Drug trends and crime tracking: Relationships between indices of heroin, amphetamine and cannabis use and crime

Western Australia

Drug and Alcohol Office Monograph:
Number 6

November 2010

Delivering a **Healthy WA**

Government of **Western Australia**
Drug and Alcohol Office

Drug trends and crime tracking: Relationships between indices of heroin, amphetamine and cannabis use and crime

Drug and Alcohol Office Monograph:
Number 6

Haynes, R., Griffiths, P., Butler, T., Allsop, S. & Gunnell, A.

November 2010

Government of Western Australia
Drug and Alcohol Office

Delivering a Healthy WA

Drug and Alcohol Office
PO Box 126
MOUNT LAWLEY WA 6929

Phone: (08) 9370 0333
Website: www.dao.health.wa.gov.au

Document prepared by
Rebecca Haynes, Drug and Alcohol Office, Perth, Western Australia

Acknowledgements:
This study was funded by the Office of Crime Prevention and the Drug and Alcohol Office.

The authors wish to acknowledge the cooperation and support of the following institutions and organisations:
Tanya Chikritzhs, National Drug Research Institute
Australian Institute of Criminology (AIC)
WA Police
The Emergency Department Information System (EDIS)
St John's Ambulance Service
The Alcohol and Drug Information Service (ADIS)
The DAO Client Management Information System (CMIS)
PICASO (Performance Indicators Client Statistics Online)
Communicable Disease Control Directorate of the Department of Health, Needle and Syringe Programs (NSP)

Suggested citation:
Haynes, R., Griffiths, P., Butler, T., Allsop, S. & Gunnell, A. (2010). *Drug trends and crime tracking: relationships between indices of heroin, amphetamine and cannabis use and crime.* Drug and Alcohol Office Monograph No 6, Drug and Alcohol Office. Perth, Western Australia. November 2010.

Contents

List of Tables

List of Figures

Abbreviations

ADIS	Alcohol and Drug Information Service
AIC	Australian Institute of Criminology
CCMES	Cannabis Cautioning Mandatory Education Scheme
CIN	Cannabis Infringement Notice
DUMA	Drug Use Monitoring Australia
EDIS	Emergency Department Information System
ICD	International Classification of Diseases
IDRS	Illicit Drug Reporting System
NCIS	National Coroner's Information System
NDSHS	National Drug Strategy Household Survey
NSEP	Needle and Syringe Exchange Program
NSP	Needle and Syringe Programs
PICASO	Performance Indicators Client Statistics Online
SIMS	Service Information Management System
SPSS	Statistical Package for the Social Sciences
WAPol	Western Australia Police

Executive Summary

Illicit drug use is associated with a range of harms to individuals, families and the wider community, and is a contributing factor to disability and death. In addition, illicit drug use is associated with crime. In 2004–05 it is estimated that drug related crime cost the Australian community $4 billion.

Due to the wide range of harms associated with illicit drug use, it is important to examine the relationships between the prevalence of illicit drug use and health-related outcomes. However, as illicit drug use is also associated with crime and criminal behaviour it is also important to consider the effects of illicit drug use and availability on crime.

This research was funded by the Office of Crime Prevention as a 'Crime Futures' research project. A primary objective was to investigate the potential for drug use indicators to be identified as a planning or 'early warning' tool for changing drug use trends. It was considered that the identification of reliable indicators would assist policy makers and service organisations in the health, welfare and justice sectors to plan in advance for changes in drug use patterns.

The associations between drug use and crime have historically varied. Recently, a tripartite collection of models was developed which assigns determinant roles to drugs in relation to crime:

- systematic model
- economic-compulsive model
- psychopharmacological model.

The systematic model designates drugs second to criminal activity. In this model, drugs are merely a commodity and the activity itself becomes criminal because of the presence of drugs. The economic-compulsive model gives drugs a significant role in the offenders' life and crime is committed in order to acquire funds to maintain drug use. In contrast, the psychopharmacological model outlines the criminal behaviour as an effect of drug use.

However, these models do not consider the physical and psychological effects of illicit drug use as well as the influences of drug market changes. In early 2001, a long lasting heroin shortage occurred internationally which affected the price of heroin and its purity. Over the same period, a decrease in property crime occurred that was linked to the reduction in heroin consumption.

In contrast, early 1999 saw the beginning of an increased use of amphetamine-type stimulants and related indicators, such as clandestine laboratories and amphetamine related emergency department presentations. Coincidentally, amphetamine consumption increased at a similar level to the number of violent offences and a link between the two was hypothesised.

The Drug Trends and Crime Tracking Project created a single database containing information about the consumption levels of heroin, amphetamine, and cannabis, as well as their related harms and crime outcomes. This database is used to determine what associations, and the strength of these associations, exist between drug use and crime in Western Australia.

De-identified and aggregated data were accessed from a variety of key stakeholders including the Western Australia Police, Department of Health, Illicit Drug Reporting System, Drug Use Monitoring in Australia study, St John's Ambulance and the Drug and Alcohol Office.

Descriptive analysis of the indicators showed:

- a decrease in heroin indicators from early 2001
- a decrease in other amphetamine-related indicators after 2004
- an increase in amphetamine seizures by Western Australian Police in 2003–04
- a seasonal pattern of crimes against the person which increases steadily after 2004
- a decrease in crimes against property, which was more distinct for burglaries, after 2001
- a steady trend line in cannabis indicators, except for issued Cannabis Infringement Notices which slowly decrease from 2005.

Relationships between the specific drug indicators revealed:

- Heroin indicators had a strong positive relationship with each other; specifically for:
    - Alcohol and Drug Information Service calls;
    - heroin seizures;
    - number of detainees who purchased heroin prior to arrest or who tested positive for heroin;
    - heroin treatment episodes, narcotic ambulance callouts; and
    - heroin related hospital admissions.
- Amphetamine indicators had some strong positive relationships with each other; specifically for:
    - amphetamine seizures:
    - sterile equipment distributed by the Needle and Syringe Program:
    - amphetamine treatment episodes; and
    - amphetamine purchased by detainees prior to arrest.
- Cannabis had few strong relationships with each other; specifically for:
    - Cannabis Infringement Notices;
    - cannabis treatment episodes; and
    - cannabis bought by detainees prior to arrest.

Correlations between heroin, amphetamines, and cannabis indicators and types of crime indicated:

- Increases in heroin related indicators corresponded to increases in crimes against property.
- Increases in amphetamine indicators corresponded to increases in crimes against the person, however cannabis and heroin increases corresponded with decreases in crimes against the person.
- Burglary increases corresponded to increases in heroin indicators.

Strong indicators of criminal behaviour and drug availability were identified as:

- incidents of drug seizures
- detainees' self-report of drugs purchased in the 30 days prior to arrest
- detainees' urinalysis results
- the number of treatment episodes
- the number of calls to the Alcohol and Drug Information Service
- the number of narcotic related ambulance callouts
- the amount of sterile equipment distributed through the Needle and Syringe Program
- the number of Cannabis Infringement Notices issued.

A primary limitation of this project is that causal relationships cannot be inferred from the results. One key criterion for inferring causality relates to temporality. That is, a cause must occur *prior* to the onset of another factor. Other limitations related to inferring causality, where other (unknown) factors may have accounted for observed results, might include changes in reporting practices or definitions, and inconsistencies in recording data. In conclusion, whilst certain data might suggest a potential relationship between two indicators requiring further investigation, caution should be applied in inferring causality. However, where apparent relationships between indicators are observed, further investigation is warranted and implications around some such relationships feature in the discussion section of this report.

Another limitation was the definition or codes used for amphetamine-type stimulants. Many data sources amalgamated amphetamine with ecstasy and methamphetamine. These different types of stimulants attract different types of users and can be used for different purposes, which may have affected the project's findings.

It is important to note that the relationship between drug use and criminal behaviour is complex as not all regular users engage in crime, and not all people participating in criminal behaviour use illicit drugs. The complexity of the association between drug use and criminal behaviour and the fact that it varies from person to person must be taken into consideration when interpreting results.

The suggested future directions of this project address specific priority areas and topics such as actions concerning the existing data collection/monitoring system

and more specialised one-off projects. Actions concerning the existing data collection/monitoring system include the database's maintenance, minor changes to the existing system, maximising the databases' utility and coordination between agencies.

1. For the existing database used in the Drug Trends and Crime Tracking Project to have current and ongoing value, it is important to continue to operate and report on a continuing basis. This project was developed through funds made available from the Office of Crime Prevention's Research and Development Grant. The grant provided resources to identify, collect, and analyse the data used for this project. The continuation of the project is to be assessed depending on the time and resources it will need to be maintained.

2. The current project analyses indicated weak correlations within cannabis-related indicators. Future use of the resources could remove cannabis and focus on stronger correlations for other drug types such as cocaine or prescription drugs.

3. In order to maximise the utility of the project, time series analysis could be used to predict future trends of drug and crime indicators. Looking at trend lines is useful in identifying what stage the community is at in terms of prevalence or extent of use for a particular drug. Trend lines also aid to inform decision makers of an appropriate response depending on where the indicators appear to be on the epidemic curve.

4. In order to develop key strategies and actions to reduce the harms of drug use, interagency collaboration is imperative to maintain an efficient and effective use of resources. The Drug Trends and Crime Tracking Project is one such resource that can provide an evidence-base for strategy and policy development.

The Drug Trends and Crime Tracking Project can be used for more specialist one-off projects such as geographical profiling of drug use and criminal activities; investigating the relationship between crime and particular kinds of drugs; and, exploring the relationship between crime and drug use for specific sub-groups in the population.

1. Background

1.1 Drug use and crime

Illicit drug use is associated with a range of harms to individuals, families and the wider community, and is a contributing factor to disability and death. In addition, drug use is associated with crime and criminal behaviour affecting law enforcement (Lasnier, Brochu, Boyd and Fischer, 2010). Estimates of illicit drug-related crime in 2004–05 cost the Australian community $4 billion (Collins and Lapsley, 2008). These costs cover expenses to police, criminal courts, prisons, property, insurance administration, violence, and loss of life

Research has demonstrated a strong association between drug use and criminal involvement. A meta-analysis of thirty studies demonstrated that the odds of criminally offending are 2.8 to 3.8 times greater for drug users than for non-drug users (Bennett, Holloway and Farrington, 2008). In addition, a study of 4,645 police arrestees found that 60% of those who had used drugs and reported crimes in the last 12 months believed that their drug use and crime were connected (Bennett and Holloway, 2006). Of these, over 80% of those that used drugs said that they committed crimes for money to purchase drugs.

Forty three per cent of injecting drug users in Australia interviewed in 2007 as part of the Illicit Drug Reporting System reported engaging in some form of criminal activity in the previous month. Of these, 67% were engaged in drug dealing, 51% in property crime, and 16% in violent crime (Kinner, George, Campbell and Degenhardt, 2009*).*

The association between drug use and crime has varied in past empirical research. Gottfredston and Hirshci (1990) proposed that the association between drug use and crime was the result of an individual's lack of self-control. Another theory later suggested that drug users commit money-orientated crime (e.g. drug dealing, theft, prostitution) in order to maintain their expensive habits (Nurco, Hanlon and Kinlock, 1991).

More recently, a tripartite collection of models has developed from an immense volume of empirical research across several countries. This research has expanded on Goldstein's (1985) models for classifying drug-related violence. The models assign different determinant roles to drugs in relation to crime: (1) the systematic model; (2) the economic-compulsive model; (3) the psychopharmacological model (Makkai and Payne, 2003; Pernanen et al, 2002).

