EARLY WARNING INDICATORS OF CHANGES IN DRUG USE: A NEW SOUTH WALES PERSPECTIVE

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SUMMARY

The aim of this report is to examine potential data sources for early warning of changes in drug use in the community. The report is written for the consideration of the National Drug Abuse Information Centre (NDAIC) in order to stimulate discussion on the topic of what indicators should be included in an early warning system. The aim of the system to be discussed is to measure, in a timely fashion, changes in drug use so as to allow the administrators and planners of drug and alcohol programs to adapt their services to meet the changing needs of their clients.

The content of the report is based largely on consultation with officials from the NSW Directorate of the Drug Offensive. No attempt was made to assess the feasibility of the potential indicators in other Australian jurisdictions. It is hoped that the list of indicators will stimulate other States/ferritories to consider the feasibility of collecting data on each indicator within their jurisdiction, and to identify other indicators which should be considered. The aim of the paper is therefore to present a discussion of the indicators from the point of view of the NSW situation as an initial stimulus for the development of a national early warning system.

Methodologically, the topic was approached by, first, listing all possible indicators of changes in drug use. This list was generated simply by asking those in the field to name indicators they thought relevant. Then, consideration was given to what aspects of drug use the indicators would be expected to cover. That is, the "dimensions of drug use" relevant to early warning were identified.

Next, literature on early warning was consulted to determine what criteria should be considered for inclusion of an indicator in an early warning network. Five criteria were identified: timeliness, volume of data, complementarity with other indicators, validity of data, and cost. Each indicator was then discussed with respect to the early warning criteria and dimensions of drug use issues. Finally, relationships between the indicators were considered. The result was a list of seven indicators which are seen from the point of view of NSW as able to fonn an early warning network.

A range of sources were considered, as well as two systematic reporting systems (National Drug Poisonings Case Reporting Systems-NDPCRS & National Forensic Case Reporting System-NFCRS).

It was concluded that:

* Law enforcement data are unreliable and lack consistency because they are open to various economic, social and political influences.

* Drug purity as an indicator is not currently measured systematically, and the costs of setting up more comprehensive testing of seized drugs may be prohibitive.

* A survey of those entering treatment facilities would be a useful indicator as it would provide information on the using trends in the established dependent population. Key informant studies could alternatively be used to gather similar information.

* Data on calls to telephone counselling services may be used to gather infonnation on abuse of licit substances; whereas data gathered in needle exchange centres provide information on illicit users who are not necessarily in contact with treatment centres or correctional services.

* Notifications of AIDS and Hepatitis B and reports from private psychiatrists should not be considered part of an early warning network because the number of expected cases would be too small to reveal reliable changes in drug use.

* A modified National Drug Poisonings Case

Reporting System, as proposed in a previous paper (Pedic, 1989), should provide reliable and comprehensive early warning data on changes in drug use through reporting of drug poisonings presenting to hospital casualty units.

* Information should be obtained from ambulance officers on those cases where patients refuse transport to casualty after being revived in order to supplement NDPCRS data.

It is therefore recommended that an early warning network consist of information gathered through the NDPCRS, the NFCRS, key informants, ambulance officer reports, telephone advice lines, patients in treatment, and needle exchange centres.

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BACKGROUND

The appearance of 'new' drugs and changes in drug usage (licit and illicit) are often perceived as occurring along the lines of an epidemic. Once a drug is introduced at one location in one sector of the community, its use can spread rapidly to other members of the community and other areas. There is therefore a need to monitor the changes in drug usage patterns. The aim of monitoring is both to identify new drugs of abuse and to pick up early signs of increases in difficulty the community might be having in using existing drugs. Data obtained from monitoring can be used to target treatment responses to new drugs and new problems with existing drugs.

The monitoring should occur within that section of the population which is most likely to experience new drug usage patterns first. Moreover, the monitoring must act as early warning of changing drug usage patterns. Any monitoring system of drug use trends must therefore have a rapid turnover in its contact with the drug using community.

The need for early warning information was noted by Jones and McAllister (1986) in their report on the establishment of a National Drug Related Data Collection System (NDRDCS). The consultants defined one of the aims of the NDRDCS as the development, where possible, of useful indicators of the changing patterns in health problems associated with drug use. Moreover, they concluded that, "early warning of changing patterns is required if effective intervention action is to be taken" (p. 3).

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Some of the drug use indicators most commonly monitored overseas include: drug abuse treatment admissions; hepatitis cases; drug-related deaths; nonfatal emergency room episodes of drug abuse; drug law violation arrests; and drug retail price and purity levels. The indicators are generally considered to have an association with drug use and abuse, but the absolute nature of this association is not known. Thus, the indicators should be viewed as a relative measure of change in drug abuse conditions and problems rather than as absolute measures.

Moreover,

> No one indicator alone enables reliable estimates of drug use patterns. Data obtained from the indicators are influenced by changes in social attitudes and government policies regarding drug misuse. Changes in individual indices may reflect changes in police priorities, public education, increases in funding of drug treatment facilities and a variety of other factors. As a result indicators of drug abuse need to be studied as a group rather than individually and the overall pattern interpreted. The major benefit derived from using indicators of illicit drug use is that they can provide infonnation regarding changes in patterns of drug use. Potentially, questions regarding increases or decreases in the use of a particular drug over time can be addressed, as can movements of preference from one type of drug to another and emergence of new drugs (Hayward, 1988, p. 33).

Early warning information regarding changes in drug use trends should act as a signal to the relevant authorities to allocate resources to particular areas of need and to 'target' the relevant drug-using population. Hardfacts and figures on changes in drug use can also act in dispelling myths about drug users and drug using practices. It is essential therefore that the obtained data be timely and represent the latest trends in drug use by including infonnation from sources which have a rapid turnover in contact with drug users. Moreover, the early warning indicators need to be considered, as stated above by Hayward (1988), as a group rather than as a series of disparate measures. Confidence in stating that a given change in drug use has occurred is substantially increased when several of the indicators are consistent. Such consistency also increases confidence in the validity of the indicator because it is more likely to have reflected the emergence of a real change in a dimension of drug use. The types of indicators to be used for early warning must be complementary and should not double-count cases of drug use. Indicators are complementary when each provides data on a distinct section of the drug using community. However, double-counting is inevitable because drug users would often be in contact with more than one agency. Double-counting should be avoided because it may distort the figures related to changes in the various dimensions of drug use with regard to anyone substance and give rise to spurious consistency.

Any method of collecting early warning data, when used by itself, runs a high risk of making estimation errors. Convincing arguments supporting this position demonstrate that every data gathering class is "potentially biased" (Webb et aI., 1966) and that no single method captures all "relevant features" (Denzin, 1970). When the strengths of several methods are combined, the estimation errors are greatly reduced. This technique is referred to as "triangulation" (Denzin, 1970) and is defined as the use of multiple measures focused on a topic of investigation. Triangulation is essential in monitoring phenomena like drug use, where the limited knowledge suggests multiple correlates (Leserman, 1977; Schlenger & Greenberg, 1980).

The value of employing multiple measures in examining drug use is constrained by the fact that available data may have been collected through diverse methodologies and measured on different levels or units. Accordingly, efforts to integrate several data sets may be hampered by a lack of a common integrating unit.

DIMENSIONS OF DRUG USE

It is now necessary to ask what type of changes the early warning network should be monitoring. That is, what changes is the network supposed to "warn" about? A list of "dimensions of drug use" will indicate what needs to be measured and, in turn, will determine the range and type of indicators to be used.

Dimensions of drug use:
(1) Identity of Drug;
(2) Number of Users;
(3) Demographics of Users
(age, gender, cultural background, location).
(4) Route of Administration;
(5) Intensity of Use; and
(6) Purity.

That is, given these six dimensions of drug use, the purpose of the early warning network is to provide timely information about (1) the appearance of new drugs, or (2) an increase in the number people using a particular drug, or (3) changes in user demographics, or (4) changes in the route of administration of a substance, or (5) a change in the purity of a drug, or (6) a change in the intensity of use of a drug.

An early warning data system should therefore include sources of information that can measure the above six dimensions of drug use and quickly detect when changes have occurred in one or more of these dimensions. It is unlikely that anyone indicator will provide information on all dimensions so that a number of indicators will have to be used in order to cover all possible changes in drug use. While most indicators will cover substance characteristics (drug name, intensity of use) and user demographics (number of users, age, gender, etc.), only very specialized data sources can monitor changes in purity and route of administration. Such indicators will therefore have to be discussed in particular.

CRITERIA FOR DATA COLLECTION

TIMEUNESS

This is the most important criterion because the purpose of early warning is to signal changes in drug use rapidly in order that appropriate responses may be operationalized and implemented at the beginning of a new drug use trend. It is therefore important that an early warning indicator contain up-to-date infonnation about drug use. This usually implies that the agency collecting the data should have rapid turnover in contact with the drug using population. Moreover, the relevant agency should also be able to collect, analyze and store the data quickly in order to be able to ascertain that a change in drug use has taken place. Appropriate indicators would therefore involve contact with drug users which involved rapid turnover and agencies that could process the data quickly to pick up changes in drug use.

VOLUME OF DATA

In order to gauge changes in drug use rapidly, an early warning indicator would need to involve high volume sources, covering a variety of substances. That is, there should be a reliable and stable baseline, involving a large number of cases/reports for a substance, against which fairly large changes in drug use could be measured. Agencies or indicators which may offer only a limited number of cases per drug half-annually, for example, would therefore not be expected to form part of an early warning network.

COMPLEMENTARY TO OTHER INDICATORS

In order to provide information about a wide range of substances and substance users, it is necessary that the multiple indicators to be used as part of an early warning network be complementary. That is, each indicator should give information, if possible, about a unique section of the drug using population and about the whole range of drug using practices. In this way, the early warning network should reflect any changes in a section of the drug using population or in any of the drug-relevant behaviours. Moreover, if the indicators are complementary, it is less likely that the network will suffer from double-counting of cases/ reports.

VALIDITY OF DATA

In any decision involving data collection it must be asked whether the collated information truly reflects what one seeks to measure. That is, are the data valid? In this context, the question is whether the apparent changes in drug use reflected in an indicator are due to real changes or whether the data are open to other influences. For instance, apparent changes may be found when data collection practices change over time, or when outside political, economic or social pressures lead to over- or under-reporting. Moreover, the data collection should be standardized and reliable. Where the indicator relies on self-reports from drug users validity of reports may be especially questionable.

