressive data related to drug offences can be found in two databases.

The "Service Général d'Appui Policier/Algemene Politie SteunDienst (SGAP/APSD)" centralises data on seizures and on associated arrests since 1994 (4). These data originate from two main sources: the police reports sent to the Court by the Judicial police, the Gendarmerie and the municipal polices, on one hand, and a standardised form when a seizure is performed, on the other hand (this form is also transmitted by Customs and Accises). Data available in police reports include type and location of the infringement, weight, price, origin and destination of the product, police unit involved, birth date, sex, nationality, and home address of the offender. Type of drug has been added from 1998 in this database.

The Belgian General Office Support Service (Bureau Central de Recherche/Centraal Bureau voor Opsporing, BCR/CBO) also centralised data on repression activities from the units of the Gendarmerie and from some units of the municipal polices. Available data include type, location and date of the infringement, name of the offender, modus operandi, tools used. Type of drug according to categories (cannabis, opiates, LSD, etc...) is not systematically mentioned. The identification of the substance is based on the Becton-Dickinson test and/or the expertise of the policemen (4).

A large re-organisation of the forces of police, initiated in 1998, is still going on in order to constitute a unique police force resulting from the merging of the Judicial police, the gendarmerie and the municipal polices. A unique database used directly by all services of police for the registration of their repressive activities is in progress.

Treatment demand data

Currently there does not exist a national monitoring system which aims to collect data on treatment demands. In addition, the total number of services involved in the treatment of drug addicts is not known. However, the different Communities and Regions have developed their own registration system based on samples of treatment units including specialised residential units (hospital in-patient units, therapeutic community units and other specialised residential units), specialised non-residential units (structured day care centres/day hospitals, specialised out-patient treatment centres, local health centre/social service centres, low threshold/drop-in/street agencies, other specialised non residential units), general services (out-patient mental health care centres, general practitioners, non-residential social care facilities), treatment units in prison and self-help services.

In the French Community, the "Comité de Concertation sur l'Alcool et les autres Drogues (CCAD)" has managed a monitoring system on treatment demands from 1992 to 2000. This system has been set up according to the Pompidou Protocol on the "First treatment demand" indicator (5). In the registration process, drug users asking a treatment were, till end 1996, identified with a code in order to avoid multiple counting. However, the new Belgian law on private life protection obliged to eliminate this identifier. It is moreover quite difficult to give, for the French Community, an estimation of the coverage rate by the CCAD registration system. The specialised centres that are subsidised by the Ministry of the French Community or the Regional Ministry of Social Affairs are obliged by decree to participate to the registration of this indicator. It is deemed that more than 80% of those centres are participating, but this figure varies from one province to another (4).

In 1996, the "Vereniging voor Alcohol en andere Drugproblemen" (VAD) started a project in the Flemish Community to collect data at the beginning of treatment in a sample of specialised residential settings and out-patient settings (centres for mental health) (4, 6). Collaboration with other settings is ongoing.

In Brussels, the "Concertation Toxicomanies Bruxelles – Overleg Druggebruik Brussel" (CTB-ODB) developed its own registration system in order to achieve an extended coverage in the area (14 out of 16 specialised centres in 1997) (4, 7).

In the German-speaking Community, information on requests for ambulatory and stationary treatment are collected since 1997 by the "Arbeitgemeinschaft für Suchtvorbeugung und Lebensbewältigung" (ASL) using its own system (4).

The VAD and CTB-ODB record only treatments and not treatment demands. It should also be emphasized that until recently there was no standardisation of the information collected by these Community/Regional monitoring systems so that geographical comparisons were not possible. However, in 1999, the Belgian REITOX Focal Point co-ordinated a working group in order to implement a minimal data set on treatment demand indicators to be collected in a standardized way by the different monitoring systems (4).

Hospital data

The Minimal Clinical Data and the Minimal Psychiatric Data ("Résumé Clinique Minimal/Minimale Klinische Gegevens" and "Résumé Psychiatrique Minimal/Minimale Psychiatrische Gegevens") are compulsory registration systems operating respectively in all general hospitals, and in all psychiatric hospitals and psychiatric units of general hospitals. Data from discharged patients are centralized by the Ministry of Social Affairs, Public Health and Environment. In this database, the statistical unit is the hospitalisation stay and not the patient. Administrative and medical data including the main cause of the hospitalisation as well as secondary diagnoses are thus registered for each stay.