The systemic model relates to crimes that are not intrinsically attributed to drug use but are committed in the course of "drug-market activity" (e.g. collecting drug debts, conflicts over territory etc). A second component to this model relates to drug-defined crimes. These crimes are activities that would not be criminal if they did not specifically deal with drugs (e.g. selling bread versus selling drugs). This

model suggests that the relationship between drugs and crime is not from individuals trying to get 'high' or access more drugs, but through drugs handled as a commodity and protecting market territories.

The economic-compulsive model determines the role of drugs as a motivator for predominantly acquisitive crimes. In other words, individuals whose drug use is a significant factor in their life are more likely to commit crime in order to gain monetary value to buy more drugs. Empirical research suggests that this subgroup is usually heroin users and/or property offenders.

The psychopharmacological model determines drug use as a direct cause of criminal behaviour. The model assumes that the individual becomes disinhibited from drug use and commits a crime that they normally would not have performed. Regular amphetamine users are more likely to attribute their criminal behaviour due to their drug use compared to others who primarily use other drugs. Additionally, violent offenders, homicide offenders and non-regular offenders were more likely to nominate psychopharmacological effects as the cause of their behaviour compared to property or fraud offenders (Makkai and Payne, 2003).

A vast number of factors influence the physical and psychological effects of illicit drugs. These factors can include frequency of use, dosage, route of administration, physical characteristics (e.g. body mass, gender etc), drug tolerance, environmental setting and polydrug use. The chemical components of a particular illicit drug may also influence a person's physiology and behaviour differently depending on the type of drug consumed. For example, depressant drugs slow down the functions of the central nervous system whereas stimulants speed these functions up. Because of this, particular drug types have different causal associations with criminal behaviour.

An example of a causal association between a stimulant and crime is amphetamines. Amphetamine use produces a variety of effects such as depression, irritability, paranoia, psychosis, and memory impairment (Maxwell, 2005). Other outcomes from amphetamine use are an increase in the risk of offending and violent behaviour and crimes (Kosten and Singha, 1999; Makkai and Payne, 2003; Tyner and Fremouw, 2008). The increase in the association between amphetamine use and violent behaviour is relatively recent in Australia and coincides with the increase in amphetamine-type stimulant use in 1999, primarily methamphetamines (Degenhardt et al, 2008; Makkai and Payne, 2003).

A longitudinal study of drug users in Sweden found that the psychopharmacological effects from amphetamine use was associated with a range of different offences (Fridell, Hesse, Jaeger and Kuhlhorn, 2008). In the same study, heroin use was associated with theft, fraud and drug offences. Unlike amphetamine users, heroin users will attribute offending behaviour to economic-compulsive factors (Makkai and Payne, 2003). Their criminal behaviours' generally escalate in severity from motor vehicle theft to armed robbery (considered a violent crime) as drug use becomes more regular.

In contrast, cannabis used in moderate doses temporarily inhibits violent and aggressive behaviour (Reiss & Roth, 1993). In an Australian study of incarcerated offenders, 81% had ever used cannabis and 53% had regularly used before imprisonment (Makkai and Payne, 2003). Regular cannabis users were more likely to be imprisoned for property, fraud, drug-related and multiple offences compared to homicide or violent offences. Fridell and colleagues (2008) suggest that passivity in cannabis users may be due to either: (1) cannabis users are sedentary in nature and perhaps differ in personality traits from stimulant users; (2) cannabis is less expensive than other drugs hence users do not rely on criminal acts for money to acquire more. Lundqvist (2005) explains that the use of cannabis can cause memory impairment and attention deficits whilst intoxicated. The resulting cognitive impairments are plausible explanations of why regular cannabis users do not engage in violent criminal activity.

1.2 Heroin, amphetamine and cannabis use in Western Australia

The National Drug Strategy Household Survey (NDSHS) is a national survey that provides cross-sectional data on alcohol, tobacco and other drug use in Australia. The Western Australian component provides estimates of licit and illicit drug use in Western Australia, including estimates of reported heroin, amphetamine, and cannabis use (Griffiths, Kalic, McGregor and Gunnell, 2009).

Heroin use in Western Australia is lower than the national prevalence. In the 2007 NDSHS survey, 1.2% of Western Australians aged 14 years and over had used heroin at least once in their lifetime compared to 1.6% of Australians. In Western Australia, males were more likely to have ever used heroin than females (1.5% and 1.0% respectively). The recent use of heroin in Western Australia is rated as the eleventh most prevalence drug excluding alcohol and tobacco. Only 0.2% of Western Australians aged 14 years and over reported using heroin in the twelve months (recent use) prior to the survey.

Meth/amphetamine use in Western Australia is more popular than heroin use. In 2007, 8.9% of Western Australians aged 14 years and over reported ever-using meth/amphetamines and 4.2% used in the last year. Meth/amphetamine use is also higher in Western Australia compared to the national prevalence. In 2007, 6.3% of Australians aged 14 years and over reported ever-using meth/amphetamine and 2.3% using it in the last year. In Western Australia, females aged 14 years and over were more likely than males to have used meth/amphetamines in the past month (2.2% and 1.5% respectively).

In 2007, cannabis was the most popular illicit drug ever used nationally and in Western Australia (33.5% and 38.3% respectively). Western Australians were more likely to have used cannabis in the last year compared to the national level (10.8% and 9.8% respectively). In Western Australia, cannabis use in the month prior to the survey was reported by 8.0% of males and 4.4% of females.

In early 2001 a long lasting heroin shortage occurred internationally, with capital cities around Australia also reporting a marked decrease in heroin availability (Longo et al, 2004; Weatherburn, Jones, Freeman and Makkai, 2003). As a result of the heroin shortage, the price of heroin increased, and heroin purity and availability decreased. Since the heroin shortage, heroin availability has increased; however, levels have not returned to those reached in late 2000 (Wodak, 2008).

Emergency department attendances for heroin-related problems, ambulance call-outs, and deaths related to heroin overdoses have significantly decreased since early 2001. This reduction is reportedly due to the difficulty for individuals to obtain heroin around this time (Degenhardt, Conroy, Gilmour and Hall, 2005; Longo, Henry-Edwards, Humeniuk, Christie and Ali, 2004). Many of the effects of the heroin shortage have been positive such as a substantial reduction in heroin overdose deaths and property crime. However, concerns were expressed that many heroin users may substitute heroin with other drugs, particularly psycho stimulants, because of the reduction in heroin supply (Longo et al, 2004). An increase in methamphetamine indicators such as the number of clandestine laboratories closed by police, amphetamine prevalence indicators, hospital separations and emergency department presentations were reported in early 2000-01. However, some data sources indicate that the increase in indicators of amphetamine-type stimulant use preceded the heroin shortage (Degenhardt et al, 2008).

1.3 Using indicators of drug use to predict crime

Due to the wide range of harms associated with illicit drug use, it is important to examine the relationships between the prevalence of illicit drug use and health-related outcomes. However, as illicit drug use is also associated with crime and criminal behaviour it is also important to consider the effects of illicit drug use and availability on crime. The development and integration of databases in the health and law enforcement areas in Western Australia will enable a clearer understanding of the interaction between drug use trends and their association to crime. Combining data from these different sources has a range of potential uses including forecasting possible changes and developments in crime-related behaviours. In addition, this information can be used for strategic policy development, planning, and resource allocation for both the Western Australia Police and the Drug and Alcohol Office.

1.4 Aims of this study

The study aimed to create a single database containing de-identified, aggregated data of heroin, amphetamine, and cannabis use indicators, and their related harms and crime outcomes. This database was used to determine associations

between the different indicators of drug use and related outcomes, and to describe up-to-date drug and crime trends in Western Australia.

2. Method

2.1 Sampling and data collection

Data on crime, heroin, amphetamine, and cannabis variables were accessed from a variety of sources within Western Australia. Data was requested in a monthly format, however many data sets were only available in quarterly series. For those variables provided in monthly time series, data were recoded into quarterly totals for graphical presentation and for comparison to other quarterly series variables.

Data from each database were extracted by the variables of interest and entered into a Statistical Package for the Social Sciences (SPSS) spreadsheet. Histograms for each variable were visually inspected to ensure each appeared to be approximately normal with no outliers or evidence of gross bimodality. Once all the data was obtained and cleaned, SPSS spreadsheets were merged to create one database containing all the variables for analysis.

2.2 Data analysis

Pearson's product-moment correlation coefficient was reported for normally distributed continuous variables. The level for the acceptance of significance (Alpha) was set at <0.05. Confidence intervals of 95% were used. Analyses were conducted using SPSS V17 for Windows.

A minor obstacle was the format of available data. In many cases raw data was either not available or permitted; in these cases data in tables from current reports were extracted. While not an insurmountable problem, the availability of raw data in these instances would have minimised error in data transfer.

The strength of relationships between heroin-related variables was determined using correlations. Similarly, correlations were performed to determine associations between the amphetamine-related variables and between cannabis-related variables. This is an important step, as the degree of intercorrelation between drug-related variables needs to be taken into account before examining the relationship between drug-related variables and crime. Cohen's conventions were used to interpret effect size. A correlation coefficient of 0.1 to 0.3 was considered weak, 0.3 to 0.5 was moderate, and greater than 0.5 was considered strong (Cohen, 1988).

2.3 Data sources

Data sources are described below. The identification of relevant data and data sources was guided by previous research literature. All data used was for the whole of Western Australia and was used in a de-identified and aggregated form, by month. Where monthly data was not available, quarterly data was used.

2.3.1 Western Australian Crime Data

The police crime frequency data was available on-line from the Western Australia Police (WAPol) statistical web site[1]. Three major crime categories were selected: total crimes against the person, drug-related crime, and crimes against property. Crimes against the person included offences such as homicide, assault, robbery, and other offences against the person (e.g. deprivation of liberty). Drug crime included: drug trafficking and drug possession offences. Crimes against property included: burglary, theft, receiving/illegal use, fraud, arson, and property damage. A second minor category looked at burglary (dwelling and non-dwelling) separately.

These crime figures are reported online on a monthly basis[2]. The strength of this data source was the ease with which it could be accessed and the minimal delay in reporting figures (approximately one month).

2.3.2 Drug Use Monitoring Australia Data – purchase and urinalyses

Drug Use Monitoring Australia (DUMA) is a research project conducted by the Australian Institute of Criminology (AIC) in conjunction with local police services. It aims to identify relationships between drug use and criminal behaviour. The DUMA project is funded by the Australian Government. The data and tabulations used in this publication were made available through the AIC. In Western Australia, the data is collected quarterly by an independent data collector with the assistance of the WAPol.

Detainees at the East Perth Watch House are interviewed and asked to provide a voluntary urine analysis. Information collected from detainees includes demographics, drug use and drug market activities. The variables used for this study were the percentage of detainees who reported purchasing heroin, amphetamines, and/or cannabis in the 30 days prior arrest, and the percentage of detainees who tested positive (by urinalysis) for heroin, amphetamines, and/or cannabis. McGregor and Makkai's (2003) research has shown the majority of detainees are honest about their drug use and behaviours.

[1] These data are for 'reported offences'

[2] http://www.police.wa.gov.au/ABOUTUS/Statistics/CrimeStatistics/tabid/1219/Default.aspx

The DUMA study is a key research tool providing timely information about the consumption of drugs and its relationship to criminal behaviour within Australia. A further strength is the ability to access data shortly after it has been collected. Data are available online within eight weeks of collection and can be accessed and downloaded with permission from the AIC.