COST

It is not the purpose of this report to consider the cost of either the overall early warning network or of any of its components. It is necessary, however, to consider whether the inclusion of anyone single indicator would involve additional costs over and above that already spent on data collection. In relation to this criterion, existing data collections where information is already collected on drugs and drug users would therefore have an advantage over indicators where additional staff time (and therefore funds) would be needed to collect the same data. A new (and therefore perhaps costly) data source could still be justified, however, if it offers unique information about drug use.

The usefulness of each indicator to be discussed below will be judged not only in terms of the five criteria listed above but also in relation to how many dimensions of drug use it can monitor. Three broad types of indicators are discussed below:

(A) Reporting Systems;

(B) Routine Government Statistics; and

(C) Information (not routinely collected) From those in Direct Contact with Users.

(A) REPORTING SYSTEMS AND EARLY WARNING OF CHANGES IN DRUG USE

In a reporting system, data are systematically collected in order to obtain information which is thought to be related to one or more dimensions of drug use. A reporting system is purpose built as the relevant data may not be collected as a matter of routine.

Such systems are continuously "sampling" drug abuse in the community. The sensitivity of a reporting system to changes, however, depends on the diversity and representativeness of reporting institutions. This is particularly important for early identification and response to the spread of drugs not previously abused, to serious adverse effects of new patterns of use, and to the spread of drug use to new populations (Rootman & Hughes, 1980).

TYPES OF REPORTING SYSTEMS

A reporting system, to be useful, requires well-defmed and rigorous reporting procedures. That is, it must include explicit procedures for ensuring that reports are submitted in an appropriate form to a designated person or persons, as well as procedures for checking, analysis and presentation of data (Rootman & Hughes, 1980).

Although all reporting systems are based on reports of "events" such as the transfer of a patient to a hospital, a death, or a prescription of a drug, these reports can be handled in various ways. For example, they can be received, analysed, and presented as single events. Some systems are capable of describing only the number of drug-related hospitalizations, arrests, seizures, deaths, prescriptions, or serum hepatitis cases occurring during a given time period. The total number of these reported events (with the exception of deaths) does not necessarily equal the number of individuals in contact with the reporting agencies during that time, because the same individual may be treated more than once for the same problem and! or may be in contact with more than one agency. Thus, one individual may account for several reports during the period concerned. Event-reporting systems, then,reportonlyevents and do not necessarily reveal the total number of individuals involved.

Alternatively, a data collection system may be capable of linking different events for the same individual in the same reporting institution. In this case, two admissions of the same individual to a given hospital would represent only one case. If the same individual were admitted by two different hospitals, *hel* she would be considered as two cases. Systems enabling multiple events for the same individual in the same institution to be identified as a single case are called Case Reporting Systems.

Finally, a data collection system may be capable of linking events that occur in different settings for the same individual. Thus, reports on a person who is admitted to a hospital casualty unit, arrested, and visits a methadone clinic may be brought together and analysed as the related experiences of one individual with different reporting institutions. In this situation, an individual who is reported separately by several institutions can be identified as one case rather than several cases. Systems capable of doing this are called Case Registers.

According to Rootman & Hughes (1980, p. 29)

> Event-reporting systems appear to be the most advantageous in terms of early warning, direct costs confidentiality, and system maintenance. Case registers appear to be the most advantageous in terms of analytical capability, flexibility, follow-up interpretation, validity and reliability checking, research, and estimating incidence and prevalence. Case-reporting systems...fall in between in all dimensions.

The most appropriate reporting system for an early warning of changes in drug use is therefore one where events, and not contacts with individual drug users, are the relevant data points. Two event-reporting systems currently operating in Australia, and therefore two possible sources of early warning information, are the National Drug Poisonings Case Reporting System (NDPCRS) and the National Forensic Case Reporting System (NFCRS).

(1) NATIONAL DRUG POISONINGS CASE REPORTING SYSTEM

One source of early warning information on the changing patterns of drug use, and a source which has traditionally been monitored through a reporting system, is the record of nonfatal emergency room episodes of drug poisonings.

The number of nonfatal reactions to specific drugs or drug combinations that present to casualty or emergency rooms is thought to increase as the number of users of a particular substance increases. Thus there is assumed

a linear relationship between the number of individuals who experience a drug overdose and are treated in hospital casualty units and the total number of active users.

The range of drug presentation at hospital casualty includes: trauma resulting from drug intoxication, infections or other complications due to injections, dependence, and withdrawal syndromes-but the most common drug related presentation is self-poisoning (Jones, 1977; Lane & Hinton, 1975; Myers et al., 1981; Proudfoot & Park, 1978), also referred to as drug overdose (Bancroft et al., 1976; Bobik & McLean, 1977; Brandwin, 1976; Soslow, 1981), acute drug reactions (Craig, 1979; Peterson & Chambers, 1975), drug abuse (Berdie, 1978; Dorman, 1979; Sellers etal., 1981) and suicidal behaviour involving drugs (Koller & Slaghuis, 1978; Retka & Lester, 1979).

The usefulness of Accident and Emergency (A & E) departments in monitoring drug-related problems is well established internationally (Brandwin, 1976; Ghodse, 1976; Ghodse et al., 1981; Hadden, 1978; Russe & Wells, 1980; Sellers et al., 1981; Sivner & Goldberg, 1978).

In Australia, the reporting system which currently monitors drug related poisonings presenting to A & E departments is called the National Drug Poisonings Case Reporting System (NDPCRS). The system is in fact incorrectly named and is an event-reporting system.

Data are reported to the National Drug Abuse Information Centre (NDAIC) by casualty departments on any person presenting to a unit involving drugs of any kind (legal, illegal, prescription) for a variety of reasons (suicide, accidental overdose, misuse). Hospitals contribute data to the NDPCRS on a voluntary basis. As a result, not all hospitals in each state participate.

Information collected from the NDPCRS is potentially of assistance in providing an early warning system of changing patterns of drug use. The system can potentially monitor three of the six dimensions of drug use: appearance of new drugs" route of administration changes and characteristics of the user (age & gender only). Since it is an event reporting system, it cannot identify individuals uniquely and cannot therefore enumerate the number of individuals involved in drug poisonings (Dimension 2). Three reports could therefore either be of three different individuals or of one person attending casualty three times. Purity and intensity of use of substance are not recorded in the NDPCRS.

The number of reports of poisonings is large enough to justify the inclusion of NDPCRS data in an early warning system. During 1986, for instance, some 3, 521 drug poisonings (50 per weekon average) were reported and there was a great variety in the types of substances involved. If the system were improved, the number of reports may increase and the data should become more reliable.

However, certain identified problems must first be addressed before NDPCRS data can be included in an early warning system. Reports from hospitals are infrequent and irregular, providing patchy coverage of patients presenting with drug poisonings. The relevant forms are handled in a variety of ways by the hospitals with no standardization. The reporting hospitals are highly dissatisfted with the lack of meaningful feedback from the central collection agency and with the lack of input regarding the data set and form design. Most hospital administrators are, however, highly supportive of an early warning system and would participate in any future system if no additional staff time had to be committed. The perceived deficiencies of the NDPCRS in relation to its data acting as a source of early warning information have been discussed elsewhere (Pedic, 1989).

Four recommendations have been made in orderto improve the NDPCRS: (l)Thatadata collection person be employed in each participating state with a brief to collect data on drug poisonings presenting whilst in attendance. This individual would also have a "public relations" role in coordinating form

collation, in providing feedback to the hospitals and 'inspiring' casualty staff to become involved in data collection. (2) That data collection be state/territory-based, with record tapes sent monthly to the Commonwealth for funher analysis and feedback to all jurisdictions. (3) That the validity of poisonings data be tested to ensure recorded substances are present. Toxicologic verification through urine analysis on a regular basis is recommended. (4) That the system be sentinel-based with random sampling of hospitals from each strata, where stratification is based on the number of patients treated annually.

If these recommendations are implemented, the NDPCRS will possibly become the most reliable and consistent source of data on changing trends in use of both legal and illegal drugs. In relation to the five criteria listed above (timeliness, number of reports, complementarity, validity of data and cost), the NDPCRS can potentially be extremely timely because reports will be collated at least monthly. The number of reports for each substance is large enough to act as a baseline against which the appearance of new drugs or changes in current drug usage may be gauged. In relation to complementarity, the system offers information on a large section of legal and illegal drugs with which users experience difficulties. Validity of the reports is questionable to some extent, but this should improve (pedic, 1989) and the validity may be tested simply through urinalysis. The cost would be virtually nil because the system already exists.

Overall, the NDPCRS is potentially the best early warning indicator of changes in drug use because it monitors half the dimensions of drug use and meets all of the criteria to some extent.

Use of casualty data in early warning: An American example

In the United States, the Drug Abuse Warning Network (DAWN) presently collects reports of drug abuse from hospital emergency rooms and county medical examiners/coroners located in 24 Standard Metropolitan Statistical Areas (SMSAs) throughout the U.S. DAWN data have been used to measure recent changes in reported cocaine morbidity and mortality, increases in speedballing (the use of cocaine and heroin in combination), and increases in the median age of heroin abusers. In addition, DAWN data were used to monitor the spread of the combination of pentazocine and tripelnnamine, known on the street as "T's and blues." With the reformulation of pentazocine to include the narcotic antagonist naloxone, DAWN reflected a subsequent decline in the number of emergency cases and fatalities related to T's and blues.

Retka (1978) has developed a 'drug emergence index' which can be used for extracting early warning information on new drugs from DAWN and NDPCRS-type data. Initial analysis of data collected by DAWN between 1973 and 1976 indicated that only 313 of the 2620 drugs named were mentioned more than 50 times. However, these 313 drugs accounted for 98% of all drug mentions. Thus only 12% of reported drugs were found to account for virtually all of the drug activity in DAWN during the period studied. It can be assumed that substances representing serious abuse problems will emerge onto the drug scene relatively faster than less dangerous substances. DAWN detects drugs of abuse at a rate that reflects both the extent of use and the hazards associated with them. It therefore seems reasonable to expect that true 'problem' drugs will be reported relatively rapidly, reflecting either a rapid expansion of use (with a relatively constant casualty rate) or a high level of medical complications among a relatively small number of users. Of course, drugs exhibiting both a high injury rate and a broad popularity will likely appear most rapidly of all.