Mortality data

The National Institute for Statistics centralizes mortality data derived from the death certifications coded by the Flemish and French Communities, and the Brussels Capital Region. Deaths occurring in the Flemish Region and the Dutch speaking part of Brussels are notified to the Flemish Community. Deaths occurring in the French and the German speaking part of the "Walloon Region" are notified to the French Community. The Brussels Capital Region officially collects death certificates filled in French.

A special register exists in Belgium which records overdose cases identified by police services.

HIV/AIDS data

In Belgium, diagnosed seropositive HIV persons and AIDS cases are registered in two integrated databases (8). Approximately 600,000 blood samples are yearly screened for HIV antibodies, excluding testing related to blood donations. Eight reference laboratories are recognised by the Ministry of Public Health to confirm the results of seropositive tests. Since they are the only laboratories subsidised for this confirmation, their reporting on new diagnosed HIV seropositive individuals gives the number of newly diagnosed seropositives in the country. Data on age, sex, nationality, residence, and possible route of transmission are collected through a standardised form sent by these laboratories to the physician of each new diagnosed HIV patient. On the other hand, each newly diagnosed AIDS case is notified in an independent way by clinicians on a standardised form. A commission of experts validates each new case referring to the definition of the Centres for Diseases Control, adopted by the European Centre for the Epidemiological Surveillance of AIDS.

Methadone consumption data

The quantities of methadone sold in Belgium are registered in a database of the Ministry of Public Health – General Pharmaceutical Inspectorate (Inspection Générale de la Pharmacie – Service des Stupéfiants/Departement Verdovende Middelen van de Algemene Farmaceutische Inspectie). Treatment centres may provide some data such as the percentage of problematic drug users undergoing a substitution treatment with methadone, mean age of patients and daily dose administrated. However, in Belgium, most problematic drug users are treated by general practitioners and are not yet registered by the monitoring systems recording treatment demands. Registration systems of patients under methadone treatment have although been developed by some Provincial Councils of Doctors ("Commissions Médicales Provinciales/ Medische Provinciale Commissies") and/or Provincial Pharmaceutical Inspectorates. These systems are currently not standardised, not generalised and not interconnected.

Coverage rate of the registration systems

The sources of data used in several methods do generally not cover the entire population. This is the case namely for most of the data used

in the multiplier method, the demographic method and several drug-related indicators involved in the multivariate method. For instance, the monitoring systems recording treatment demands in Belgium operate on samples of treatment centres. Therefore, the estimate of the prevalence obtained from these data sources should be corrected to account for their registration coverage rate.

Methods and feasibility in Belgium

The multiplier method

Method

To estimate the prevalence of a characteristic or a disease in a target population of size N, epidemiologists generally make a survey in a sample drawn at random from this target population. The size of the sample, n, which has to be investigated is given by the basic relation:

$$n = N \cdot f$$

where f is the sampling fraction or sampling rate. The value of f is chosen taking into consideration the expected precision of the estimated prevalence and the cost of the survey. It also gives the probability that a person belonging to the target population will be included in the sample. Thus, given pre-determined values of N and f, one can calculate n. A full sampling frame, i.e. a list of each person belonging to the target population, is assumed to be available in order to draw the sample.

This sampling frame is obviously not available in the context of hidden populations. The unknown total number of problematic drug users, N, could however be estimated from:

$$N = \frac{n}{f}$$

if one knows the values of:

- n, the size of a group of problematic drugs users who can be identified by different sources of information such as polices services, treatment centres, hospitals, death certifications, HIV/AIDS register, etc... (Table 1), and

– *f*, a parameter called in the present context the multiplier. This parameter has the same probabilistic meaning as in the sampling theory but its value does not depend on cost and reliability considerations and cannot be pre-determined by the investigators. On the contrary, the value of the multiplier must be estimated using external information.