There are some limitations associated with the DUMA data. Firstly, violent, intoxicated, or unstable detainees are not invited to participate in the study, as they may be a risk to the interviewer. Therefore, there may be a disparity in drug use and behaviours between those that are eligible to participate and those ineligible. Additionally, across the four quarters in 2008, an average of 77% of detainees agreed to participate out of those who were eligible and approached (Gaffney et al, 2010). Again, there may be some disparity in drug use between those who consented and those who declined to participate.

Another limitation is that in Western Australia, detainee interviews are conducted at one of Perth's inner city police stations (the East Perth Watch House). There may be differences in drug use or criminal behaviour between these detainees and those detained at an outer suburban or non-metropolitan police lock-up.

2.3.3 Drug seizures

Seizure data are generally accepted as a major indicator of the amount of drugs available in the community, although it is acknowledged that factors relating to police operations also contribute to the volume of seizures.

The number of drug seizure incidents for amphetamines, cannabis, and heroin were obtained from WAPol. A drug seizure incident refers to a distinct event in which one or more types of drugs seized have been counted. This assists the police to determine how often they encounter these types of drugs. If the same type of drug is recorded multiple times on an incident report, it is only counted as one incident of the drug type. If one drug seizure incident involves more than one type of drug, each drug type will be recorded separately.

The primary limitation of this data is that the number of previous documented incidents can change. Changes occur due to delays in toxicology results to confirm the drug type seized in order to correctly charge the individual/s. Additionally, the number of incidents of drug seized does not take into account the amount or weight of the drugs. Therefore, it is unclear whether the frequency of police encounters of that drug is due to a small amount found on the person or a large amount transported interstate.

2.3.4 Drug Purity

Data relating to the purity of heroin and amphetamine was obtained from published Illicit Drug Reporting System (IDRS) reports. The IDRS is a national monitoring system to identify emerging trends in illicit drug markets conducted

annually. The project consists of three components: interviews with injecting drug users in Australian capital cities; interviews with key experts and professionals; and analysis of indicator data sources.

Drug purity data was obtained via forensic analysis of drug seizures by WAPol from the IDRS reports; rather than self-reported perception of purity by drug users, which is also collected by the IDRS.

A limitation of this data is access to the raw data (toxicology results) which is not available. Therefore, data were derived from published reports, possibly resulting in a greater risk of error in data transfer.

2.3.5 Drug-related deaths

Drug-related deaths were obtained from the National Coroner's Information System (NCIS). Coronial data represents the number of deaths recorded by the Coroner's Court of Western Australia. Deaths are referred to the Coroner for review in the following instances:

- where the person died unexpectedly and cause of death is unknown;
- where the person died in a violent or unnatural manner;
- where the person was 'held in care' or custody prior death;
- where the person died during or as a result of an anaesthetic;
- where the person's identity is unknown; and
- where a doctor is unable to sign a death certificate stating the cause of death.

Deaths related to the relevant International Classification of Diseases (version 10 (ICD–10)) codes for heroin, amphetamines, and cannabis were obtained from the NCIS[3]. In addition, a text search was conducted for heroin, amphetamine, and/or cannabis. These cases had drug use as either an underlying cause or a contributory factor to death. The period used was from July 2000 to date for closed cases only. Unintentional deaths were included. Therefore, deaths related to suicide, assault, medical procedures etc were excluded.

There is an underestimate of actual deaths caused or impacted by drug use as not all deaths are referred to the Coroner; which is a major limitation of this database. Another limitation is the delay in the Coroners' findings being produced, which can take one to three years.

[3] ICD-10 codes: Heroin: T40.1, F11 or F19 with T40.1; Amphetamines: T43.6, F15 or F19 with T43.6; Cannabis: T40.7, F12 or F19 with T40.7.

2.3.6 Ambulance callouts

Aggregated data for the number of St John's Ambulance callouts to 'narcotic'[4] overdoses were obtained. The St John's Ambulance provides these data to the School of Primary, Aboriginal, and Rural Health at the University of Western Australia. The Drug and Alcohol Office receives this data monthly from the University. However, there is a time lag in data received of 6-8 months.

2.3.7 Calls to the Alcohol and Drug Information Service

The Alcohol and Drug Information Service (ADIS) is a telephone information and counselling service for people concerned about their (or others) drug use. ADIS is also a referral network and links callers to appropriate treatment services. This data is compiled by the Drug and Alcohol Office and available through current access permitted to the researchers.

The number of heroin, amphetamine, and cannabis-related calls to ADIS were retrieved from the database. The ADIS database has a minimal lag in reporting time because call details are recorded immediately at the end of each call. Therefore, information about calls is easily accessible through a 'living' database.

2.3.8 Treatment episodes

The Service Information Management Service (SIMS) and Performance Indicators Client Statistics Online (PICASO) databases contain demographic, treatment and diagnostic information for all patients attending non-government agencies, Integrated Services, and Next Step Drug and Alcohol Services. The unit of analysis is an episode of contact at a drug and alcohol treatment service. This represents a count of activity in all services which have been funded by the Drug and Alcohol Office, and does not record unique individuals who have attended these services in a particular period. An episode of contact includes a variety of treatment services such as pharmacotherapy, residential rehabilitation, counselling and case management.

The Drug and Alcohol Office is the custodian for this data. Access was granted by the Drug and Alcohol Office to extract data for aggregated monthly data for current treatment episodes whose primary drug of concern was heroin, amphetamines, or cannabis.

Limitations of this data include changes in reporting standards over time. Data collected prior to 2000 were unreliable and unlikely to be an accurate representation of clients seeking treatment. In addition, the development of integrated services, when non-government agencies integrated with Next Step Drug and Alcohol Services, may have altered reporting slightly in late 2007 and onwards. Another limitation to this data is that there is a three to four month delay

[4] Any incident where there is collapse or loss of consciousness thought to be due to the use of opioid drugs is coded as a narcotic overdose. This differs from callouts to individuals who have overdosed on their prescribed medications.

for exact numbers because some non-government agencies update their databases at quarterly periods. For example, a client that starts treatment in December of 2008 will be shown in January 2009 figures for new treatment episodes. However, a client that commences treatment in January 2009 will not show up until April 2009 after the agency enters new client details at the March quarter.

2.3.9 Hospital admissions

The Western Australia Department of Health is the custodian for hospital morbidity data. The hospital morbidity database holds all inpatient information and activity for any Western Australian hospital except emergency or outpatient activity. Permission was granted by the Department of Health for access to restricted de-identified data of specific drug-related ICD-10 codes. The data extracted for this study was the number of patients that were admitted into a Western Australian hospital (excluding emergency departments) that were coded for either principal or other diagnostic ICD-10 codes of heroin, opioids, amphetamines, and/or cannabis.

A limitation of this data is the time lag in reporting times of approximately six to ten months due to morbidity coding. Another limitation is the ICD-10 coding for amphetamines. The ICD-10 codes, T43.6 and F15, are the codes for psycho stimulant use and mental or behavioural effects from psycho stimulant use. Therefore, the code covers all psycho stimulants and does not distinguish between amphetamine, methamphetamine, ecstasy or other prescribed psycho stimulant medications (e.g. Ritalin). Another limitation is that the data are reliant on accurate diagnosis and coding.

2.3.10 Needle and syringe distributions

The Needle and Syringe Program (NSP) data details the number of needles and syringes distributed throughout Western Australia and the sites from which they were distributed (both suburb and outlet type). Needle and Syringe Programs (NSP) describe any program where sterile injecting equipment is made available to people who inject drugs. There are three main types of services that provide injecting equipment to drug users; pharmacy based NSP; health services based NSP (hospitals, community health centre's and other related health services); and needle and syringe exchange programs (NSEP).

This data was obtained with permission from the Communicable Disease Control Directorate of the Department of Health. NSP data are available for the previous calendar year and are potentially useful as an index of injecting drug practices in Western Australia. However, it is unknown how many units of sterile equipment each individual obtains and this is potentially a limitation of the data.

2.3.11 Cannabis Infringement Notices

Cannabis infringement notice (CIN) data was obtained from the WAPol. The CIN scheme was established in accordance with the provisions of the *Cannabis Control Act 2003*. The scheme enables police to issue a caution to first time offenders (aged over 18 years) who possess 25 grams or less of cannabis. A person may expiate a CIN by either paying the appropriate modified penalty or attending a cannabis education session within 28 days of issue (for further information see Drug and Alcohol Office, 2003).

The CIN scheme was passed by the Western Australian parliament in September 2003 and came into force on 22 March 2004. It is important to note that the *Cannabis Control Act 2003* is linked to sections 5(1)(d)(i), 6(2) and 7(2) of the *Misuse of Drugs Act 1981.* This means that police have the option of charging a person instead of issuing them a CIN.

Infringement notices are issued for:

- possession of a smoking implement with detectable traces of cannabis
- use of or possession of not more than 15 grams of cannabis
- use of or possession of more than 15 grams and not more than 30 grams of cannabis
- cultivation of not more than two non-hydroponically grown cannabis plants.

The strength of this data source was the minimal lag in reporting and retrieval (approximately three months).

2.4 Ethical considerations

Curtin University of Technology's Human Research Ethics Committee approved the Drug Trends and Crime Tracking project (Reference: HR 139/2009).

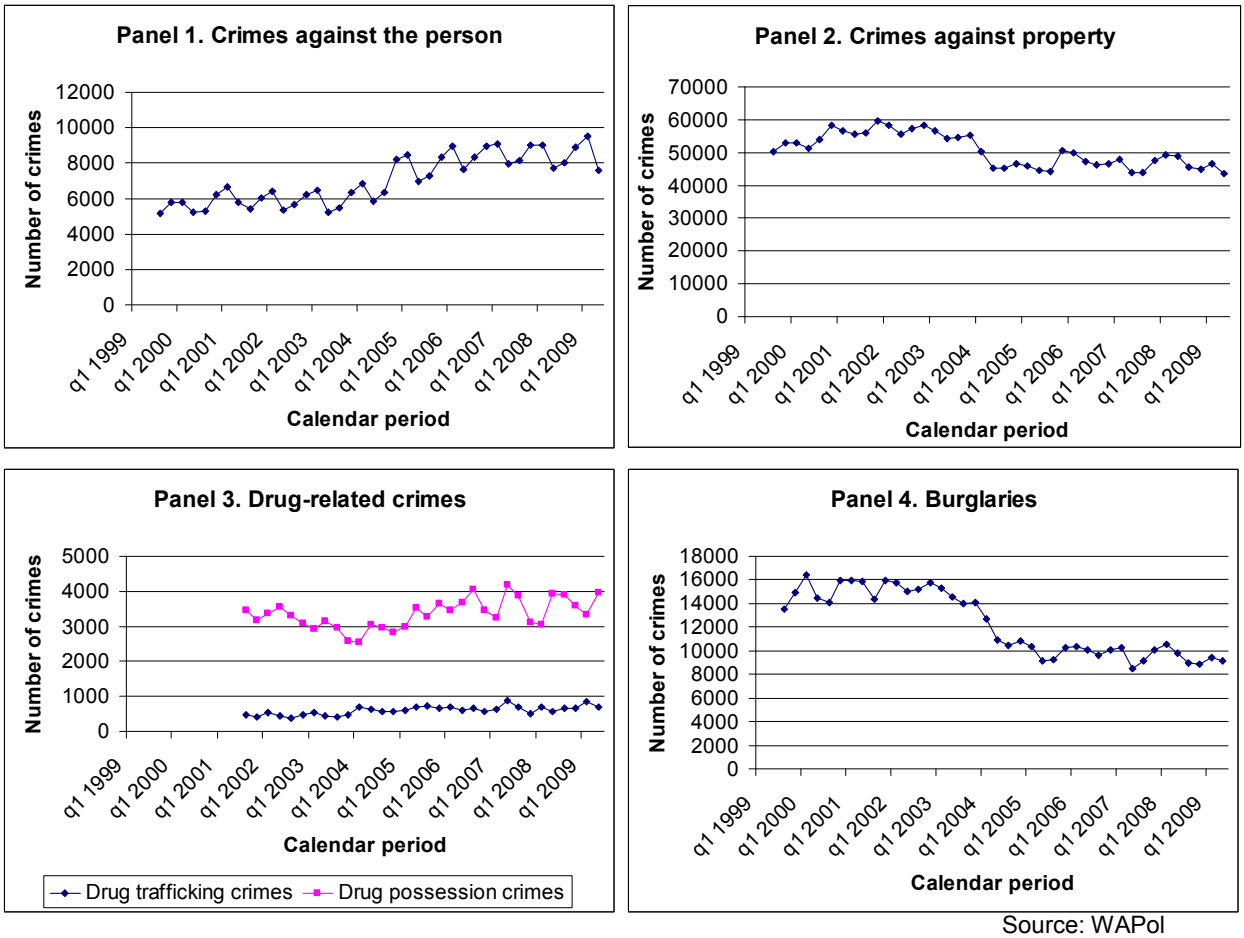
As the data were obtained from established databases with individual participants not identified or contacted, consent forms were not required and no ethical problems were identified. Each agency's data custodian released data at their discretion.