If each drug is looked at separately, the dates of first and fiftieth mentions from a certain date in the reporting system can be determined, and the difference between the two dates can be considered an index of the rate at which each drug 'emerged' onto the drug scene. One would expect that the known problem drugs would be reported 50 times within a relatively short period. Similarly, new drugs involving significant physical or psychological risk should also emerge relatively rapidly, regardless of when first mentioned. Drugs carrying little medical hazard, on the other hand, might be expected to take longer to accumulate the 50 mentions needed to qualify for the emergence index.

The Australian NDPCRS could similarly be studied in order to determine the minimum number of reports obtained annually for the drugs that account for almost all poisoning cases. That is, once we know how many days it takes for each drug, on average, to be reported 'x' number of times, then an early warning of increased drug abuse can be sounded whenever a particular drug reaches the emergence index in less than 'x' days. The number 'x' will be the number of days it takes for drugs that account for 95% to 99% of all reports to be mentioned. Therefore, to further facilitate the role of the NDPCRS as an early warning indicator of changes in drug use, a figure must be calculated for each substance each month which will indicate the expected number of reports for each substance. Whenever the number of monthly reports exceeds the expected figure, a warning may be sounded to those in the field regarding that substance.

(2) NATIONAL FORENSIC CASE REPORTING SYSTEM (NFCRS)

Another Australian event-reporting system is the National Forensic Case Reporting System (NFCRS). This system provides information on drug-related deaths investigated by the Coroners' Courts and the findings of forensic and toxicological analyses of deaths. If a death occurs in unusual or unexpected circumstances, a Coroner may refer the death to a State or Territory forensic laboratory for toxicological analysis. The aim of the system is to provide early warning information on drug related deaths.

The number of deaths related to the use of a particular drug can act as an indicator of the extent of prevalence and incidence of the use of that substance. Moreover, "data on drug-related deaths are thought to be indicators of changes in the number of intravenous drug users and changes in availability, purity, and price of drug" (Hayward, 1988).

An increase in the number (change of rates in prevalence) of active heroin and other drug users in an area is thought to result in an increase in the number of fatal reactions to specific drugs. For instance, it is assumed that the number of deaths associated with drug use and abuse would increase proportionally (Le., linearly) with the number of persons who self-administer heroin and other drugs of varying quantity and quality.

However, variations in the rate of drug-related deaths may be misinterpreted. For example, a large increase in the number of drug-related deaths reported in France, Germany and Italy during the late 1970s was believed to have indicated a real change in the extent of drug abuse. However, in West Berlin, Rome and London, closer study of the figures reveals periods when the number of drug-related deaths diminished at times when the use of drugs, such as heroin, was still believed to be increasing. The reduction in deaths was attributed, in the case of West Berlin, to variations in the quality and purity of heroin and in the use of other drugs in combination with heroin; in the case of Italy, to the use of Naloxone; and in the case of London, to a decrease in use of other drugs, such as barbiturates, and an increase in the use of heroin by smoking rather than by injection (Hartnoll, 1986). The assumption of a linear relationship between drug-related deaths and drug use may therefore not be a valid one.

The Australian Bureau of Statistics (ABS)

uses cause of death as decided by the coroner or certifying doctor to compile the annual mortality collection. Since there are frequently long delays in deciding the cause of death, the statistics are inappropriate for early warning. Moreover, the ABS only codes one cause of death and cases where drug use may have been a secondary factor in the death would therefore not be picked up in the ABS figures. The NFCRS was an attempt to overcome these difficulties. The system was initially proposed during 1982 and a three month trial in NSW developed a proforma which seemed to provide satisfactory data with limited resource requirements. Since 1987, reports of all cases where any drug is detected have been sent to the National Drug Abuse Information Centre.

Each jurisdiction sends to NDAIC data collected using a standard form. Between 100 and 200 forms are received monthly from forensic laboratories around Australia. In 1987, there were 1229 drug related deaths referred for analysis, involving 2082 drug mentions. For 1988 there were 1408 deaths reported and these involved 2722 drug mentions (National Drug Abuse Data Systems, statistical update Number 10, May 1989). Trends can be extracted from the NFCRS data. Thus, reports involving antidepressants increased from 168 to 246 between 1987 and 1988. An increase was also noted for amphetamines (8 to 42), cannabis (20 to 52), cocaine (0 to 6), and opiates (325 to 480); whereas little change was noted in reports of tranquillizers and barbiturates.

The NFCRS is therefore timely and provides a large number of reports each month to enable it to function as part of an early warning network. Moreover, the high degree of standardization in testing techniques between States implies that meaningful inter-jurisdiction comparisons can be made.

NFCRS data have the following limitations:

* criteria for deciding when toxicological analysis is requested varies across jurisdictions;
* frequently, only general screens are used, specific drugs are tested only at the Coroner's request; and
* only samples of blood, urine or liver are tested, drugs present elsewhere may not be detected (National Drug Abuse Data System, Statistical Update, Number 10, May 1989).

Although no direct comparisons can be made between different States/I'erritories, it seems reasonable to view the biases inherent in the system as constant over time, so that changes in time trends may be gauged.

Given that the forensic laboratory has full access to records about the deceased individual, it is possible to collect data on all six dimensions of drug use through the NFCRS. That is, drugs involved can be recorded, as can the total number of individuals deceased through use, their demographics, route of administration, drug purity and intensity of use. The reports are clearly timely and the number of cases large enough to extract early warning data. The system is also complementary to the NDPCRS because it provides data on persons who experienced more serious drug-use problems than those attending casualty. The system already exists and its inclusion in an early warning network would therefore be minimal. However, there may be questions about the validity of cross-jurisdictional comparisons in trend data. The NFCRS thereby meets four of he five criteria for inclusion in early warning.

(B)
ROUTINE STATISTICS

In the course of providing various services to the public, government departments often collect information which may be of use with regard to obtaining early warning of changes in drug use. These administrative by-products are referred to as "routine statistics". Routine statistics include: data on arrested drug offenders; information on drug addicts entering treatment; hospital separations for drug-related illnesses; and drug-related deaths.

Routine statistics have many limitations. They are usually very basic and often incomplete.

Moreover, they are usually compiled on an annual basis and therefore lack the timeliness necessary in an early warning system. As indicators they are considered to have an association with drug abuse, but the exact nature of that relationship is often unknown. In addition to the extent of drug abuse, routine statistics are influenced by other factors, such as variations in the level of activities designed to deal with drug problems. For these reasons, it is essential in interpreting them to use several indicators that draw on different sources of information and to supplement bare statistical data with an understanding of both the context in which they have been gathered and how they have been gathered.

Due to the fact that in many countries routine statistics are often the only data available, they tend to be used, without qualification, as indicators of the severity of drug problems. Some of these indicators, especially the quantities of drugs seized and the number of drug-related deaths, carry an emotional and political impact that is out of proportion to their real value as measures of the trend in drug use in the population.

Next, some of the routine statistics collected in NSW will be examined to determine their place (if any) in an early warning network.

(1) LAW ENFORCEMENT DATA

(i) Drug Seizures

An increase in seizures of a particular drug implies that the drug is more available in the community, and therefore, the prevalence of use of that substance is thought to be increasing. It can therefore be assumed that the numbers of drug seizures and charges would grow as the availability and use of a particular drug increases, although growth in drug seizures and arrests could also reflect increased police activity (Wardlaw & Deane, 1986).

The Australian Federal Police (AFP) maintain statistics on drug seizures by Federal agencies. The amounts seized between 1978 and 1986 have varied widely from year to year, but with a general tendency to increase. This may reflect an increased amount of drug importation, an increase in the proportion seized, or it may reflect increased law enforcement vigilance.

This indicator is therefore subject to a variety of interpretations. It becomes useful only in combination with other indicators. Thus, if substantial increases in both the number of seizures and the amount of drugs seized occur in a context of falling prices, rising purity and increased demand for methadone treatment (as has happened in the UK), then it is likely that the data indicate a rise in prevalence of use rather than changes in other factors such as an improvement in interception rates or police activity levels.

The database related to drug seizures is certainly large enough to enable extraction of early warning information. In 1985, for instance, in NSW alone there were 812 seizures of heroin, 85 of cocaine and 282 of amphetamines. Such numbers allow for changes in drug use to be reflected in these measures: that is, there is no "basement" effect.

Despite the previous criticism of law enforcement data as an epidemiological measure, it provides one of the few long term sources for drug reports in Australia. Unfortunately, comparable information on types of drugs is not available from each jurisdiction. With the eventual advent of the Australian Drug Data Base within the Australian Bureau of Criminal Intelligence, this type of information should be available for all jurisdictions (Stevens, 1989).

It is envisaged that data currently being collected by the Australian Bureau of Criminal Intelligence, as part of its Australian Drug Data Base (Law Enforcement Component), will provide greater detail in this area. These data were to have been available by 1989.

Drug seizure levels can to some extent be used as an indicator of the availability of various drugs and might reflect the number of users

and intensity of use. However, in terms of early warning criteria, the statistics lack timeliness because there is no provision, as yet, for rapid compilation of seizure data which could enable the information to be used in early warning of changing drug use. Therefore, as an early warning indicator, drug seizure levels are not perceived as valuable data.

(ii) Court Statistics

Data on drug-related charges and convictions are available from regular Australian Bureau of Statistics reports, on Higher Criminal Court Statistics, Childrens Courts Statistics and Courts of Petty Sessions Statistics. Some of the limitations of this indicator are that only the most serious offence is recorded and that it is possible for a person to appear in court for different offences more than once a year, thereby resulting in double-counting of offenders. Double-counting may exaggerate the presence of a new substance in the community and lead to an overestimate of changes in substance use and trafficking.

In New South Wales, data on court appearances involving illegal drugs are available from the NSW Bureau of Crime Statistics and Research (BCSR), and cover only those offenders who were convicted. At present the BCSR collects statistics on appearances before Local courts in NSW for summary matters or indictable matters heard by consent. The courts complete a statistical return in respect of the principal offence determined at each final appearance. These are stored in a computer file for later analysis (BCSR, 1988).