TABLE 1

Sources of information and data commonly used in the multiplier method

Source of information	Parameter	Data
Police	n	Number of problematic drug users first-time registered by the police during the previous 10 years *
	f	Proportion of all recorded drug-related deaths which has been observed by the police among drug users known during the previous 10 years
Police	n	Number of registered problematic drug users in a given year
	f	Probability that a problematic drug user will be in contact with the police during the same period
Treatment centres	n	Number of problematic drug users who underwent treatment in a given year
	f	Probability for a problematic drug user to be treated (in-treatment rate) during the same period
Hospital (Minimal Psychiatric Data)	n	Number of problematic drug users hospitalised in psychiatric departments in a given year
	f	Probability for a problematic drug user to be hospitalised in such departments during the same period
Mortality	n	Number of registered drug-related deaths among problematic drug users in a given year
	f	Probability of death among problematic drug users during the same period
HIV/AIDS register	n	Number of HIV positive patients being problematic drug users in a given year
	f	Probability to be HIV positive among problematic drug users during the same period
Register of patients treated with methadone	n	Number of problematic drug users under methadone substitution treatment in a given year
	f	Probability for a problematic drug user to be under methadone substitution treatment during the same period

* mean duration of the dependence is assumed to be ten years (9)

For instance, *n* may be the number of problematic drug users who underwent treatment in a given year and *f* is the probability for a problematic drug user to be treated during the same period (table 1). Data from treatment centres collected by the monitoring systems are used to estimate *n* when the coverage rate of the monitoring systems is known. The multiplier *f* has to be estimated from data collected in a sample of problematic drug users. Such sample is obtained through sampling techniques involving direct contact with drug users who provide access to and/or information on their peers (10, 11). A common method, known as the snowball sampling, involves researchers first orientating themselves in the target population, then making contacts and interviewing respondents. At the end of each interview, respondents are asked to assist in finding new potential respondents, called nominees. Chains of nominees are thus generated through referrals from earlier respondents: a nominee becomes a referral when he designates peers as new potential nominees. Interviewing new nominees therefore expands the sample by infiltration through the social contacts and networks of problematic drugs users. In this approach, problematic drug use is assumed to be a social phenomenon that occurs in the context of groups and networks. Indeed, many studies indicate that initiation and continued problematic drug use almost always take place in an interlinked social system even if the connections between the subgroups of this system are indirect and if the number and intensity of links vary. This method has been intensively applied in the field of ethnographic studies and prevention programmes which do not necessarily aim at the representativeness of the sample. The validity of the estimates derived from a snowball sample may therefore be questioned from an epidemiological viewpoint. Nevertheless, representativeness of a snowball sample can however be expected if sampling procedures are designed to reduce selection and nomination bias. Three methodological aspects should be considered in this context: (i) the starting points or "zero stages" for the snowball chains (ii) the sampling strategy to select nominees to be contacted in each successive stage or "wave" of the snowball chains, and (iii) the number of waves, i.e. the length, of the chain. Starting points should be independently chosen so as to be spread across the main groups or networks of problematic drug users living in a given area. Starting points should therefore be selected to maximize the heterogeneity of the "zero stage" sample in terms of socio-economic and demographic groups, as well as in terms of occupational and recreational circles. Some prior knowledge of where problematic drug users might be found is consequently an essential first step. In theory, all nominees could be contacted and interviewed at each wave (each referral may nominate 5 to 10 other drug users). However, only one or two nominees will be interviewed owing to practical limitations of fieldwork. The nomi-

nee(s) should therefore be selected so as to increase the probability that the snowball chain will infiltrate through other groups of problematic drug users. Various predefined criteria of selection can be used to increase the heterogeneity of the sample at the different stages of the snowball: for instance, a nominee will be selected if he greatly differs for sex, age and/or occupation compared to the referral who designated him. Random sampling could also be used. Lastly, representativeness of the sample is more likely if long chains are obtained. At each stage of the chain, it could be worthwhile to constitute a reserve of nominees in order to increase the chance of snowball continuing since a chain will end when a nominee refuses to be interviewed or when he is unwilling to give names of peers. Mathematical modelling of the snowball sampling using theory of neural networks has presently not been fully explored and deserves further investigations.

The reliability of the self-reported information is another important question.

In general, the multiplier is estimated from small-scale surveys conducted on a regional basis or in a large city. A generalisation of this local estimate to the whole country may therefore provide an unreliable national estimate if there are significant geographical variations of this estimate. In addition, the sampling error of the estimate of the multiplier may be large due to the observation of small probabilities in small samples. This means low precision and large confidence intervals for the estimate, or in other words high uncertainty of the estimate.