3. Results

3.1 Western Australian Crime Data

Figure 1 shows the patterns of crime from the third quarter of 1999 to the second quarter of 2009. Reported crimes against the person (Figure 1: Panel 1) increased across the data collection period. Crimes against the person appear to have a consistent seasonal pattern; reported rates are highest for each year in the first quarter and lowest in the second quarter. Crimes against property (Panel 2) increased between 1999 and 2001 peaking at 59,784 crimes in the fourth quarter of 2001. Crimes against property then gradually decreased, reaching a low of 43,630 crimes in the second quarter of 2009.

Figure 1: Patterns of crime



Source: WAPol

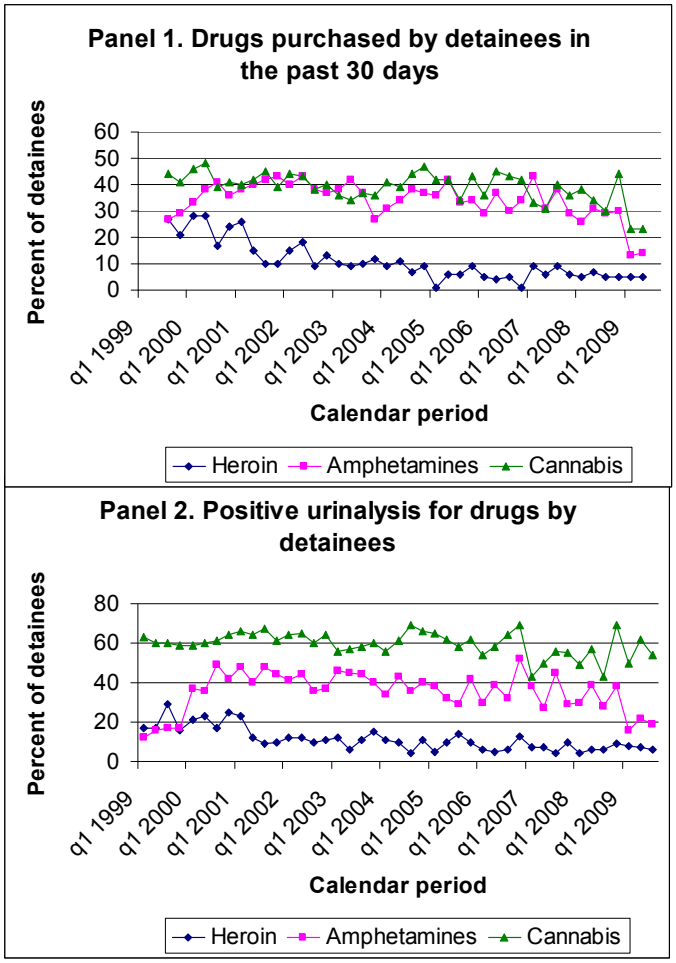
The number of drug trafficking crimes (Panel 3) gradually increased from the third quarter of 2001 (479 crimes) to the second quarter of 2009 (707 crimes). The number of drug possession crimes declined from 2001 to 2004 and have subsequently increased. Reported burglaries (Panel 4) remained stable from 1999 until 2004. There was a large decline in number of burglaries from 2004 to 2006 after which numbers continued to decline slightly.

The heroin shortage, which was generally considered to have begun in early 2001, did not appear to have any discernable effects on these four crime categories. Overall, crimes against the person increased and property crime and burglaries reduced. Drug possession fluctuated between 2001 and 2009 whilst drug trafficking remained relatively stable across the period.

3.2 DUMA Detainee Data – purchase and urinalysis

Figure 2 shows the proportion of police detainees who reported purchasing drugs in the last 30 days, and the proportion of detainees who tested positive for drugs. The proportion of detainees who reported purchasing heroin in the last 30 days declined between 1999 and 2009 (Figure 2: Panel 1) with the largest decline occurring during 2001.

Figure 2: Detainee data



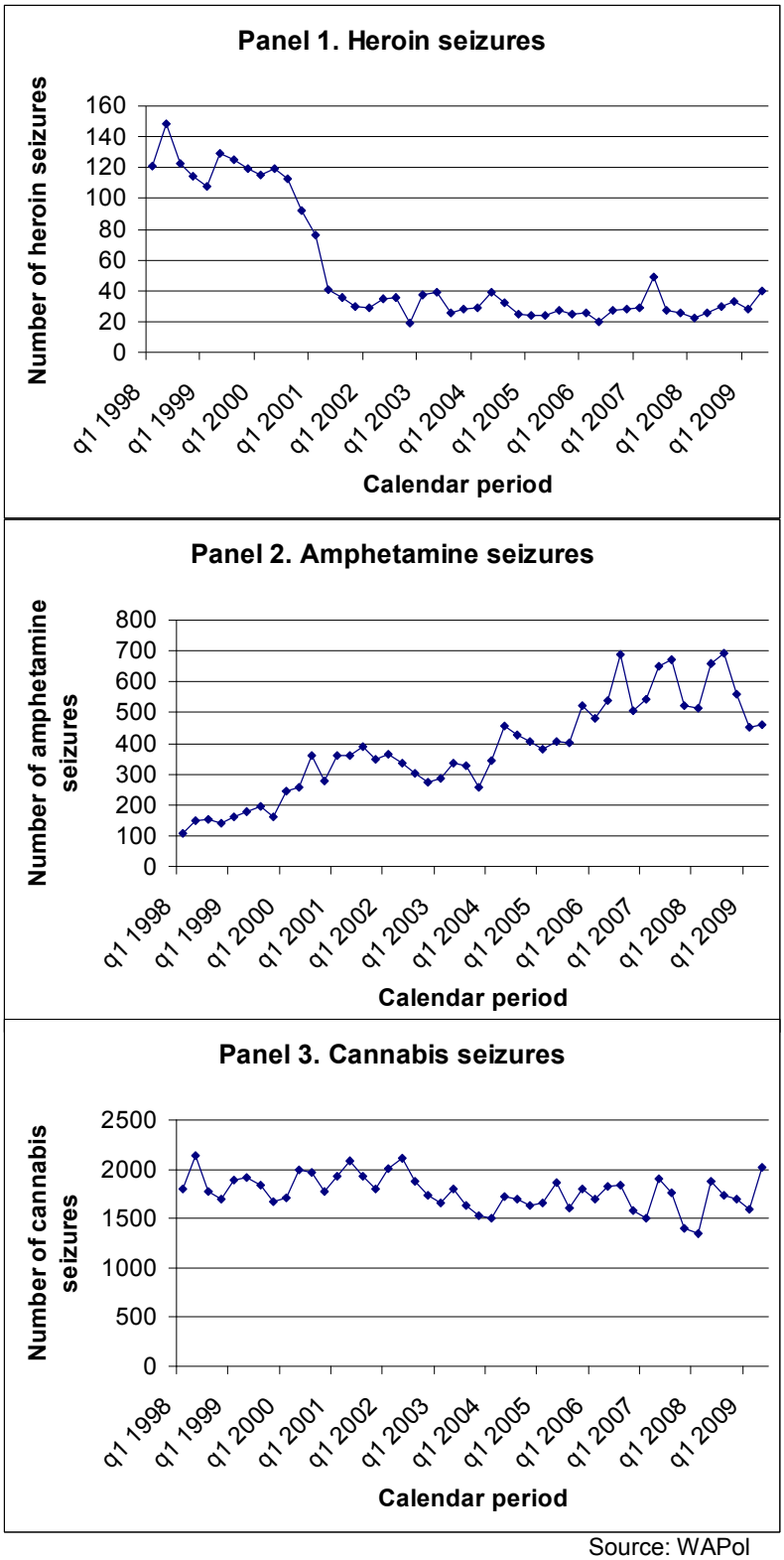
Source: AIC DUMA 1999-2009 [computer file]

The proportion of detainees who tested positive for heroin also decreased during 2001 after which it has remained relatively stable (Panel 2). In contrast, positive urinalyses for amphetamines increased dramatically from 1999 to 2001, which then followed a sporadic trend line before sharply decreasing in early 2009.

3.3 Drug seizures and purity

Figure 3 shows the number of incidents of heroin, amphetamine and cannabis seizures.

Figure 3: Drug seizure data



Source: WAPol

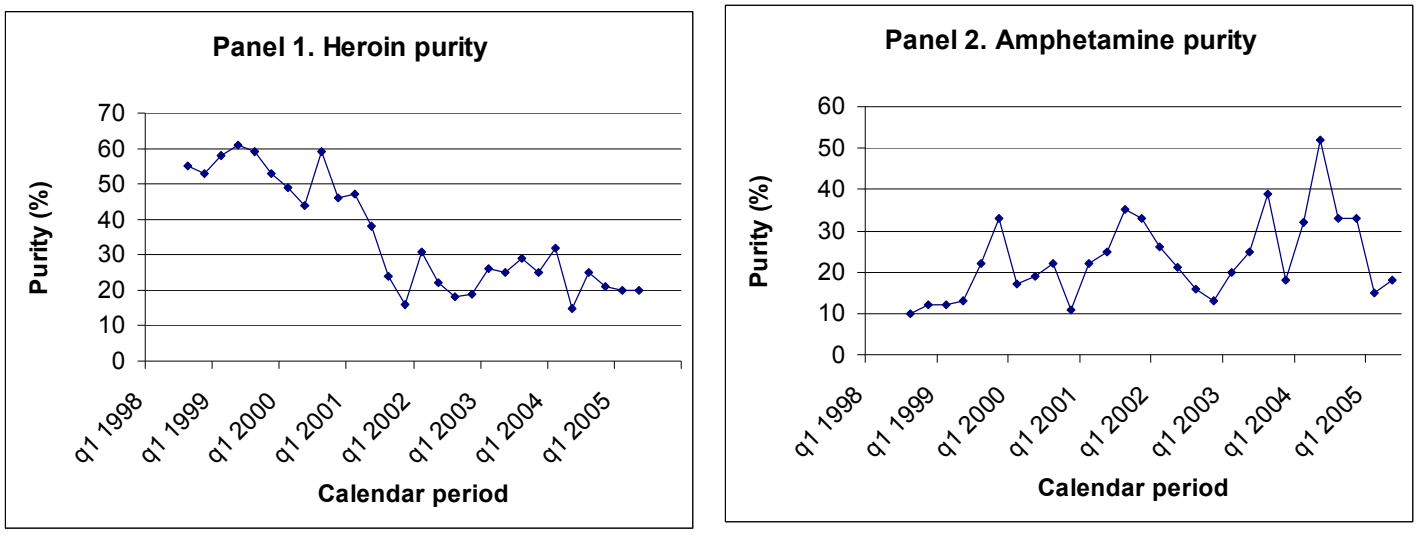
Heroin seizures dropped dramatically during 2001 (Figure 3: Panel 1) which is consistent with the start of the 2001 heroin shortage. In the fourth quarter of 2000, there were 113 heroin seizures and this declined to 30 seizures in the fourth quarter of 2001. Since then the number of seizures has remained stable at around 30 per quarter. There was a strong relationship between the number of heroin seizures and heroin purity (r=0.93, p<0.01).