The data base is large enough to permit extraction of early warning information. In 1986, for instance, there were some 7, 573 local court appearances for drug offences resulting in a fmding of guilt. These ranged from some 5, 000 appearances for cannabis to 76 cases for cocaine.

One problem in using court statistics as an early warning of changes in drug use lies in the difficulty of separation of trends in arrest figures caused by changes in police practices, changes in arrest probabilities once arrestedpreviously, changes in the user population, etc. However, the most important problem in the context of early warning is that the court data lack timeliness as there is quite often a long time lag between arrest and the final court appearance.

Therefore, the lack of a clear relationship between court appearances and drug use, and the delay in compilation of the relevant data, clearly disqualify court data as an early warning indicator.

(iii) Purity of Seized Drugs

Purity measures of seized drugs are no longer collected as a matter of routine in NSW. However, because changes in the purity of drugs can indicate important changes in the patterns of drug use, the value of these data will still be considered in relation to a early warning system.

Changes in availability of a drug are thought to be related to changes in drug purity (Person et al., 1976). For example, "when heroin is scarce, it is 'cut' or diluted more frequently in order to conserve the scarce commodity" (Greene et al., 1974, p. 6). In that case, a purity decrease would indicate low supply. Availability of a drug, in tum, is thought to be related to prevalence of drug usage such that an easily available drug will be one used more frequently (N.S.W. Royal Commission into Drug Trafficking, 1979, p. 328). Moreover, in relation to incidence of drug use, if a drug is readily available (Le., if purity is high), there is increased likelihood of new individuals experimenting with the drug, and if the drug is one such as heroin, then some of the new users may progress to dependence (Greene et al., 1974).

However, it should be noted that purity levels of a substance will eventually peak. That is,

the percent purity per dose will be maintained even with a steadily increasing number of users. Heroin dealers, for instance, may increase purity levels in order to market a quality product and thus attract new customers. However, once a profitable consumer base has been established, the incentive to continue increasing purity levels disappears and purity remains a relative constant. The time from first use by one user to first use by his "successors" (those to who he/she introduces the drug) is less than a year in a majority of cases. Thus, once the profitable base market has been established, it is self-reproducing to a certain extent. With a prolonged and substantial decline in prevalence there is less working capital to meet the costs of importing and distributing drugs. In this case, the percent of heroin per dose would be expected to decline.

SOURCES OF PURITY DATA:

From 1977 to the end of 1985, seizures of heroin by NSW police were analysed at the Division of Analytical Laboratories. Fluctuation in the purity of samples was minimal indicating that the drug was at a reasonably constant level of availability over this period.

In NSW at present there is no systematic collection of this data. This is due to the introduction in 1986 of the Drug Misuse and Trafficking Act. Now, any powder found to contain heroin in any proportion is regarded as pure heroin for the purposes of the Act. This resulted in purity measurements being no longer required for enforcement purposes.

Given the potential value of having price and purity data systematically measured and available, the Bureau of Crime Statistics and Research had submitted for funding a proposal to undertake a feasibility study of the value for collecting this data as a drug use indicator. The proposal was for 480 heroin samples to be analyzed, involving measuring percentage heroin, total weight and identification of other substances. The NDAIC Grants Committee Meeting in December 1988 decided not to fund this project because it was perceived as not fitting into the scope of NDADS.

Officers at the Division of Analytical Laboratories, which still carry out tests of purity on samples of some larger police hauls of illicit drugs, have indicated that purity tests on all seized substances would be extremely costly. The estimated cost of the feasibility study alone was $73 000, with a $55 per sample estimate given by Australian Government Analytical Laboratories (AGAL). If another laboratory were to take up such testing, there may be large additional costs related to provision of proper security, record keeping and laboratory equipment.

SOURCES OF NSW SAMPLES:

There were two main sources of street drugs submitted for analysis in NSW-those submitted by the police in relation to a variety of drug offences and those submitted by health care professionals.

There are some obvious selection biases in the types of street drugs submitted for analysis from the police and health care professionals: "Because of the necessarily selective nature of law enforcement coupled with the fact that only a minute fraction of illicit drug users are ever arrested..., data from police seizures provides for generalization only to those drug users who are the primary subjects for police attention (Miller, 1974).

If tests of purity were to be included as an early warning indicator, the problem of selection biases would have to be addressed. According to Cook and Flaherty (1980), to reduce this problem the selection of samples should be extended in several ways to obtain a more representative coverage of the drug scene. First, health professionals (drug counsellors, physicians, etc.) could be encouraged to submit samples of street drugs which they obtain in the course of their duties. However, this is not recommended due to legal problems. Second, a representative sample of police seizures which fall outside present selection guidelines should be submitted for examination. Third, serious consideration could be given to the organization of purchasing studies, which appear to be the most desirable method for the collection of samples for intelligence work, such as recommended by NSW through

the Bureau of Crime Statistics and Research.

The Drug Enforcement Administration (DEA) of the US Department of Justice, for instance, monitors the price and purity of illicit drugs through a "buying" programme. DEA agents routinely purchase heroin, cocaine and methamphetamines in urban buying areas, locations where "comer level" dealers (the lowest level in the dealing hierarchy) sell drugs. These agents are thus quite knowledgeable about geographic patterns of drug dealing and can obtain a representative sample of drugs rapidly (Flaherty, Kotranski & Fox, 1983, p. 96-97).

Past data on variation of purity levels indicates minimal annual changes. Over a nine year period (between 1977 and 1985) the overall purity level increase was from 18% to 30%. The largest annual change in purity was a 7% increase from 1981 to 1982 (Muir, 1989). It is therefore unlikely that there would be sufficient short-term changes in purity to justify purity measurement as a means of gaining early warning information on changes in drug trafficking.

Purity levels are also often confounded with drug price. A fall in price may indicate increased supply, especially if the purity is rising. Price could also therefore be monitored as a means of determining whether changes have occurred in drug trafficking and supply: price is assumed to be negatively related to supply-as supply increases, prices fall, and vice versa.

Experienced narcotics police with knowledge of how illicit markets work are likely to provide reliable information on drug prices. Interviews with arrested users need to be carried out by experienced police officers if valid data are to be obtained (Hartnoll et al., 1989). However, even the prices reported by the police might be affected by other pressures. For example, a desire to emphasize the significance of major seizures could lead to inflated figures. Conversely, a desire to stress increasing availability could lead to selection of the lowest prices. It is difficult to see a solution to these problems, and price monitoring is therefore not expected to be part of an early warning network.

Measurement of the purity of seized or submitted drugs is obviously the only means of monitoring this dimension of drug use. No other indicator can give us information related to the purity dimension. The purity indicator fails however to meet most of the relevant criteria outlined above--timeliness could only be achieved by active purchase of illegal drugs; large variation in purity is unlikely; and the cost may be prohibitive.

Overall, purity is a potentially valid and unique indicator of changing drug use and should be considered part of an early warning network if steps were taken to improve its timeliness and if these were not overly costly.

(2) AIDS AND HEPATITIS B NOTIFICATIONS

Intravenous (IV) drug use is mistakenly considered by many to relate only to heroin use. Preliminary data from research projects in both NSW and the ACf however indicate that a number of drugs other than heroin are being administered intravenously, particularly amphetamines and to some extent cocaine. Health consequences of N drug use have been proposed as indicators of changes in drug use.

Hepatitis B and AIDS can both be used as indicators of intravenous drug use because such activity places users at risk for contracting AIDS, Hepatitis B and Hepatitis C. According to Schreeder (1978): "30% of drug abusers seeking treatment have a history of icteric (having Jaundice) hepatitis on one or more occasions after the onset of regular parenteral (intravenous or intramuscular) drug abuse." With regard to AIDS, IV drug use has been implicated as the mode of transmission in some 25% of AIDS cases in the United States and one estimate of the rate of antibody positive IV drug users in New York is 80%.

The NH & MRC Special Unit in AIDS Epidemiology and Clinical Research (University of NSW) produces a monthly cumulative index of AIDS cases in Australia,

showing separately those cases transmitted through IV drug use. those programs. This source therefore provides timely data on changes in IV drug use, data suitable for inclusion in an early warning system.

However, the number of reported cases of both hepatitis and AIDS may be too small to provide a stable baseline against which gross changes in drug use could be measured. In the Aer, for instance, 1988 saw 18 notifications of hepatitis B, but only one of these individuals was an IV drug user (Stevens, 1989). In South Australia, of the 230 individuals identified as HIV antibody positive, only 39 (or 17%) were IV drug users (Faulkner, Bums & Bungey, 1989, p. 140). The figures are an underestimate of the incidence of both hepatitis B and the level of IV drug use in those with the disease because testing for hepatitis is not compulsory and reporting is dependent on cooperation of doctors. Moreover, a confounding factor in the assumption that the level of hepatitis B cases is related to IV drug use may be nationality of the patient because research shows that the level of incidence of the disease is higher among Asian and Mediterranean migrants than in the general community.

In NSW, notification of all cases of AIDS or mv infection is mandatory. The obtained figures are compiled by the AIDS Bureau in Sydney and are considered to be a serious underestimate of the prevalence of infection. Doubts have also been expressed about the assumption that Hepatitis B is an indicator of either needle sharing or IV drug use.

At present, only data on Hepatitis A and B are entered in the relevant Western Australian data base. Hepatitis C data are kept but not recorded. This is unfortunate because research suggests that Hepatitis C is associated with intravenous drug use.

The small number of reported cases and the long incubation period involved, as well as the delays in reporting, rule out this source as an early warning indicator of changes in drug use and route of administration.

(3) PATTERNS OF DRUG USE AMONGST TREATMENT CLIENTS

Treatment demand can be a useful and sensitive indicator of patterns of drug use in the community. However, its function as an early warning indicator of changes in drug use could be greatly impeded by the time lag between use and treatment (Hartnoll et al., 1989). Those in treatment can, however, still act as a pertinent source of up-to-date information about the changing drug scene if they are surveyed regarding their recent using patterns.

In the United States, periodic surveys have been made to elicit information regarding the street availability and quality of heroin as judged by addicts entering treatment (OU Pont & Greene, 1973). Questionnaire information obtained from addicts entering treatment has been shown to be remarkably valid (Stephens, 1972).