Feasibility in Belgium

Police data

A first approach to estimate prevalence is based on the number of problematic drug users first-time registered by the police services during the previous ten years (Table 1). This method can obviously not be applied since these data are only available from 1994. A second approach consists in using the number of problematic drug users registered during a given year by the police services (Table 1). However two problems seriously limit the possibility to use these data for prevalence estimate. First they are presently not sufficiently reliable because of under-reporting of cases, on one hand, and lack of a systematic reporting of the link between violation against law and type of drug involved. Secondly, the multiplier, i.e. the probability to be in contact with the police during the same period (Table 1), has to be estimated.

Treatment demand data

The total number of problematic drug users beginning a treatment in treatment centres could theoretically be established. The actual number in the country must however be extrapolated since all centres do not participate to the monitoring. This implies therefore that one knows the coverage rate of each of the monitoring systems. A study is presently going on to estimate these coverage rates. In addition, a survey has been proposed to estimate the in-treatment rate for the different Communities of the country. Estimate of prevalence using such data could reasonably be expected within two years if a survey on the in-treatment rate is carried out.

Hospital data

These data do not presently allow estimating the prevalence of problematic drug use because the statistical unit is the hospital stay, and there is no possibility to identify the patient, which means that is not possible to count patients actually admitted in hospitals (12). Moreover, there are no data regarding the multiplier, i.e. the probability to be hospitalised.

Mortality data

Presently, the number of registered drug-related deaths is available only till 1995. The quality of the death certification remains to be ascertained. There are no data providing an estimate of the mortality rate among problematic drug users.

HIV/AIDS register

The number of injecting drug users, N, has been calculated using the number of alive HIV persons, n, the life-time prevalence rate of injecting drug use among HIV patients, p_1, and the prevalence rate of HIV seropositivity among injecting drug users, p_2. The ratio p_1/p_2 was used as the multiplier. Details of this estimate can be found in another paper (13). Data needed to carry out the calculations were provided by the national HIV/AIDS register and the database of treatment demands recorded by the monitoring system of the French community (CCAD). It was inferred that, in 1995, there were 20,000 injecting drug users (95% CL: 10,300 – 46,300) yielding a prevalence rate of 0.36% (95% CL: 0.18-0.83%).

Register of patients treated with methadone

Presently, such a register does not exist at the national level. Nevertheless, as mentioned previously, some Provincial Councils of Doctors and/or Provincial Pharmaceutical Inspectorates have initiated local registration systems of patients under methadone treatment.

The capture-recapture method (14-17)

Method

This method has a long history and was first applied a century ago to estimate the size of populations of fishs and wild animals. In these studies, a random sample of animals is captured, marked and released. Later, a second random sample is recaptured and the number of marked animals in this second sample is observed. The size of the population may be estimated if one may assume that the proportion of marked animals found in the second ("recapture") sample provides an estimate of the proportion of marked animals in the whole population. Thus, if a "capture" sample of 200 animals is marked and released and if a "recapture" sample of 100 contains 10 marked animals, the estimate of the total population will be 2,000 (200 marked animals represent 10% of the whole population). The same data can be tabulated according to the so-called "two-source model" (Table 2). If the value of a, b and c in table 2 are replaced by 10, 90, and 190, respectively, the maximum likelihood estimator of the unobserved cell, x, will be 1,710 and the sum of the four cells will give 2,000. In fact, the capture-recapture method is just an application of the multiplier method since the size of the population is obtained dividing the size of the first sample by the proportion of marked individuals in the second sample, this proportion being the multiplier (15). The principle of the capture-recapture method consists thus to use information from the number of overlapping cases observed in the two samples in order to estimate the number of absents in both lists and consequently the size of the population.

TABLE 2
The two-source model

			Sample 1	
		Present	Absent	Total
Sample 2	Present	a	b	a + b
	Absent	c	x	–
	Total	a + c	–	N = a + b +c + x

Maximum likelihood estimator of unobserved cell: $x = [b \cdot c]/a$
$Var(N) = [(a + b) \cdot (a + c) \cdot b \cdot c] / a^3$

In epidemiological studies, the expression "being captured and marked in the first sample" is simply replaced by "being present in a first list/sample", and "being recaptured in the second sample" by "being present in the second list/sample". Lists used in drug use epidemiology

include treatment demand data, police data, mortality data, etc. More complex models can be obtained using more than two samples. They are referred as multiple sources or K-sample capture-recapture models.