In contrast to heroin, the number of amphetamine seizures have steadily increased over the years, with a low of 107 seizures in the first quarter of 1998 and a peak of 692 seizures in the third quarter of 2008 (Panel 2). An increase in amphetamine seizures begins between 2003–04. At this time, the Minister of Police had introduced new laws to crack down on illegal drug laboratories manufacturing amphetamines (Roberts, 2003). In recent years, the number of amphetamine seizures has stabilized in comparison to the 2000–06 period. The amphetamine seizure pattern is consistent with importation and local manufacture amphetamine indicators for the same period (Degenhardt et al, 2008).

Cannabis seizures have remained relatively stable averaging around 1800 seizures each quarter (Panel 3). This stability is also reported for detainees with positive urinalysis for cannabis or had purchased cannabis in the last thirty days (Figure 2).

Figure 4 shows purity data of heroin and amphetamines from 1998 to 2005. There was a drop in the purity levels of heroin during early 2001, which is consistent with the heroin shortage. Since 2002, the purity of heroin has fluctuated between approximately 15% and 30%. The purity of amphetamines has varied considerably between 1998 and 2005 in Western Australia.

Figure 4: Drug purity data



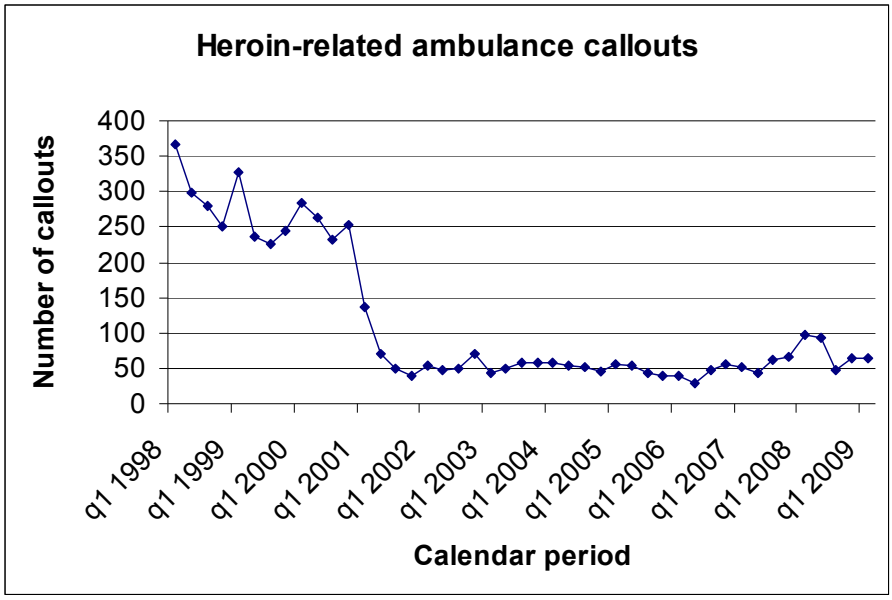
Source: Illicit Drug Reporting System

3.4 Deaths and ambulance callouts

The number of ambulance 'narcotic-related' callouts significantly reduced from 1998 to 2009 (Figure 5). The largest decrease occurred during 2001. The numbers of deaths that were caused by heroin, amphetamine, and/or cannabis use, or that had heroin, amphetamine and/or cannabis use as a contributing factor, were too small to draw any significant inferences (Figure 6).

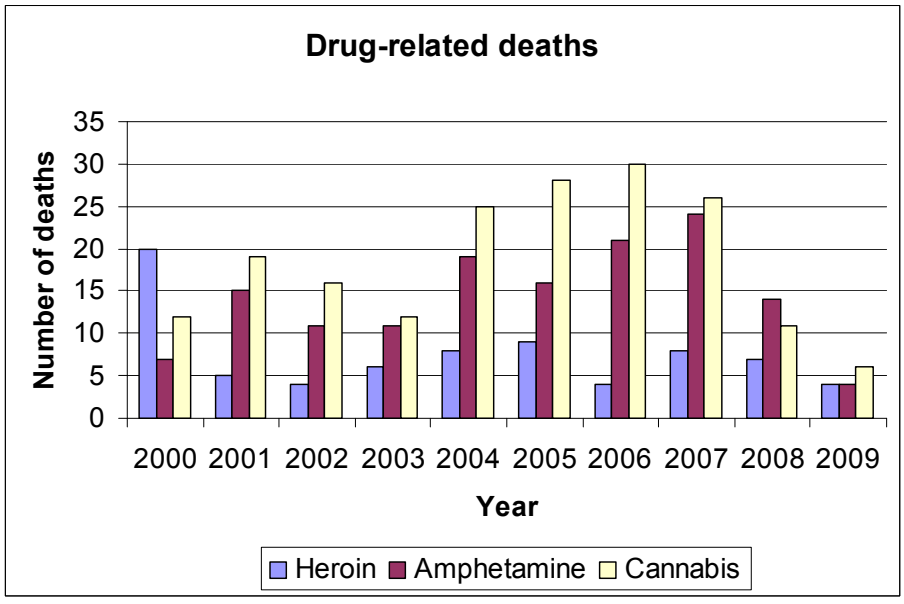
NB: Due to the existing time lags for coroner case closures, the 2008 and 2009 figures for drug-related deaths are underestimates.

Figure 5: Ambulance 'narcotic-related' callouts



Source: St John's Ambulance, Western Australia

Figure 6: Number of heroin, amphetamine and cannabis-related deaths



Source: National Coroner's Information System, Victorian Institute of Forensic Medicine

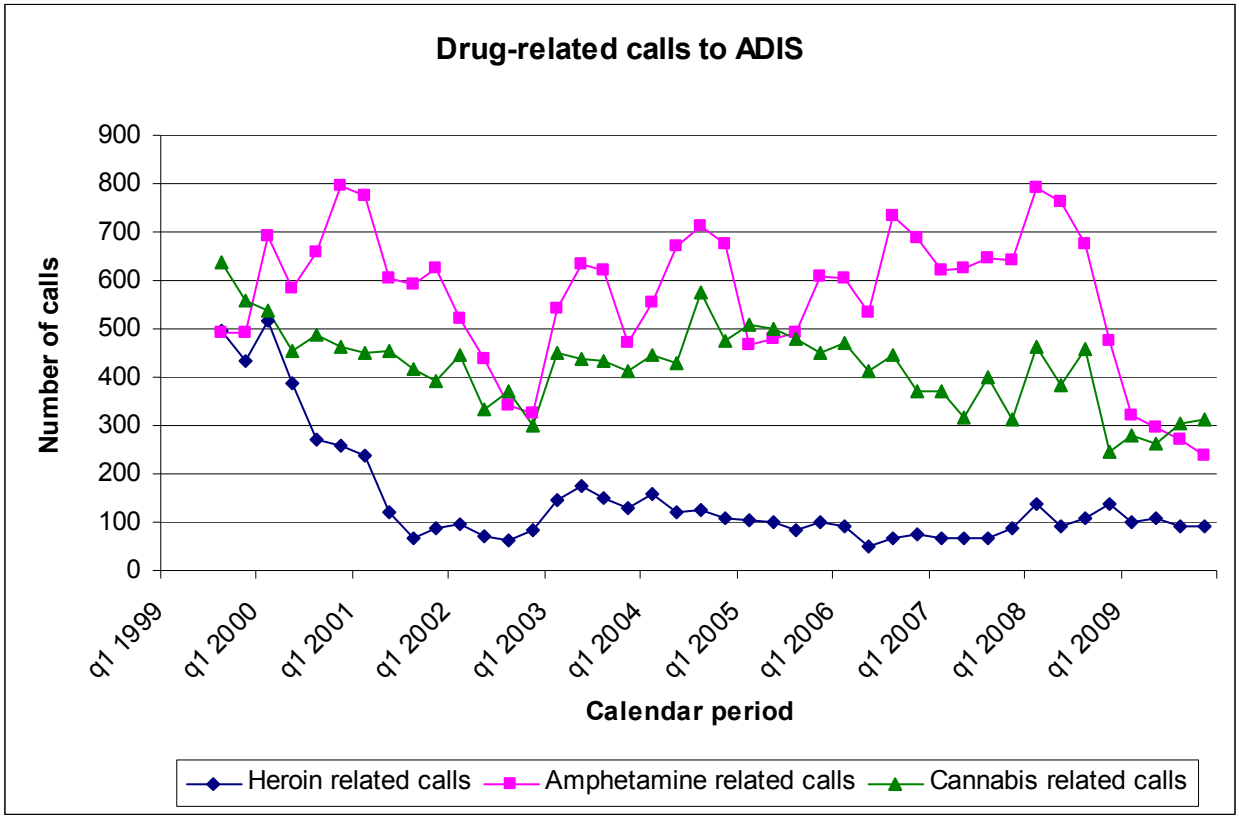
3.5 Calls to the Alcohol and Drug Information Service

Figure 7 shows the pattern of heroin, amphetamine, and cannabis-related calls to ADIS. The number of heroin-related calls decreased from around 500 in the third quarter of 1999 to around 70 in the third quarter of 2001. As with heroin seizures, the number of heroin-related calls to ADIS declined in advance of the generally accepted time point of the heroin shortage.

Since mid-2008, the numbers of amphetamine-related calls to ADIS declined. This coincides with the Drug Aware Amphetamine Education Campaign, an annual six week multi-media campaign in Western Australia incorporating the Drug Aware Pro, a six star world qualifying surfing event held in Margaret River, Western Australia. An increase in visits to the Drug Aware website was reported because of the campaign and visits have continued to increase. This alternative method of accessing information about amphetamines may account for some of the decrease in amphetamine-related ADIS calls. Interestingly, for the same period, a decrease in the incidents of amphetamine seizures by WAPol (Figure 3) and positive urinalysis for amphetamines in detainees (Figure 2) is reported.

The number of calls related to cannabis has gradually declined over all years investigated.