Stephens (1972) investigated the truthfulness of addict information by cross-checking the addict's responses with the information obtained from treatment agencies, family members and peers of the addict. He found high percentages of agreement between addict and other information, even on detailed scales, indicating that a group of addicts were truthful respondents. Stephens also suggested that "letting addict informants know that their responses may be checked with independent sources possibly might help insure more truthful responses" (p. 557).

Routine urinalysis of entering clients of drug treatment agencies could also provide useful early warning of changes in drug use. In NSW, the urinalysis screens of methadone treatment clients reported some recent but isolated positive screens for Ecstasy. Subsequently, there have been drug arrests in NSW associated with that substance.

Therefore, collating data on recent drug use will clearly be a more useful measure of patterns of drug use than is information on the presenting and primary drug problem. This might therefore function as a good indicator of

changes in drug use in that sector of the drug community that experiences problems with use and/or a section of addict population that has perhaps been using drugs for a longer period.

Periodic surveys of, or routine interviews with, clients entering methadone treatment could therefore provide timely data on changing patterns of drug use by identifying any new drugs being used, enabling compilation of data on demographics of drug users, changes in route of administration and intensity of use. In terms of the early warning criteria, the reports from entering clients can be timely on a unit basis; a large number of reports can be expected; the indicator offers information on changing patterns of drug use in the long-term-user addict population and is therefore complementary to other early warning indicators; the validity of the information can potentially be confIrmed through urinalysis; and the cost would be minimal because most jurisdictions already collect data from methadone clients.

Overall, given the advantages listed above, reports of current drug use from clients entering treatment would provide extremely useful early warning information on changing patterns of drug use, second only to data provided through the NDPCRS.

(4) TELEPHONE COUNSELLING SERVICE CALLS

Telephone counselling services for individuals experiencing alcohol and/or drug related problems operate in all Australian states and routine statistics are collected on calls received. The agencies provide counselling, information, assessment and referral on a 24-hour, 7 days a week basis. As such the facilities represent an on-going point of contact for individuals experiencing problems with drugs. These services should therefore be able to provide immediate and timely data on new drug trends or patterns of use.

In NSW, the agency is known as the Alcohol andDrugInformation Service (ADIS). By the end of the 1988 fmancial year, ADIS in NSW was receiving approximately 35 000 calls annually. Half of these calls were for counselling. Data from these calls are collected on a "Record Form" and entered into a data base to be analyzed monthly. The agency uses the data for evaluation of the service, monitoring of drug use, targeting groups for intervention, and providing information to government for surveillance of trends in drug use and problems.

Information is unobtrusively collected from callers during the telephone call and entered on a standard questionnaire either during the call or upon its completion. The standard form consists of 21 questions concerning the characteristics of the person identified as the drug user and substance use data. This information is then coded, entered into the agency's computer and statistical tables generated.

Although all calls are confidential (no names or addresses are collected), data are recorded in such a way as to provide a sound basis for analysis. This information is not actively elicited by the counsellor solely for the purpose of data collection for its own sake and thus in some questions there is a high proportion of data which are "not available". Equally, some questions are not applicable to the caller's situation so there may also be a high number of "not applicable" scores which are not included in the analysis of the data for a particular question.

A large percentage of the callers (63.5% in the 1987/88 financial year) were not themselves drug users, but called either on behalf of partners, friends, relatives, etc., or called seeking information. The validity of the data may decrease if the caller is reporting the alcohol or drug use of another person. Bias in apparent patterns of drug use may occur also: a small number of regular callers may distort the statistics and the number of calls may simply reflect the media publicity the service has received up to a particular date and/or be indicative of the presence of another phone

service (e.g., Lifeline). "Even so, telephone data has the potential to highlight the appearance of new drugs on the basis of a single confmnable case and may also contribute to the creation of complex indices to measure drug prevalence and regional distributions especially using multivariate statistical methods" (Ross, 1989, p. 14).

The NSW ADIS form records: time, date and duration of the call; sex and location of caller; type of call (drug information, counselling, etc.); relationship of caller to the identified person; sex, age, cultural background, and location of identified person; whether the identified person is pregnant; drug(s) involved; duration of use; whether the identified person is an intravenous drug user; whether he/she is sharing needles; whether other agencies have been contacted; type of income of identified person; type and name of agency previously contacted; and how caller knew about ADIS.

Given that in 1988 ADIS in NSW alone reported 17 123 queries regarding drugs and alcohol (12 000 in Victoria, called DIRECT Line), that is, on average 330reports per week (240 in Victoria), trends in calls about various substances should be considered part of an early warning system. A large number of calls is received with regard to a wide range of drugs, and this existing baseline would be sensitive to any increases in enquiries about anyone substance. The extent of calls regarding various drugs is, however, too readily influenced by medical and government education campaigns. Moreover, the existence of various other telephone services to which users can direct their queries introduces another bias. Drug users aware primarily of ADIS, for instance, would obviously call that service and those aware of others (e.g., Lifeline) might call another. Bias is therefore introduced in the manner by which the public becomes aware of the various services and which services are included in an early warning network.

The usefulness of information collected from telephone data in detecting changes in drug use was illustrated in Western Australia where this source was the first to report the appearance of MDMA ('Ecstasy') in Australia (Hayward, 1988).

Telephone services could therefore provide timely information on changes in drug use by identifying new drugs and demographics of new users, by monitoring changes in the number of users, route of administration and intensity of use. The information is timely and the number of reports per substance large enough to detect changes in use. The validity of the data can be tested by including checks in the questionnaire which would determine whether the caller was truthful. Although relevant data are currently collected, there may be additional costs in supporting staff to analyze the information more quickly because some agencies have fallen behind in this task due to staff shortage.

Overall, data on changing patterns of drug use from telephone agencies canprovideextremely valuable and timely information on changing patterns of drug use, as potentially useful as that from clients entering treatment, but still second in value to NDPCRS data.

(C) INFORMATION (NOT ROUTINELY COLLECTED) FROM THOSE DIRECTLY IN CONTACT WITH USERS

(1) PRIVATE PSYCHIATRISTS

Researchers attempting to estimate the size of the drug-using community within a population have often used reports from private psychiatrists in this effort (e.g., Peveler et al, 1988). The rationale behind this in the American context is that drug users who can afford private psychiatric treatment are a different population from those that attend government-funded treatment centres. One may ask, however, whether private psychiatrists are a valuable data source for early warning of

changes in drug use in Australia, given the cultural differences between the U.S. and Australia. Research thus far indicates the answer to this question is clearly no. Two recent surveys, one on a sample of Sydney psychiatrists (Andrews & Rickie,1986) and one of Australian psychiatrists (Andrews & Hadzi-Pavlovic, 1988), have shown that psychiatrists have very low levels of contact with the drug using community.

Andrews and Rickie (1986) asked 55 Sydney psychiatrists for details of all patients seen in the previous five working days. Given that 69% of the reported patients were private, fee-paying clients and 31% were seen within the public sector, the study was, in large part, a study of private psychiatric practice. Of the 1316 patients reported, there were only 32 (2.4% of total) cases of drug or alcohol abuse, and even these were secondary to a diagnosis of psychotic illness.

In the Australia-wide survey, Andrews and Hadzi-Pavlovic (1988) asked psychiatrists for details of their last 20 patients. Ninety-nine doctors provided data on 1940 patients. Only 48 of these (2.5% of total) presented with drug and alcohol problems.

If private psychiatrists were to act as a source of early warning information on changing patterns of drug use, a much larger number of psychiatrists would need to be monitored. That is, in order for this source to provide reliable data about changes in drug use, a large number of initial reports on each drug would be necessary to act as a baseline from which variations could be gauged. Given that an Australia-wide survey of some one hundred psychiatrists only yielded 48 reports over a one-week period, a much larger number of psychiatrists would need to be used in an early warning system.

There may be value in reports from private psychiatrists in monitoring an "at-risk" group, those drug users that can afford private treatment and may be using the more expensive substances such as cocaine. The small number of expected reports and the lack of timeliness in reports would, however, still disqualify this as an early warning indicator.

(2) AMBULANCE OFFICERS' REPORTS - ACT DRUG INDICATORS PROJECT

The ACf Drug Indicators Project is "a three year program funded by NCADA which aims to develop and refme methodologies for estimating the incidence, prevalence and character of illegal drug use, to construct and monitor indicators of relative changes in drug use levels and patterns over time, and to assess how best to integrate information from different agencies and sources to provide a broader and more accurate picture of illegal drug use than is currently available. It is intended that the methods developed in the ACf will act as models for similar data collection systems in other jurisdictions" (Lee, Stevens & Wardlaw, 1989). The ACf Project is therefore a multi-agency study to determine which data sources are the most reliable means of assessing the extent and nature of drug use.

Data are collected from the following agencies: welfare centres; drug treatment agencies; detoxification units; community units; crisis detoxification centres; drug referral and information centres; corrective services; Australian Federal Police; and the ACf needle exchange program.

One of the sources of information on changing patterns of drug use consulted by the Project is the report of drug poisonings from ambulance drivers. This is a potentially useful indicator because some drug overdose cases are attended by the ambulance officers but refuse transfer to a hospital and therefore are not included in the casualty statistics recorded in the National Drug Poisonings Case Reporting System (NDPCRS).

The ACf Ambulance Service operates a computer data base on which ambulance officers directly enter information relating to the call they have previously answered. Data including drug involvement are coded, making retrieval of drug-related cases relatively

straightforward.

During 1988, the ACf Ambulance Service was called to 343 cases in the overdose category: 34 reports of heroin (10 of whom refused transportation to hospital following resuscitation) and seven cases involving amphetamines and four involving cannabis.

Importantly, none of the seven amphetamine cases were reported to the NDPCRS, probably because of the inadequacies inherent in that system (e.g., casualty officers may have been too busy to complete forms). The mentions of illegal drugs (45 in all) are therefore small relative to the mentions of legal drugs (298), mostly benzodiazepines and barbiturates.

The most obvious advantage of this reporting system is that it includes all cases of persons asking for ambulance assistance in relation to drug use, including those that refuse to go to the emergency room after being revived by the officers. In this way one could capture data from a large section of the drug using population that does have problems with drug use but refuses hospital treatment.

Data from ambulance drivers could therefore provide quite reliable and timely information regarding new patterns of both legal and illegal drug use, especially if the computerized system of data collection becomes nation-wide. Given the stated importance of the NDPCRS in an early warning network, it is essential to include reports from ambulance officers in the network in order to complement data obtained from the NDPCRS.