Two underlying assumptions are required to apply the method:

- the probability of selection into one sample/list must be the same for each individual (although any two sources may differ in this probability). This implies that the population under study is "closed", i.e. individuals do not enter or leave the population during the study period.
- the lists/samples must be mutually independent, i.e. the individual probability of selection into one list must not be influenced by the presence or absence of the person in another list. In K-sample capture-recapture models, this assumption can be tested using log-linear regression models.

The capture-recapture method is mainly recommended to carry out prevalence studies at a local level (these local estimates are important to use the multivariate indicator method, described below). Nevertheless it has been used to estimate prevalence at a national level in some European countries. In Italy, this method was used with data from private and public treatment services, centralised at the national level (9). Ireland and Finland were also able to extrapolate local prevalence estimates to the whole country since problematic drug use is heavily concentrated in their capital city (9).

Feasibility in Belgium

The application of this method implies that epidemiologists are able to match data from the same person, collected on different lists or samples, for instance on police databases and treatment demand databases. This practical problem limits strongly the use of the method throughout European countries since law generally forbids the use of codes based on birth date, name and surname. Identifiers generated by computerized algorithms could be a solution to the problem but such approach is not presently commonly widespread. Further investigations have also to be undertaken to see whether matching on age, sex and other socio-demographic variables commonly registered in various databases could be used to detect, with a high probability, data belonging to the same person but recorded in different databases.

The prevalence of opiate use in the French Community has been estimated from the CCAD database by the capture-recapture method (18). In this statistical analysis, opiates users recorded in 1993 defined the first

list/sample and those recorded in 1994 the second list/sample. The number of opiates users was estimated to amount to 14,600 i.e. a prevalence rate of 0.7%. While this result (regarding opiate use) is apparently consistent with the national estimate obtained from the HIV/AIDS database (regarding injecting drug use), it has however to be interpreted with caution because the assumptions underlying the two sources model are obviously not met (lack of mutual independence of the two samples, and probability of selection into a sample/list for each individual probably not equal).

Prevalence rate derived from incidence data

Method

Another way to estimate the prevalence rate of problematic drug use consists to use the well-known relation existing between prevalence, incidence and duration of a disease (19):

$$P = \frac{I \cdot \bar{d}}{I + I \cdot \bar{d}}$$

with P being the prevalence rate of problematic drug use, I the annual flow of first treatment demands from problematic drug users and $\bar{d}$ the mean duration of the problematic drug use. If I is small,

$$P \approx I \cdot \bar{d}$$

Note that the annual flow of first contacts with the police could be used in this formula instead of the annual flow of first treatment demands. In the terminology of drug epidemiologists, this method is also known as the "demographic method" (9). Stationarity of the population of problematic drug users must be assumed: this means that the number of problematic drug users undergoing a first treatment (assumed to leave the pool of untreated problematic drug users) is equal to the number of new untreated problematic drug users during a given year (entering the pool of problematic drug users). This is the major drawback of this approach since the assumption of stationary may be questioned: increasing trend of the incidence of problematic drug use has been reported in most countries (17). The estimation of the mean duration of problematic drug use constitutes another flaw of this method. Three pieces of information are needed to derive an estimate of the mean duration: (a) the duration between the moment of first problematic drug use

and the moment of first treatment demand (sometimes refers as the latency period), (b) the average number of treatment episodes and (c) the average duration between two successive treatments. The mean duration is then obtained from:

$$a + 2 \cdot b \cdot c$$

Since the number of further treatments until the end of the addiction cannot be observed at the moment of the survey (data right-censored), an empirical factor of 2 is used (9). Obviously, this estimate could be biased if periods of abstinence are not accounted.

Feasibility in Belgium

For the annual flow of first treatment demands from problematic drug users in Belgium, the situation is the same as that described for the treatment demand data requiring the extrapolation of data. The database of the French Community (CCAD), and maybe local cohorts studies, can be used to estimate the mean duration of problematic drug use. Thus, this approach is theoretically feasible but the restriction related to the stationary hypothesis must be kept in mind.