Figure 7: Heroin-, amphetamine- and cannabis-related calls to ADIS



Source: Drug and Alcohol Office

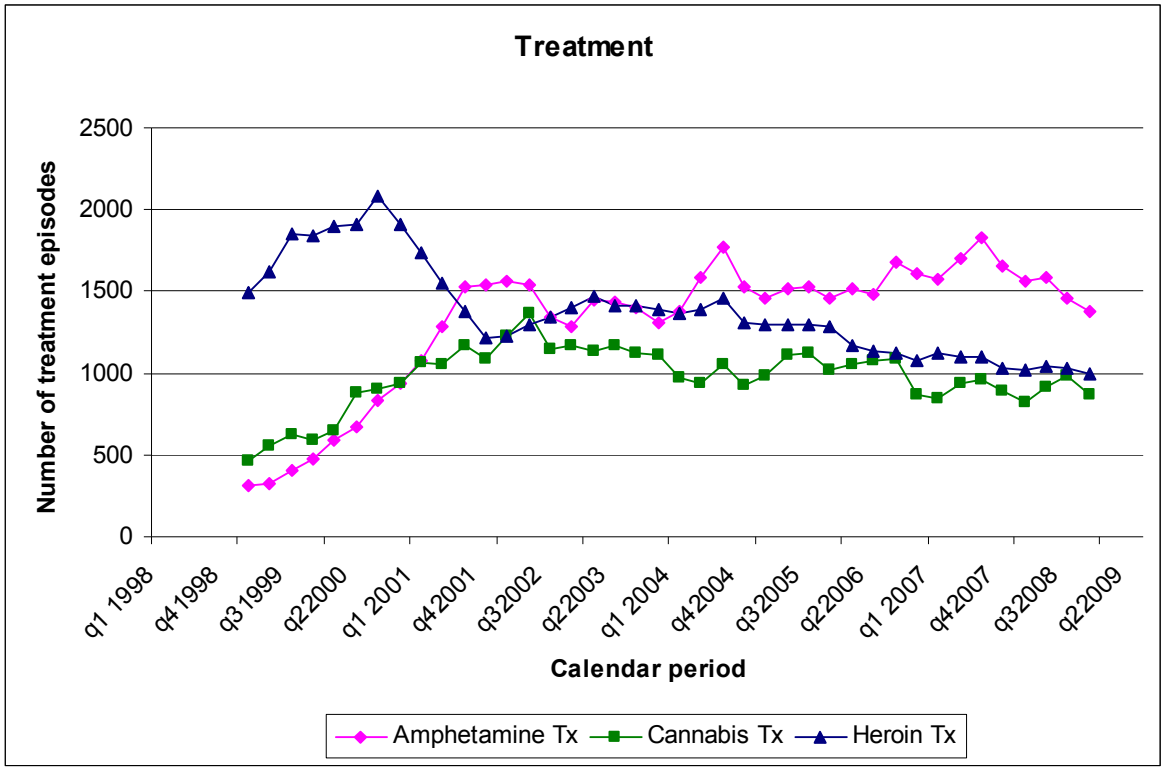
3.5 Treatment episodes

The number of open and opened (current) treatment episodes where heroin is the primary drug of concern peaked in the third quarter of 2000 (Figure 8). Treatment episodes where heroin was the primary drug of concern also started to reduce prior to the beginning of the heroin shortage in 2001. This reduction reflects the drop in heroin seizures and heroin-related ADIS calls for the same period. Numbers of treatment episodes for heroin were at the lowest level for the period analysed in the final quarter of 2008.

In contrast, the number of current treatment episodes where amphetamine or cannabis was the primary drug of concern increased considerably from the beginning of 1999 to the end of 2001. There were 468 treatment episodes where cannabis was the primary drug of concern in the first quarter of 1999 and this almost tripled to 1229 in the first quarter of 2002. In the first quarter of 1999, there were 316 treatment episodes where amphetamine was the primary drug of concern, and this quadrupled to 1229 in the first quarter of 2002. Since 2002, the number of current treatment episodes where amphetamine or cannabis is the primary drug of concern has fluctuated across time but remained relatively stable.

Amphetamine-related treatment episodes begin to decrease in early 2008 which is roughly six months prior to an observed decrease in WAPol amphetamine seizures and ADIS calls.

Figure 8: Open and opened treatment episodes where heroin, amphetamine, or cannabis was the primary drug of concern



Source: Drug and Alcohol Office

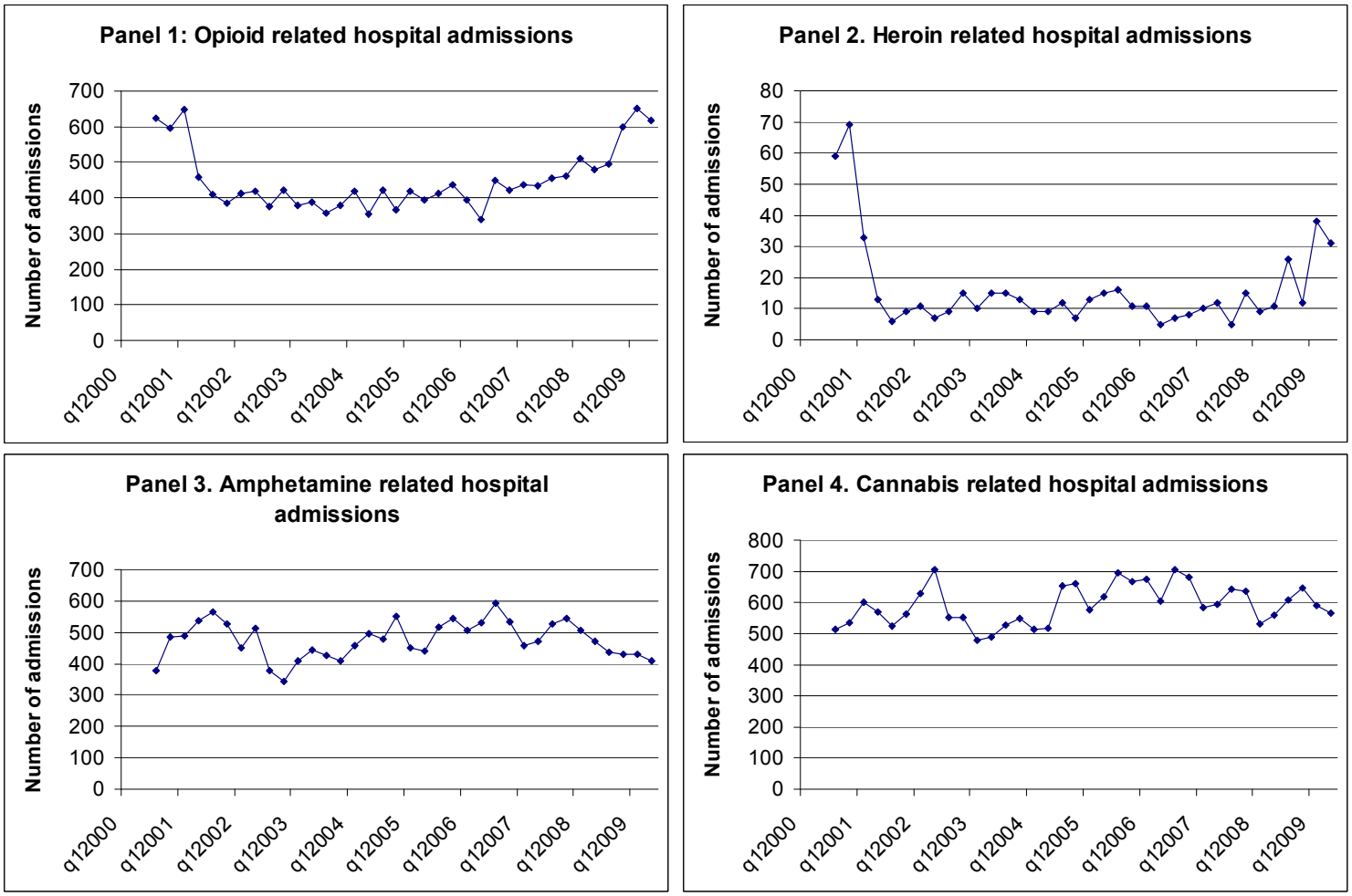
3.7 Hospital admissions

There was a dramatic decrease in heroin-related hospital admissions in early 2001 from 69 admissions recorded in the 4th quarter of 2000 to only 6 admissions recorded in the third quarter of 2001 (Figure 9: Panel 2). This decrease is consistent with other heroin indicators for the same period. Heroin admissions have however increased during 2008 and 2009.

The number of amphetamine-related hospital admissions has fluctuated over the years, with the lowest number for all years analysed occurring at the end of 2002 (Figure 9: Panel 3). Since the end of 2007, the number of amphetamine-related hospital admissions has declined (from 543 admissions in the fourth quarter 2007 to 408 in the second quarter of 2009); which coincides with a decrease in amphetamine-related calls to ADIS. Furthermore, an increase in amphetamine-seizures by WAPol starts around early-mid 2008, which may have affected amphetamine supply in Western Australia leading to a further decrease in harms (i.e. hospital admissions).

Similarly to other cannabis-related indicators, the numbers of cannabis-related hospital admissions have remained stable between 2000–09 (Figure 9: Panel 4).

Figure 9: Number of hospital admissions



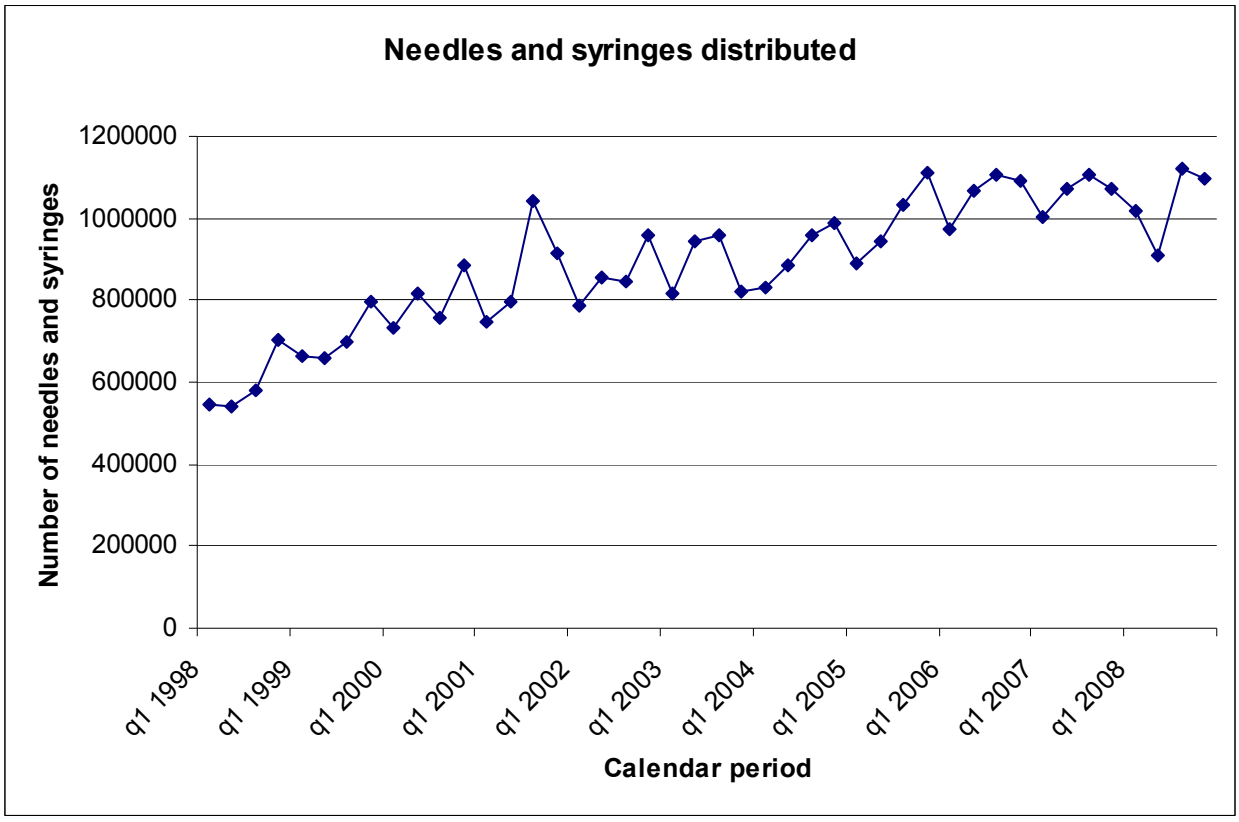
Source: Western Australia Department of Health

3.8 Needle and syringe program data

NSPs describe any program where sterile injecting equipment is made available to people who inject drugs. There are three main types of services that provide injecting equipment to drug users, these being pharmacy based NSP, health services based NSP, and NSEP. The number of needles and syringes distributed by these services for the purpose of drug injection in Western Australia are shown in Figure 10.