(3) NEEDLE AND SYRINGE EXCHANGE CENTRES

Given that use of previously used syringes is one of the major means of mv transmission, health departments in most jurisdictions have begun to set up facilities where addicts can obtain clean needles and syringes. Such facilities therefore provide one of the few points of contact between the authorities and active drug users, who are not necessarily experiencing negative health, social or criminal justice consequences due to drug use. Data collection at needle exchange centres might thus provide early warning information about the changing drug use habits of a section of the 'drug using community'.

In the ACT during the 1988 calendar year there were 766 new clients to the Needle Exchange Program (Stevens, 1989). There were only 373 new clients in the preceding period, July-December 1987. In relation to 1988 data, the ACf Drug Indicators Project Agency study sample obtained through treatment centres contained only 329 individuals who reported injecting drugs. TheProject, involving all other indicators, could therefore only find less than half the number of drug users identified through needle exchange. "Clearly the ACT Needle Exchange Program is serving a much larger proportion (and possibly a different section) of the IV drug using community than the drug treatment agencies" (Stevens, 1989).

Treatment and corrective services agencies can more readily collect data on the pattern of illegal drug use but are restricted in describing the characteristics of the illegal drug using population because these agencies only see people who are experiencing problems with their drug use. Needle exchange programs serve many different types of IV drug users but have more difficulty in describing the patterns of drug use among their clients because of the nature of the service.

Moreover, there are also qualitiative differences in the type of drugs used. Those attendingdrug treatment and corrective service agencies in the ACT are covered by the Indicators Project. The majority of these (290 out of 329) are injecting heroin, 34 amphetamines and 4 cocaine. The reports from the Needle Exchanges Program indicate quite different patterns of drug use. Qualitiative data from the workers at the Needle Exchange suggests that the majority are in fact amphetamine users. To determine whether this is correct, the needle exchange staff are

trialling a sample data collection on the types of drugs injected by their clients.

If the ACT data collection trial proves successful, it might be possible to collect infonnation (from most other similar agencies around Australia) about IV drug users without much additional cost and to obtain data that is obviously timely. Personal communication with the director of the needle-exchange program indicates a likely response rate of around 40% to questions related to drugs used by the clients. Even this kind of response base would allow access to very detailed data about changes in drug use in this section of the drug community.

In NSW, also, some of the needle exchange centres have begun to collect client and substance-to-be-used infonnation. The Kirketon Road Centre, Kings Cross and a centre in Manly, for instance, collect extensive data on client demographics, needle-use behaviour and drugs used. Substance use data include amount of various drugs used, frequency and length of usage. Moreover, in relation to use of hepatitis B and AIDS data as an indicator of IV drug use, the centre also collects information on "Hepatitis B status" and date of last HIV test and result.

The form of data collection now being piloted in needle exchange centres could potentially provide infonnation on all dimensions of drug use, apart from purity measurement. The infonnation would be timely because data could be collected at each visit and a large number of cases could be expected nationally every month. The data would complement information from the NDPCRS because it would describe using panems of those currently experiencing no negative health consequences of drug use. Validity of obtained infonnation would be testable and additional costs involved in data collection minimal as the services already exist.

It is therefore feasible that quite valuable infonnation about the IV section of the drug using population could be obtained from needle exchange centres, without incurring much additional cost. This information could provide an early warning of changes in drug use if all (or a sample of) centres, which are now Australia-wide, were to collect data on substances used, even on a sample basis.

Overall, infonnation about changes in drug use should be collected from needle exchange centres in order to complement data from indicators based on individuals experiencing health problems through drug use (NDPCRS, methadone treatment and ambulance officer reports).

(4) **DRUG** USE AMONG **PRISONERS**

Trends in drug usage within prisons may be an indicator of trends in substance use in the general community. It is therefore possible that information about drug use in prisons may act as one source of early warning of changes in drug use.

Indennaur and Upton (1988) have shown that the number of drug users in prisons of a variety of substances is sufficiently high to justify the inclusion of prisoners' drug use as a potential early warning indicator. In a sample of West Australian offenders, they found the number of individuals reporting drug use to be from 21 who reponed volatile substance use to 570 indicating heroin. There were also a sufficiently large number of reported LSD, barbiturate, heroin, cocaine, and amphetamine users. Given the large number of reports in a sample of W A prisoners, the overall Australian total would certainly justify the monitoring of drug use in prisons as an indication of changes in drug use trends. That is, the existing use of a number of substances is large enough at the moment in the prison population so that relatively small aberrations in use would not be perceived incorrectly as dramatic changes. Relatively gross and large changes in drug use in prisons would need to occur for the early warning to "sound".

However, the use of self-report measures in prisons is problematic, with under-reponing,

over-reporting and general concerns regarding reliability. Nevertheless, a number of prison-based studies have successfully employed self-report measures (e.g., Dobinson & Ward, 1984; White & Boyer, 1985).

Given that existing data collections on drug use in prison have not as yet been identified for each Australianjurisdiction, one cannotconclude how feasible and costly such an indicator might prove. The issue of how and to what extent (if any) data on drug use in prison is currently colectedwill be discussed in a forthcoming paper by the same author. It is therefore difficult to make a defmitive statement about the value of including prison drug use in an early warning network and this' should be left until the more detailed investigation is carried ouit into this issue specifically.

(5) KEY INFORMANTS

Key infonnant studies are interviews or consultation with experts in the field of drug use or with individuals' possessing intimate knowledge of the drug scene. The experts may therefore be researchers, treatment agency personnel, police officers addicts entering treatment and/or ex-addicts who still have contact with the drug using population (Flaherty, Kotranski, & Fox, 1983, 1986; Riley, Wagenfeld, & Sonnad, 1981).

In New York, an early warning system has been established using a network of key infonnants. They supply infonnation to a central base on trends in drug use and drug distribution, e.g., the availability of particular drugs and their purity. Aside from law enforcement, the purpose of the early warning system is to implement interventions and to give treatment agencies advance notice of possible trends so that they can be prepared.

Canadian key-infonnant studies (Rootman, 1988) consist of a network of observers of the local drug scene who come together from time to time to share their knowledge and perceptions. This approach therefore entails asking selected individuals to report on the practices of groups familiar to them, rather than their own practices as in the case of typical surveys.

The validity of key infonnants in accurately describing trends in the illegal drug market and drug scene is an obvious concern. The reports given by key infonnants maybe distorted due to faulty recall, lack of knowledge, exaggeration, or inappropriate choice of infonnants. However, it is likely that the bigger the pool of key infonnants, the more reliable will be the results especially if the key infonnants are all "saying the same thing".

New pools of infonnants would need to be chosen on a continuous basis to ensure that changes in a drug use dimension are continuously monitored in a variety of areas and sectors of the drug using community. There are no overseas models offering criteria by which key infonnants should be chosen for early warning purposes and how often the pool of infonnants should be changed. Perhaps such issues need to be discussed at the NDADS meeting.

Interviews with key infonnants can potentially provide infonnation on all aspects of drug use: new substances, number and demographics of users, changes in route of administration, purity and intensity of use. Datawouldbe timely as key infonnants would have immediate knowledge about changes in drug use. However, some initial time lag could be expected until the initial interviews established 'usage' baselines for various substances against which future changes could be gauged. Infonnation from key figures in the field obtained in this way could then complement data from other sources and act as an independent validation of whether changes in drug usage observed through other indicators (e.g., NDPCRS) have really taken place. However, as this would be a new indicator for inclusion in an early warning network, there would be large initial costs.

Overall, there is much to commend the direct collation of infonnation from key figures in the field and this should be included in an early

warning network. The infonnation can be collected immediately and without "filtering" through official fonns. Given its potential value in early warning, the additional cost of setting up key infonnant interviews may be justified.

(6) EARLY WARNING FIELD UNITS

Richman and Rootman (1982) have argued that,inorderto gauge changes indrugusemost directly, it may be possible to set up early warning field units. They cite the analogy of epidemic field units located in many parts of the world which have endemic infectious diseases. The units were intended to assist in the early identification of change in problems, to develop specific interventions as well as to enhance understanding of basic disease processes.

In setting up epidemiologic field units for gauging drug use trends, Hughes, Crawford, and Barker (1971) found a number of advantages in using a methadone-maintained ex-addict from the community under study to act as the "infoOllant" on changing trends. They found that with ex-addicts, training requirements were minimal because of the years of experience in the addict subculture. Moreover, access to and physical safety within the study population were facilitated by an already established relationship with the actively using addict population. Finally, Hughes et al. found that addicts who had occupied higher-level dealer roles had an intimate working knowledge of the membership and dynamics of the drug-distribution system.

There is also considerable evidence that an important factor in eliciting truthful responses from addicts is the interviewer's experience with and knowledge of drug users and the general drug scene (Aiken, 1986; Biernacki & Waldorf, 1981; Burr, 1983; Johnson & Goldstein, 1983). Therefore, insiders who can communicate with addicts on their own tenns and who are trusted by the users will be more likely to obtain reliable and valid infonnation.

A recent example of the success of using ex-addict interviewers is the Sydney 'Storefront' Study (Dobinson & Poletti, 1989). An ex-addict was recruited to infonn the drug community that the NSW Bureau of Crime Statistics and Research was interested in interviewing dealers who were at the same time addicts and dealt with drugs in large amounts (e.g., above the one kilogram), that is, above street-level packets. The ex-addict interviewer gained easy and rapid access to the drug using and supply community and was especially successful in initiating and maintaining the chain referral process. Each person interviewed was paid $30 and an additional $20 for each person they in turn convinced to attend the interview. Free condoms and syringes were also provided, all of which served to enhance the credibility of the project and the rapport between interviewer and respondent. Consequently, some 150 people were interviewed regarding their dealing and using practices. Those interviewed were also required to keep a diary of their activities. The latter proved a valuable source of infonnation on the drug trafficking market in the inner Sydney suburbs. Due to the extraordinary cooperation shown by the drug community to the ex-addict interviewer, the target of 150 interviews was reached in just seven weeks instead of the anticipated three to four months.