Use of methadone consumption data

Method

It has already been demonstrated that, in some specified cases, the prevalence of chronic diseases may be estimated through the use of medicine consumption data (20). For instance, the prevalence of chronic diseases treated with medicines that are specific to the disease and must be taken continuously, can be easily derived from the total amount of these medicines sold in a given region and the mean quantities used during the same period. The feasibility of the method was ascertained using medicine consumption data for the treatment of diabetes mellitus and intraocular hypertension, collected in Belgium in 1990 and 1992, respectively. In the meantime, the method has been theoretically developed to account for non-specific medications and for non-continuous medication intake (duration of treatment and/or recurrence).

Opiate users may be considered as "ill" people treated continuously during one or several periods with methadone. In first approximation, the use of methadone as major analgesic could be considered negligible. The number of opiate users under methadone treatment, n, could therefore be derived from:

$$\hat{n} = \frac{V}{\hat{c}}$$

where V is the amount of methadone sold in one year in a given region, and $\hat{c}$ is an estimate of the average quantity of methadone used by the patients living in this region in the same year. This latter could be estimated from a sample of drug users being treated with methadone. The prevalence of problematic opiate use can be then obtained if the probability for an opiate user to be under methadone treatment is known. In addition, it is necessary to estimate (i) the proportion of problematic drug users who take methadone as a substitute without being in treatment, (ii) the mean dose used by these methadone consumers.

Feasibility in Belgium

Data on methadone sales are centralised by the Ministry of Social Affairs, Public Health and Environment. The number of people undergoing a substitution treatment with methadone was estimated from the quantities of methadone sold by wholesalers to pharmacists divided by the mean daily dose used per patient. In 1996, this number amounted to 7, 100 patients (21). The validity of this estimate depends on the accuracy of drug sales data and of the estimate of the average dose used. First, there is some uncertainty regarding the methadone sales because some wholesalers do not have computerised data, requiring a correction to estimate the total sold quantities. Secondly, the mean daily dose per patient was based on two different kinds of data: the recommendations from a panel of experts (physicians, "Commissions Médicales Provinciales/ Medische Provinciale Commissies") and the results of a study conducted among a sample of pharmacists in the province of Liège in 1994 (22). The mean daily dose used in the calculation was 40 mg, excepted for the province of Brabant where the value was 50 mg. A poor compliance with the treatment may be another source of bias. In a study conducted in Charleroi, one fifth of the patients did not take the methadone as supposed, i.e. daily (23). Moreover, as previously mentioned, some drug users do not take methadone in the frame of a treatment and the mean consumption of methadone by these users is consequently unknown. Further investigations are therefore needed to obtain a better estimate of the mean dose of methadone used in substitution treatments because several factors could influence the methadone dosage (prescribers – GPs or treatment centres –, regional variabilities, associations with other psychotropes, adaptation of methadone dosage with individual evolution, etc...).

Multivariate indicator method

Method

Its principle consists in deriving the prevalence of problematic drug use in a given region from information provided by a set of drug-related indicators observed in this region. More specifically, it is assumed that the prevalence could be predicted from an appropriated linear combination of these drug-related indicators. The drug-related indicators generally used include the number of offenders against drug-laws, the number of drug-related deaths, the number of problematic drug users in treatment, the number of cases of HIV related to injecting drug use and the number of imprisoned addicts. This set of five drug-related indicators, observed in region *i* (*i* = 1, 2,.., n), provides the following data matrix:

$$\begin{bmatrix} x_{11} & x_{12} & x_{13} & x_{14} & x_{15} \\ x_{21} & x_{22} & x_{23} & x_{24} & x_{25} \\ . & . & . & . & . \\ . & . & . & . & . \\ x_{n1} & x_{n2} & x_{n3} & x_{n4} & x_{n5} \end{bmatrix}$$

where x_{ij} represents the value of the *j*th indicators (j = 1, 2,..,5) observed in the *i*th region. Principal component analysis is then used to compute a set of new variables Y_k, called principal components (24, 25). Each of these new variables Y_k is a linear combination of the original variables x_{ij}. The value of Y_k for the region *i* (also called the score of the kth component for the region *i*) is therefore given by:

$$Y_{ik} = a_{k1} \cdot x_{i1} + a_{k2} \cdot x_{i2} + a_{k3} \cdot x_{i3} + a_{k4} \cdot x_{i4} + a_{k5} \cdot x_{i5}$$

The coefficients a_{kj} are estimated in such a way that the new variables Y_k:

- are uncorrelated (orthogonal), and
- have maximum variance in the sense that the variance of the *k*th component explains the *k*th largest portion of the total variance (the variance of the first component explains the first largest portion of the total variance, the variance of the second component explains the second largest portion, etc...).