The number of needles and syringes distributed doubled over the 10-year period from the first quarter of 1998 (around 55,000) to the first quarter of 2008 (around 110,000). The trend line has a seasonal effect with more injecting equipment distributed during the mid-late year periods. There was no apparent effect of the heroin shortage on NSP data; however, the NSP provides sterile equipment to all injecting drug users regardless of drug type.

Figure 10: Number of needles and syringes distributed



Source: Needle and Syringe Program

It is important to note that there are a number of key factors which are likely to have influenced the number of needles and syringes distributed from 1998 to 2008. The first fixed-site needle and syringe exchange was established in Perth in 1998. Following 1998, awareness and availability increased which corresponded to the increase in numbers of needles and syringes distributed. In 1999 to 2009 commonwealth funding was provided for increased diversification

of NSPs which contributed to a considerable expansion of services. In addition, an Operational Directive was issued in 2001 which meant that all non-metropolitan hospitals were required to provide a NSP.

NSP data were negatively related to all heroin-related indicators such as heroin seizures (r =-0.82 p < 0.01), ambulance call-outs (r = -0.80 p < 0.01), heroin purchased in the last 30 days (r = -0.64 p < 0.01) and heroin-related calls to ADIS (r = -0.65 p < 0.05). This suggests that the amount of needles and syringes distributed increases when other heroin-related indicators decrease; and vice versa.

In contrast, NSP data was positively related to amphetamine seizures (r = 0.84 p < 0.01), urinalyses positive for amphetamines (r = 0.41 p < 0.05) and the number of amphetamine treatment episodes (r = 0.74 p < 0.01). In other words, as the amount of sterile equipment distributed by NSP increases, so do the number of amphetamine-related treatment episodes; amphetamine seizures; and the number of detainees at the East Perth Watch House who test positive for amphetamines (Figure 8, 3 and 2 respectively).

These results suggest that the number of needles and syringes distributed are a marker for amphetamine use rather than heroin use.

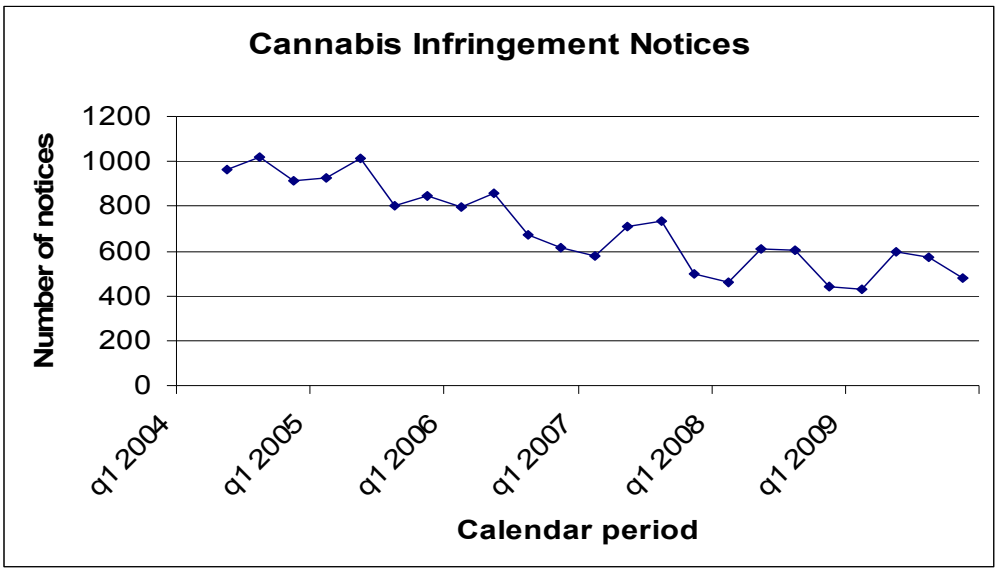
3.9 Cannabis Infringement Notices

The CIN scheme was introduced in Western Australia in 2003 and was developed from the statewide Cannabis Cautioning Mandatory Education Scheme (CCMES). The 2003 changes to cannabis legislation have been supported by additional measures: education awareness campaigns; controls over hydroponic retailers; prohibition in sales of smoking implement to minors; and requirement for paraphernalia retailers to provide resources about the harms of cannabis use.

The CIN scheme achieved its' primary goal of diverting minor offenders away from the court system, especially in the first five quarters of implementation. After mid 2005, the number of CINs issued each quarter declined compared to the earlier period and the number of people charged with minor cannabis offences began to increase. This corresponds to cannabis prevalence rates, which has steadily decreased. The prevalence of Western Australians aged 14 years or over who used cannabis in the last year has continued a declining trend from 2001 (17.5%) to 2007 (10.8%) (Kalic, Gunnell, Griffiths and McGregor, 2009).

Considering the history above, Figure 11 shows the gradual decline of issued CINs from the period 2004 to 2009 (Figure 11). In the second quarter of 2004, there were 966 CINs, and this declined to 598 notices in the second quarter of 2009. The number of CINs has a cyclical pattern whereby the number of notices given in the middle of each year is higher than the first and fourth quarters. It is important to note that the number of CINs distributed is also influenced by police activity, so some caution in interpretation is needed.

Figure 11: Number of cannabis infringement notices



Source: WAPol

3.10 Relationship between heroin-related variables

Table 1 shows the robust relationship between heroin-related variables. Analysis included data from the first quarter of 1998 to the last quarter of 2009, where data was available. All heroin-related variables, excluding heroin-related deaths were associated with each other. All of these variables except for the NSP had a strong positive relationship. Therefore, as one of the heroin-related indicators increases so do all the others (excluding heroin deaths and NSP). For example, as the number of incidents of heroin seizures increases so will the number of heroin-related ADIS calls.

The number of sterile equipment distributed by the NSP had a negative relationship with other heroin-related variables, except for heroin-related hospital admissions and deaths. For instance, this means that the greater the number of sterile equipment distributed through the NSP, the less amount of narcotic-related ambulance callouts there are. This would indicate that the NSP is not an indicator of heroin availability or prevalence in Western Australia.

Table 1. Relationship between heroin-related variables

	Heroin seizures	ADIS calls	Heroin bought	Positive urinalyses	Heroin treatment	Amb. callouts	Hospital admissions	Heroin deaths	NSP
Heroin seizures	-	**0.92	**0.84	**0.79	**0.83	**0.95	**0.81	-0.39	**-0.82
ADIS calls		-	**0.81	**0.77	**0.81	**0.91	**0.75	0.17	*-0.65
Heroin bought			-	**0.87	**0.84	**0.82	**0.49	0.20	**-0.70
Positive urinalyses				-	**0.80	**0.75	**0.61	*0.35	**-0.64
Heroin treatment					-	**0.76	**0.74	*0.42	**-0.61
Amb. callouts						-	**0.89	*0.40	**-0.80
Hospital admissions							-	**0.72	-0.36
Heroin deaths								-	-0.10
NSP									-

* $p < .05$ ** $p < .01$

3.11 Relationship between amphetamine-related variables

The relationship between amphetamine-related variables is not as robust as the relationship between heroin-related variables (Table 2). Analysis included data from the first quarter of 1998 to the last quarter of 2009, where data was available.

Amphetamine-related seizures reported by WAPol had a strong positive correlation with the number of amphetamine-related treatment episodes and the amount of sterile equipment distributed by the NSP. In other words, the more amphetamines that are seized by WAPol, the higher the number of individuals who accessed sterile injecting equipment and amphetamine-related treatment services. Amphetamine-related treatment services also increased with the number of detainees who tested positive for amphetamines at the East Perth Watch House.

Amphetamine-related hospital admissions had a moderate to strong positive correlation with the number of amphetamine-related calls to ADIS, and a moderate negative correlation with the distribution of sterile injecting equipment. In other words, as the number of amphetamine-related hospital admissions increases; amphetamine-related calls to ADIS also increase, but the number of sterile injecting equipment distributed by NSP decreases.

Table 2. Relationship between amphetamine-related variables

	Amphetamine seizures	ADIS calls	Amphetamine bought	Positive urinalyses	Amphetamine treatment	Hospital admissions	Amphetamine deaths	NSP
Amphetamine seizures	-	*0.32	-0.19	0.17	**0.73	*0.39	*0.36	**0.84
ADIS Calls		-	0.27	**0.45	0.12	**0.52	0.29	-0.03
Amphetamine bought			-	**0.72	0.15	0.12	0.07	0.17
Positive urinalyses				-	**0.51	0.13	0.09	*0.41
Amphetamine treatment					-	**0.46	**0.44	**0.74
Hospital admissions						-	*0.36	*-0.46
Amphetamine deaths							-	0.28
NSP								-

* $p < .05$ ** $p < .01$

3.12 Relationship between cannabis-related variables

Cannabis-related variables (Table 3) had a lower amount of significant correlations than heroin or amphetamine-related variables. Analysis included data from the beginning of 1998 to the end of 2009, where data was available.

The number of cannabis-related calls to ADIS had a moderate positive relationship with the amount of cannabis bought by detainees in the last 30 days; and a strong positive relationship with the number of CINs issued. This means that the more cannabis-related calls ADIS received, the more CINs were issued and a greater number of detainees at the East Perth Watch House were able to buy cannabis 30 days prior to arrest.

The number of CINs issued was positively correlated with the number of cannabis-related treatment episodes. Therefore, the more CINs that are issued by the WAPol, the more cannabis treatment episodes are recorded.

These results revolve around the pathways of the CIN. The correlations between CINs, cannabis-related treatment services, and detainees in the East Perth Watch House increase together.

Table 3. Relationship between cannabis-related variables

	Cannabis seizures	ADIS calls	Cannabis bought	Positive urinalyses	Cannabis treatment	Hospital admissions	Cannabis deaths	CIN
Cannabis seizures	-	-0.02	0.18	*0.39	0.18	0.06	-0.15	0.34
ADIS calls		-	**0.47	0.12	*-0.35	-0.03	0.22	**0.76
Cannabis bought			-	**0.61	-0.10	0.24	0.02	*0.52
Positive urinalyses				-	0.14	0.21	-0.03	*0.44
Cannabis treatment					-	0.05	0.12	**0.66
Hospital admissions						-	0.25	0.14
Cannabis deaths							-	*0.53
CIN								-

* $p < .05$ ** $p < .01$

3.13 Potential predictors of crime-related variables

This section describes the analyses of relationships between major Western Australian crime-related variables including reported crimes against the person, crimes against property, burglaries and drug crime for the whole of the state and potential indicator variables (Table 4). Analysis included data from the first quarter of 1998 to the last quarter of 2009, where data was available.