Use of the ethnographic approach in drug abuse research is not new. New York, Chicago, Philadelphia, and San Francisco in the United States have used highly trained ethnographers in a variety of efforts (Flaherty et al., 1983; McCall & Simmons, 1969), including routine monitoring of the drug scene in high-risk areas of the city, a one-time study of the effects of drug use among Hispanic families, a study of amphetamine users and diet-pill doctors. While employment of professional ethnographers would be productive for all cities, such employment is also costly, and requires very careful selection and training of ethnographic staff.

It might therefore be possible to set up a national network of field units in each of Australia's capital cities, employing an ex-addict who would collect information on the drug scene first-hand and/or set up interviews for addicts/dealers with the field unit. Although costly, such data would be extremely timely and more reflective of changing drug use patterns than less direct measures. Moreover, the cost could be reduced if the units are located in only a selection of cities where changes in drug use patterns are most likely to occur first.

Early warning field units could therefore provide immediate and direct information about changing drug use: identify new drugs, a change in the number or composition of drug users, changes in route of administration, purity or intensity of use. This information, like that obtained through key informants, could be used to validate apparent changes in drug use picked up by other indicators and would be costly.

Given the likely similarity between key informant and field unit data (and cost), only one of these need be used in an early warning network. The key informant approach is perhaps a more realistic way of getting direct information from the field and such interviews are therefore seen as a vital component of an early warning network.

The summary table on the last page lists the indicators discussed, the dimensions of drug use each could monitor, which criteria of early warning are met and whether the indicators should be included in a early warning network.

CONCLUSIONS

Given the lack of a reliable and complete database on drug use, and the bias which exists in the extant data, multiple indicators, as argued above, are one way of overcoming these problems. "Each source reflects only part of the problem, of the population, or of the market, but a careful comparison and combination of data from different sources will produce a more complete overall picture" (Wardlaw, 1989 pp. 349-350).

Which indicators, however, should make up an early warning system? Some ideas about the final composition of an early warning network can be obtained from the ACT Drug Indicators Project's 'role model', theLondon Drug Indicators Project (Hartnoll, Lewis, Daviaud & Mitcheson, 1985).

According to Hartnoll et al. (1985), in monitoring drug use it is important to:

(a) include both statistical and descriptive data;
(b) cover as wide a variety of agencies, drug takers and other sources of information; and
(c) employ as many different methods as possible.

In relation to (a) above, it is therefore important to include information from key informants in order to obtain a complete picture of changes in drug use. Assessment of the 'drug scene' should therefore include, apart from 'hard' collections of numbers and statistics, personal observations and experience from those with intimate knowledge of the drug-using community. "Bare statistical data only becomes meaningful when enriched with understanding of the context from which it was derived" (Hartnoll et al., 1985, p. 11). Moreover, information gathered through personal contacts with those in the drug community are often unavailable through any other means as such contacts provide information on individuals who use drugs without experiencing any adverse health, social or criminal justice consequences. The key informant approach is therefore an important part of any system designed to quickly signal changes in drug use.

In relation to (b) above the implication is that anyone agency will only have contact with one particular sector of the drug-using community. Moreover, the roles of the various agencies operating in the 'drug scene' are

varied and each facility will perceive (and report) drug problems from different perspectives. The same may be found among drug users. Patterns of drugs (and the perception of drug use patterns) in one community of drug users may differ dramatically from those in another. It is therefore vitally important to cover a range of agencies and to include treatment agency data and health-consequences-of-drug-use indicators, as well as information from drug users themselves.

In relation to (c) above, the implication is that it is essential to "draw on more than one method, preferably several, which neither rest on the same assumptions nor rely on the same data" (Hartnoll et al., 1985, p. 11). That is, any one method of gathering data on drugs used is bound to make invalid assumptions and to include errors in measurement. The more methods are used, the more one can cross-validate the fmdings obtained through anyone single method.

Therefore, to decide what combination of indicators to employ, one question to address is what relationships exist between the various indicators. Gardin and Leibson (1980) have looked at this question and found that:

(a) The most powerful relationship occurs between emergency room poisonings and overdose deaths (r = .62). Both these indicators simply measure different levels of medical crises and would be predicted to be strongly related in a positive direction. Thus, when prevalence increases, the number of individuals who may potentially come to medical attention increases.

and

(b) Emergency room cases of a drug overdose and purity of that drug are positively related (r =.33). As might be expected, as purity rises, the potential for a drug use accident increases.

Therefore, given the quite high correlation between the incidence of emergency room cases related to a substance and the involvement of that substance in overdose deaths and because the NDPCRS already collects data on the role of various substances in poisonings presenting to emergency rooms, it appears that inclusion of both NDPCRS and NFCRS data in an early warning network may be unnecessary.

Moreover, given the relationship between emergency room data and purity information, as found by Gardin and Leibson (1980), it may also be unnecessary to collect purity figures. That is, if purity information can add nothing to our knowledge of changes in drug use over and above that provided by the NDPCRS (and is also no more timely than NDPCRS data), then it need not be collected for early warning purposes. Thus, the very substantial cost involved in collecting purity figures would also be avoided.

Assuming that the NDPCRS forms the basic part of an early warning network, then real consideration should also be given to inclusion of reports from ambulance drivers to supplement emergency room data due to the proportion of overdosed patients who refuse transfer to hospital after resuscitation. This option would be even more realistic if ambulance officers in most jurisdictions were to enter data on computer.

In relation to law enforcement data, two main difficulties are apparent in considering their inclusion in an early warning network. First, the relationship between seizures/charges and drug use trends is unclear because of the multiple influences (political, economic and social) which determine police activity. Any changes in seizures/charges related to a particular substance do not necessarily reflect changes in actual substance use. Second, there is an unacceptably long time delay between seizures/charges and the dissemination of information about those events because of the various jurisdictional issues that arise in police activity and in the passing on of information to other authorities. There are hopes that the work of the ABCI in relation to the Australian Drug Data Base will overcome some of these difficulties. However, at this point, there is little to recommend inclusion of law enforcementdata in an early warning network.

AIDS and Hepatitis B notifications are related only to intraveneous drug use and have an uncertain relationship even with that sector of the drug using community. There is only a small number of cases reported annually and the reports are unreliable as they dependent on cooperation of doctors in notifying the relevant authorities. Due to the delay between drug use and HIV or Hepatitis B infection, also, these data are unsuitable for an early warning network.

Private psychiatrists are also an unsuitable source of data for early warning purposes because studies show that only a limited part of their work involves contact with drug users. Therefore, use of information from this source would either involve an extensive list of practicing psychiatrists or work with a limited number of practitioners who specialize in the drug and alcohol field. However, given the delay in gathering a sufficient number of cases, this indicator could not act as early warning.

Due to its extensive contact with those that abuse licit substances, data from telephone line services (e.g., ADIS) could be used in an early warning network. The services are already operational and collect the relevant data. It would therefore merely be a matter of extracting the relevant information from these organizations.

For access to information on the drug use of long-term addicts, two sources can be consulted: patients in treatment and key informants. Those who have been using for a long period of time and are experiencing severe problems related to drug use will approach treatment agencies. Information from these individuals obtained at admission will be a useful and timely indicator of what changes in drug use are occurring in the long-term addict population. Key informant studies would be more difficult and costly to run, but would provide a wider range of information (e.g., changes in dealing behaviour, purity of substances).

Needle and syringe exchange centres, on the other hand, would be an appropriate source of information on changing patterns of drug use amongst active drug users. As awareness of the role of needle-sharing in HIV transmission increases, needle-exchange centres are likely to become more popular with this (and other) sector(s) of the drug community and will therefore provide data on drug use patterns in a larger proportion of drug users. The few exchange centres that do successfully collect data on client drug use might be a model for similar facilities around Australia.

An early warning network would therefore consist ofinformation gathered through the NDPCRS, the NFCRS, key informants, ambulance officer reports, telephone advice lines, patients in treatment and needle exchange centres.

The sources of data identified here as possible components of an early warning system of changes in drug use generally covered agencies which already collect the relevant data as part of their routine functioning. For limited additional cost and effort, the desired information can be collected, collated and analyzed to monitor changes in drug use patterns.

EARLY WARNING NOTIFICATION

When changes in drug use are picked up by the early warning network, the relevant information would be passed on to individuals and groups who deal with drug users. Therefore, if a new substance, for instance, emerged through one of the early warning indicators the response should be to alert drug treatment agencies, hospitals and others likely to be contacted by drug users for help. The organizations/individuals so informed could then prepare resources or funds necessary for handling problems that arise through use of that drug. If changes in preference for or purity of drugs occur, agencies could similarly be alerted to switch resources to prepare for the consequences of the change.

The alert could be sounded in a variety of ways, depending on the nature of the change that has occurred and the jurisdiction within which the change is first noted. The procedure for notifying relevant individuals of changes could therefore also be discussed at the NDADS meeting. Possible channels of alert include sending letters to medical journals, informing doctors likely to deal with drug users directly through letters, or the publication by the National Drug Abuse Infonnation Centre of regular tri-monthly reports on changes in drug use which could be sent to all agencies dealing with drug users.

[please refer to table on the last page for summary of indicators]

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REFERENCES

Aiken, L. S. (1986). Retrospective self-reports by clients differ from original reports: Implications for the evaluation of drug treatment programs. *International Journal of the Addictions,* 21, 767-788.

Andrews, G. & Hadzi-Pavlovic, D. (1988). The work of Australian psychiatrists. *Australian and New Zealand Journal of Psychiatry,* 22, 153-165.

Andrews,G. &Hickie,C. (1986). Thepeople seen by Sydney psychiatrists. *Australian and New Zealand Journal of Psychiatry, 20, 492-*495.

Bancroft, J. H., Skrimshire, A. M., & Simkin, S. (1976). The reasons people give for taking overdoses. *British Journal of Psychiatry,* 128, 538-548.

BCSR-Bureau of Crime Statistics and Research (1988). The Work of the N.S.W. Bureau of Crime Statistics and Research.

Berdie, M. (1978). An evaluation of services provided drug abusers in emergency rooms. *International Journal of the Addictions,* 13, 695-707.

Biernacki,P. & Waldorf,D. (1981). Snowball sampling. *Sociological Methods and Research, 10, 141-163.*

Bobik, A. & McLean, A. J. (1977). Drug analysis in the overdosed patient: Its application to clinical toxicology. *Medical Journal of Australia, i, 367-369.*

Brandwin, M. A. (1976). Drug overdose in emergency room admissions. *American Journal of Drug and Alcohol Abuse,* 3, 605-619.