In most cases the first, the first two or the first three components adequately approximate the true configuration of the original data matrix. Approximation is deemed to be adequate when the variance of the chosen number of components explains at least 75-80 percent of the total variance. If, for instance, the variance of the first principal component explains more than 75 percent of the total variance, the first component score for the region *i*:

$$Y_{i1} = a_{11} \cdot x_{i1} + a_{12} \cdot x_{i2} + a_{13} \cdot x_{i3} + a_{14} \cdot x_{i4} + a_{15} \cdot x_{i5}$$

is thought to be the "best" indicator summarising the information provided by the five drug-related indicators (the linear combination is "best" in the sense that it captures the largest amount of the variation in the original five variables among all possible choices of a_{kj}).

Least squares regression analysis could then be used to obtain the relationship between the prevalence of problematic drug use, P_i, and the values of the first component score observed in the various regions:

$$P_i = \beta_0 + \beta_1 \cdot Y_{i1}$$

This linear regression model allows the prediction of the prevalence in a region where only drug-related indicators are available. Obviously, it is necessary to apply the method to have an estimate of the prevalence of drug use in at least two regions, possibly a region with a low prevalence rate and a region with a high prevalence rate. National estimate of the prevalence is then obtained by summation of the regional estimates.

Feasibility in Belgium

This method requires a division of the country into geographical units where the prevalence of problematic drug use is inferred from drug-related indicators. Belgium is made up of 10 areas corresponding to the provincial division or 42 smaller areas corresponding to the administrative "arrondissements". At the level of this last geographical division, however, some drug-related indicators are not available such as, for instance, the number of offenders against drug law. In addition, as seen before, the reliability of this indicator is presently questionable. The application of the multivariate indicator method using data at the level of the administrative "arrondissement" is consequently not feasible.

At the provincial level, treatment demand data are available but, as previously mentioned, the coverage rate of the different monitoring systems is not presently known either at the national or at the provincial

level. The number of drug-related-deaths at the provincial level, according to either place of residence or place of death, is available but unfortunately only till 1995. Cases of HIV/AIDS related to injecting drug use are available in the national HIV/AIDS register according to place of residence. There is presently no database on imprisoned addicts but data on people in prison for violation of drug legislation could be obtained.

Lastly, it is necessary to apply the method to have an estimate of the prevalence of drug use in at least two provinces (possibly a low and a high prevalence rate). Presently, these estimates are unfortunately not available.

Confidence limits of prevalence point estimate of problematic drug use

No general formula can be given for the variance of the prevalence estimated by most of the above-mentioned methods (capture-recapture method is one exception, Table 2). Three methods have to be considered in constructing confidence limits for the estimated prevalence: resampling techniques such as bootstrap (26), approximation through the use of the delta method (27, 28) and application of the Fieller theorem (26, 29). Interested readers may consult the references for further details on these methods.

Conclusions

The importance of problematic drug use can be assessed through several distinct methods using a large variety of data. Unfortunately, almost no method can presently be applied in Belgium. The national HIV/AIDS register revealed to be the only source of information providing proper data to estimate the prevalence of injecting drug use in 1995 among the population aged 15-54 years. However, external information regarding the frequency of HIV seropositivity among injecting drug users is required in the calculations but the reliability of this information must be improved. On the other hand, it is generally agreed that a robust and consistent estimate of the prevalence of problematic drug use should ideally be based on estimates obtained by at least two different methods. Such a robust estimate cannot presently be achieved in Belgium and efforts must consequently be made to bridge this gap.

In order to quickly obtain national prevalence estimates, the use of data on treatment demands appears to be the most promising approach

in terms of feasibility. Two related problems must however be solved: the first deals with the estimate of the coverage rate of the monitoring systems recording treatment demands and the second with the estimate of the in-treatment rate or probability to be treated. It is expected that the national working group on the treatment demand indicator, on one hand, and the results of a survey to be conducted in different cities of the three Regions will respectively provide information about these two parameters.

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Résumé

Objectif: Etudier la faisabilité de méthodes destinées à estimer l'ampleur de la consommation problématique de drogues en Belgique.

Méthode: Le nombre de cas prévalents d'utilisateurs problématiques de drogues peut être estimé à partir de données provenant des services de police, d'hôpitaux et de centres spécialisés dans le traitement des dépendances, des certificats de décès, du registre VIH/SIDA et de données de consommation de méthadone. Cinq méthodes d'estimation sont utilisées: (1) la méthode dite du multiplicateur, (2) la technique de capture-recapture, (3) l'utilisation de la relation donnant la prévalence en fonction de l'incidence et de la durée de la maladie, (4) l'utilisation de données de consommation de méthadone et (5) une méthode multivariée basée sur une analyse en composantes principales d'indicateurs de consommation de drogues. La disponibilité de ces données et la faisabilité de ces méthodes d'estimation en Belgique sont analysées.

Résultats: Le registre VIH/SIDA est, actuellement, la seule source de données permettant d'estimer le nombre d'injecteur de drogues en Belgique. Toutes les autres sources de données ne peuvent fournir des informations suffisamment valides. Les principales raisons de cet état de fait résident dans la loi sur la protection de la vie privée, rendant difficile l'appariement des données d'une même personne figurant dans des fichiers différents, le manque de standardisation des différents systèmes d'enregistrement des demandes de traitement fonctionnant dans les différentes Régions et/ou Communautés de notre pays, et par le manque de connaissance du taux de couverture de ces systèmes de surveillance.

Conclusion: Idéalement, les résultats obtenus par, au moins, deux méthodes différentes d'estimation sont nécessaires pour obtenir une estimation robuste et cohérente de la prévalence de l'utilisation problématique de drogues. Une telle estimation n'est actuellement pas envisageable en Belgique et des efforts doivent être consenti pour combler cette lacune. En terme de faisabilité, l'utilisation de données relatives aux demandes de traitement semble être l'approche la plus prometteuse pour obtenir, rapidement, des estimations de prévalence au niveau national.

Samenvatting

Doelstelling: De haalbaarheid nagaan van verschillende methodes om de omvang van het problematisch druggebruik in België in te schatten.

Methode: Het aantal prevalente gevallen van problematisch druggebruik kan geschat worden op basis van gegevens afkomstig van politiediensten, hospitalen en centra gespecialiseerd in de behandeling van druggebruikers, overlijdensattesten, het HIV/AIDS register en gegevens over de consumptie van methadon. Vijf methodes van schatting worden gebruikt: (1) de „multiplier" methode, (2) de „capture-recapture" methode, (3) het gebruik van de relatie tussen prevalentie, incidentie en duur van de ziekte, (4) het gebruik van gegevens over de consumptie van methadon, en (5) een multivariate methode gebaseerd op een „principal component" analyse van indicatoren in verband met drugconsumptie. De beschikbaarheid van deze gegevens en de haalbaarheid van deze methodes in België worden bestudeerd.

Resultaten: Momenteel is het Belgisch HIV/AIDS register de enige gegevensbron die toelaat een schatting te maken van het aantal intraveneuze druggebruikers in België. Alle andere gegevensbronnen leveren geen voldoende betrouwbare informatie. De voornaamste redenen hiervoor zijn de wet op de bescherming van de private levenssfeer, die het moeilijk maakt personen uit verschillende lijsten te koppelen, het gebrek aan standaardisatie van gegevens rond vragen naar behandeling van druggebruikers ingeschreven in de verschillende registratiesystemen van de Gewesten en/of Gemeenschappen van het land, en het gebrek aan kennis van de „coverage" van deze registratiesystemen.

Bespreking: Een robuuste en consistente schatting van de prevalentie van problematisch druggebruik zou idealiter moeten steunen op minstens twee verschillende methodes. Een dergelijke schatting is momenteel niet in België mogelijk en inspanningen zijn bijgevolg nodig om deze leemte in te vullen. In termen van haalbaarheid, lijkt het gebruik van gegevens rond vragen naar behandeling de meest hoopgevend aanpak om snel schattingen te bekomen op nationaal niveau.

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