Burr, A. (1983). Increased sale of opiates on the blackmarket in the Piccadily area. *British Medical Journal,* 287,883-885.

Cook, G. A. & Flaherty, B. (1980). The analysis of street drugs. New South Wales Drug and Alcohol Authority, In-House Report Series, A 80/1.

Craig,R. J. (1979). Emergencyroomadmission for acute drug reactions in VA hospital. *American Journal of Drug and Alcohol Abuse,* 6,73-78.

Denzin,N. (1970). The Research Act. Chicago: Aidine.

Dobinson,I. &Poletti,P. (1989). Buyingand Selling Heroin: A Study of Heroin Userf Dealers. Sydney: NSW Bureau of Crime Statistics and Research.

Dobinson, I. & Ward, P. (1984). Drugs and Crime- A Survey of NSW Property Offenders. NSW Bureau of Crime Statistics and Research.

Dorman, J. M. (1979). University infIrmary admissions for drug abuse, 1968-1970 and *1973-1975. International Journal of the Addictions,* 14, 723-729.

DuPont,R. L. &Greene,M. H. (1973). The dynamics of a heroin addiction epidemic. *Science,* 181,716-722.

Faulkner, C., Burns, T., & Bungey, J. (1989). Indicators of illegal drug use: South Australia. In Epidemiology of Illegal Drug Use in Australia. 1988. Proceedings of the First National Drug Indicators Conference, Canberra, May 1988, pp. 135-157.

Flaherty, E. W., Kotranski, L. & Fox, E. (1983). A model for monitoring changes in drug use and treatment entry. *Prevention in Human Services,* 2,89-108.

Flaherty, E. W., Kotranski, L. & Fox, E. (1986). Defining drug use: A model for the integration of measures through the census tract. *International Journal of the Addictions,* 21,717-738.

Gardin, T. H. & Leibson, E. (1980). Heroin abuse indicators: A test of recent assumptions. *International Journal of the Addictions, 15,* 115-124.

Ghodse, A. H. (1976). Drug problems dealt with by 62 London casualty departments: A preliminary report. *British Journal of Preventive and Social Medicine, 30, 251-256.*

Ghodse, A. H., Edwards, G., Stapleton, J. et al. (1981). Drug-related problems in London accident and emergency departments. *Lancet, ii, 859-862.*

Greene, N. M., Kozel, N. J., Hunt, L. G., & Appletree, R. C. (1974). An assessment of the diffusion of heroin abuse to medium-sized American cities. Special Action Office for Drug Abuse Prevention. Washington, DC.

Hadden, S. M. (1978). Drug overdose: A study of the accident and emergency department of the Royal Victoria Hospital. *UlsterMedical Journal,* 47, 165-170.

Hartnoll, R. (1986). Current situation relating to drug abuse assessment in European countries. *Bulletin on Narcotics,* 38, 65-80.

Hartnoll, R., Avico, U., Ingold, F. R., Lange, K., Lenke, L., O'Hare, A., & de Roij-Motshagen, A. (1989). A multi-city study of drug misuse in Europe. *Bulletin on Narcotics,* 41, 3-27.

Hartnoll, R., Lewis, R., Daviaud, E., & Mitcheson, M. (1985). Drug Problems: Assessing Local Needs. London Drug Indicators Project.

Hayward, L. (1988). Indicators of illicit drug abuse in Western Australia 1981-1987. Western Australian Drug Data Collection Unit, Perth.

Hughes, P. H., Crawford, G. A. & Barker, N. W. (1971). Developing an epidemiologic field team for drug dependence. *Archives of General Psychiatry,* 24, 389-393.

Indermaur, D. & Upton, K. (1988). Drug Abuse Screening Project. Western Australia Department of Corrective Services.

Johnson, B. D. & Goldstein, P. (1983). The Economic Behayiour of Street Qpiate Users. New York: Narcotic and Drug Research Inc.

Jones, D. R. (1977). Self-poisoning with drugs: The past 20 years in Sheffield. *British Medical Journal, i, 28-29.*

Jones, R. & McAllister, I. (1986). The Establishment of a National Drug-Related Data Collection System: A Report to the Commonwealth Department of Health. Australia.

Koller, K. & Slaghuis, W. (1978). Suicide attempts 1973-1977-Urban Hobart: A further five year follow-up reporting a decline. *Australian and New Zealand Journal of Psychiatry,* 12, 169-173.

Lane, M. & Hinton, J. (1975). A discussion paper on self-poisoning presenting at casualty. Emergency Health Care Study. Division of Health Services Research, Health Commission of N. S. W.

Lee, C., Stevens, A. & Wardlaw, G. (1989). OUarterly report of the ACT Drug Indicators PrQject. October-December 1988. Canberra: Australian Institute of Criminology.

Leserman, J. (1977). Identification of Yariables Associated with the Prevalence of Heroin Use. Research Triangle Park, North Carolina: Research Triangle Institute.

McCall, G. S. & Simmons, 1. L. (1969). Issues in Participant Observation: A Text and Reader. Reading, Maine: Addison-Wesley.

Miller, R. D. (1974). Is street drug analysis necessary in Canada? In Marshman, J. A. (Ed.), Street Drug Analysis and its Social and Clinical Implications. Ontario: Addiction Research Foundation, pp. 41-66.

Muir, C. (1989). Indicators of illicit drugs in NSW. In Epidemiology of Illegal Drug Use in Australia. 1988. Proceedings of the First National Drug Indicators Conference, Canberra, May 1988, pp. 57-82.

Myers, O. B., Smith, A. J., Elliott, R. L., & MacKaskill, P. (1981). Self-poisoning with drugs: A 3 1/2 year study in Newcastle, N. S. W. *Medical Journal of Australia, ii, 402-405.*

New South Wales Royal Commission into Drug Trafficking (Commissioner, Mr Justice P. Woodward). (1979). Sydney: N.S.W. Government Printer.

Pedic, F. (1989). A report on the National Drug Poisonings Case Reporting System. NSW Directorate of the Drug Offensive.

Person, P. H., Retka, R. L., & Woodward, J. A. (1976). Toward a Heroin Problem Index An Analytical Model for Drug Abuse Indicators. National Institute on Drug Abuse Technical Paper, DHEW Publication No. (ADM) 76-367. Washington, DC: US Government Printing Office.

Peterson, D. M. & Chambers, C. D. (1975). Demographic characteristics of emergency room admissions for acute drug reactions. *International Journal of the Addictions, 10,* 963-975.

Peveler, R. C., Green, *S.,* & Mandelbrote, B. M. (1988). Prevalence of heroin misuse in Oxford City. *British Journal of Addiction, 83,* 513-518.

Proudfoot, A. T. & Park, J. (1978). Changing pattern of drugs used for self-poisoning. *British Medical Journal, i, 90-93.*

Retka, R. L. (1978). Patterns of new drug detection in the Drug Abuse Warning Network. *British Journal of Addiction, 73,* 155-165.

Retka, R. L. & Lester, G. 1. (1979). Drug-related suicide: A DAWN proftle. *International Journal of the Addictions,* 14, 599-606.

Richman, A. & Rootman, I. (1982). Epidemiologic field units on narcotic-related problems. *Bulletin on Narcotics,* 34, 17-28.

Riley, W. 1., Wagenfeld, M. 0., & Sonnad, S. (1981). Triangulated investigating: An approach to the estimating of the extent of heroin use. *International Journal of the Addictions,* 16, 97-108.

Rootman, I. (1988). Epidemiologic methods and indicators. In Blackwell, 1. C. and Erickson, P. G. (Eds.), Illicit Drugs in Canada. Ontario: Nelson, pp. 213-219.

Rootman, I. & Hughes, P. H. (1980). Drug-abuse reporting systems. World Health Organization Offset Publication No. 55, Geneva.

Ross, J. (1989). Statistical indicators of drug use and abuse in Victoria. In Epidemiology of Illegal Drug Use in Australia. 1988. Proceedings of the First National Drug Indicators Conference, Canberra, May 1988, pp. 83-103.

Russe, B. R. & Wells, K. S. (1980). Aresearch note on drug related emergency room cases. *Journal ofAlcohol and Drug Education, 15,* 7-13.

Schlenger, W. E. &Greenberg,S. W. (1980). Characteristics of cities and their relationship to heroin use: An analysis of heroin use correlates in metropolitan areas. *International Journa! of the Addictions,* 15, 1141-1168.

Schreeder, M. T. (1978). What is the relationship between viral hepatitis and drug abuse? In Proceedings: Community correspondents group meeting five. Forecasting Branch, Division of Resource Development, National Institute on Drug Abuse, December 1978.

Sellers, A. M., Marsham, J. A., Kaplan, H. L. et al. (1981). Acute and chronic drug abuse emergencies in Metropolitan Toronto. *International Journal of the Addictions,* 16, 283-303.

Sivner, A. L. & Goldberg, L. A. (1978). Deliberate self-poisoning: A study from North Manchaster General Hospital. *The Pharmaceutical Journal,* 221,207-207.

Soslow, A. R. (1981). Acute drug overdose: One hospital's experience. *Annals of Emergency Medicine, 10, 18-21.*

Stephens, R. (1972). The truthfulness of addict respondents in research projects. *International Journal of the Addictions,* 7,549-558.

Stevens, A. (1989). Draft copy of the Annual report of the ACf Drug Indicators Project for 1988. Canberra: Australian Institute of Criminology.

Wardlaw,G. (1989). The importance of druguse indicators research. In Epidemiology of Illegal Drug Use in Australia. 1988. Proceedings of the First National Drug Indicators Conference, Canberra, May 1988, pp. 347-352.

Wardlaw, G. & Deane, H. (1986). Uses and abuses of drug law enforcement statistics. In P. Wilson (Ed.) Trends and Issues in Crime and Criminal Justice. No.1. Canberra: Australian Institute of Criminology.

Webb, E., Cambell, D., Schwartz, R., & Sechrest, L. (1966). Unobtrusiye Measures: Nonreactive Research in the Social Sciences. Chicago: Rand McNally.

White, R. & Boyer, K. (1985). Alcoholism amongst the Tasmanian prison population. *Australian and New Zealand Journal of Criminology,* 18, 109-114.

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