3.13.1 Relationship between crimes against property and indicators of drug use

Crimes against property reported to the WAPol had strong correlations with amphetamine seizures (r = -0.65 p < 0.01) and the amount of detainees who purchased heroin 30 days before arrest (r = 0.54 p < 0.01). Therefore, as the number of crimes against property reported to WAPol increased; the amount of detainees who purchased heroin 30 days prior to arrest also increased, whilst the number of amphetamine seizures decreased.

Moderate positive correlations illustrate that as reported crimes against property increased the following drug-related indicators also increased; the proportion of detainees who purchased amphetamines in the 30 days prior to arrest, the proportion of detainees who tested positive for heroin or amphetamines, the number of treatment episodes for heroin, and the number of amphetamine-related hospital admissions.

Reported property crime is positively correlated with both heroin and amphetamine-related indicators. In a 2001 study of incarcerated property offenders, 81% reported regularly using any illicit drug before imprisonment (i.e. cannabis, amphetamines, heroin or cocaine) (Makkai and Payne, 2003). Additionally, adult detainees in Australian police stations arrested for a property offence were more likely to test positive for any drug (except cannabis) compared to other offence types (Gaffney et al, 2010). However, when looking at the crime types within specific drug users, heroin users were more likely to commit a property offence compared to amphetamine users whom were more likely to commit a drug-related offence (Gaffney et al, 2010).

In summary, property crimes are committed by both amphetamine and heroin users; however, a larger number of heroin users will commit a property offence than any other offence type. Therefore, the fact that there is a stronger positive correlation with detainees who have purchased heroin 30 days prior to arrest than detainees who have purchased amphetamines 30 days prior to arrest is expected.

3.13.2 Relationship between crimes against the person and indicators of drug use

Crimes against the person was strongly correlated with heroin-related treatment episodes, amphetamine seizures and issued CINs. As these crimes increased,

amphetamine seizures increased, and heroin-related treatment episodes and CINs decreased.

Detainees who had purchased heroin within the 30 days prior to arrest was negatively correlated with crimes against the person; implying that the more detainees that had purchased heroin prior to their arrest, the less crimes against the person were reported to WAPol.

Crimes against the person have a negative correlation with most heroin-related indicators (e.g. ambulance narcotic callouts, ADIS calls, heroin seizures and positive urine tests for heroin in detainees). This indicates that reported crimes against the person increase when heroin-related indicators of availability and prevalence are low.

However, as amphetamine seizures by WAPol increase, so do the numbers of amphetamine-related treatment episodes and crimes against the person; whilst the amount of amphetamine purchased by detainees prior to arrest and CINs decreases. A theory for this pattern could be that as reported crimes against the person increase, WAPol focus resources into tackling amphetamine which involves; decreasing availability of the drug (seizures increase; purchases decrease), and this encourages regular users to seek treatment (episodes increase). As the police are focusing their resources on amphetamines and not on minor cannabis offences, CINs issued decrease.

Crimes against the person showed an increase over the spring and summer months of every year. Outside the scope of the current analyses is the affect of alcohol use, which has also been linked to crimes against the person (Nicholas, 2008).

3.13.3 Relationship between burglaries and indicators of drug use

Correlations between burglaries (dwelling and non-dwelling) and heroin-related indicators had significant moderate to strong positive relationships excluding heroin-related deaths and hospital admissions. The strongest relationships between burglaries and heroin-related indicators were for detainees who had purchased heroin within 30 days prior to arrest, and the number of heroin-related treatment episodes. This indicates that when heroin appears to be accessible, the number of burglaries increases.

The number of incidents of amphetamine seizures by WAPol had a strong negative relationship with burglaries (r = -0.80 p < 0.01). Namely, that as reported burglaries increased, the number of incidents of amphetamine seizures decreased. Additionally, amphetamine-related treatment episodes and sterile equipment distributed by NSP had a strong negative correlation with burglaries. Therefore, when amphetamines are not easily accessible, the number of burglaries increases.

Table 4. Relationships between crime and potential indicators

	Crimes against property	Crimes against the person	Burglaries [a]	Drug-related crimes
Seizures				
^Heroin	0.25	**-0.52	**0.46	-0.19
^Amphetamines	**-0.65	**0.72	**-0.80	**0.77
Cannabis	0.27	**-0.51	0.31	**0.43
DUMA Data[b]				
^Purchased heroin (%)	**0.54	**-0.67	**0.73	*-0.35
Purchased amphetamines (%)	**0.43	**-0.46	**0.44	-0.20
Purchased cannabis (%)	0.23	*-0.33	*0.34	*-0.32
^Urine positive for heroin (%)	**0.43	**-0.53	**0.59	*-0.38
^Urine positive for amphetamines (%)	*0.40	-0.25	*0.35	-0.15
Urine positive for cannabis (%)	0.22	*-0.34	0.30	-0.19
ADIS calls				
^Heroin-related	0.22	**-0.48	**0.46	*-0.37
Amphetamine-related	-0.03	0.08	-0.02	0.04
Cannabis-related	0.09	*-0.37	0.24	*0.37
Open and opened Treatment episodes				
^Heroin	**0.46	**-0.73	**0.67	**-0.43
^Amphetamines	*-0.37	**0.54	**-0.55	*0.36
Cannabis	*0.32	-0.18	0.16	0.09
Hospital admissions				
^Heroin-related	0.18	-0.15	0.20	0.04
^Amphetamine-related	-0.21	0.26	-0.22	0.21
Cannabis-related	**-0.43	**0.48	**-0.47	*0.40
Deaths				
Heroin-related	0.06	-0.15	0.04	0.08
Amphetamine-related	-0.29	*0.39	*-0.37	0.04
Cannabis-related	-0.22	0.28	-0.31	0.10
Other				
^Needle Syringe Program	-0.35	**0.51	**-0.61	0.35
^CIN	-0.17	**-0.71	0.35	-0.26
Ambulance 'narcotic-related' callouts	0.25	**-0.42	**0.44	-0.24

*$p < .05$. ** $p < .01$;
[a] Dwelling and non-dwelling;
[b] Refers to the previous 30 days
^ These indicators correlated moderately or strongly (had a correlation coefficient of greater than 0.3) with more than half of the other indicators for that particular drug (Tables 1–3)

3.13.4 Drug-related crimes and indicators of drug use

Drug-related crimes had only one strong correlation with any of the drug indicators. Amphetamine seizures by WAPol increased as the numbers of drug-related crimes were reported ($r = 0.77$ $p < 0.01$).

Analyses indicated a moderate positive correlation between the number of incidents of cannabis seizures and drug-related crimes. However, a moderate negative correlation was found between heroin-related treatment episodes and drug-related crimes. In other words, as reported drug-related crimes increased, the number of cannabis seizures also increased whilst heroin-related treatment episodes decreased.

4. Discussion

This study successfully integrated a wide and varied range of crime and drug-related information into a single database, which can be used to examine trends over time and to identify relationships between drugs and crime.

The indicators demonstrate that at the time of the reported heroin shortage in early 2001, there was a decline in the number of heroin seizures, heroin-related ambulance call-outs, heroin-related calls to ADIS, heroin treatment episodes, heroin-related hospital admissions, and level of heroin purity. These heroin indicators were strongly correlated with each other meaning that as one starts to increase, the others will follow. Surprisingly, the correlation between heroin indicators and the amount of sterile equipment distributed by the NSP was negative. The meaning of this relationship is that as other heroin indicators increase, the amount of sterile equipment decreases.

The amount of sterile equipment distributed by the NSP did have a positive relationship with two of the amphetamine indicators. The number of incidents of amphetamine seizures and amphetamine-related treatment episodes both increased with the NSP figures. Additionally, when one of these indicators was to decrease, so did the other two. This indicates that amphetamine users rather than heroin users may predominantly use the NSP. However, other injecting drugs (e.g. morphine, cocaine, buprenorphine etc) were outside the scope of this project and thus, the affect of their use on the NSP can not be established.

Amphetamine use indicators showed a decline during late 2008 and early 2009. For example, during this period there were reductions in the proportion of detainees who reported purchasing amphetamines and who tested positive for amphetamines, amphetamine-related calls to ADIS, and treatment episodes for amphetamine use. However, the number of incidents of amphetamine seizures reported by WAPol increased over the same period. This may suggest that the effect of an increase in amphetamine seizures decreased other indicators of amphetamine use for the most recent years analysed.

It has been suggested by some researchers that amphetamine use is linked to violent and aggressive behaviour (Kosten and Singha, 1999; Tyner and Fremouw, 2008). In this study, reported crimes against the person significantly increased as heroin-related indicators decreased. The implication is that crimes against the person are inversely related to heroin availability: when heroin is accessible, crimes against the person decrease.

However, crimes against the person followed a seasonal pattern of increasing over the warmer months before decreasing in autumn and winter. It also increased as amphetamine seizures, distributed sterile equipment (NSP) and amphetamine-related treatment episodes increased. These results suggest a strong correlation between amphetamine-related indicators and crimes against the person in that they increase together.

Although there was an increase in recorded assaults over the time period analysed, the number of assaults reported in victimization surveys (Australian Bureau of Statistics, 2005) did not significantly increase over the same time period. This suggests that the increase in recorded assaults may be associated with changes to federal family law and state domestic violence legislation that took place in 2004.

The WAPol's strategy to reduce anti-social behaviour (Western Australian Police, 2009) targets public events and youth gatherings in public places. In the warmer months, there are more public events and music festivals in Perth. In accordance with the strategy, WAPol attend these events to ensure public order. Music festivals and similar types of events attract amphetamine users because amphetamines are considered a 'party drug' (Drug and Crime Prevention Committee, 2004). Therefore, consistent with this study's findings, the number of amphetamine seizures increase in the warmer months possibly due to the police presence at these events.

Amphetamine and heroin-related indicators were correlated with reported crimes against property. A decrease in amphetamine seizures and detainees who purchased heroin within 30 days prior arrest had the strongest relationship with property crime. However, the relationship was not the same for both indicators. As property crimes increased, heroin purchased in the last 30 days increased, but the amount of amphetamines seized by WAPol decreased. Both amphetamine and heroin users commit property crime; however a larger number of detainees who test positive for heroin commit crimes against property than any other offence (Gaffney et al, 2010).

The above results differed when burglary offences (dwelling and non-dwelling) were separated from crimes against property. Heroin-related indicators were strongly correlated with burglaries whilst amphetamine-related indicators had a strong inverse relationship with burglaries. After the 2001 heroin shortage, a decrease in property crime occurred (Moffatt, Weatherburn and Donnelly, 2005). Moffatt and colleagues (2005) discovered that although the reduction in heroin consumption played an important role in the decrease of reported property offences, other factors were involved. These factors included an increase in the imprisonment rate of convicted burglars, an increase in average weekly earnings and an increase in the number of heroin users returning to treatment. Heroin-related treatment episodes had a strong positive relationship with burglaries in this study in contrast to Moffat and colleagues' findings. However, Moffat and colleagues measured the uptake of clients starting methadone maintenance therapy, whilst this study measured any contact with a drug and alcohol treatment provider where heroin was the primary drug of concern. It is plausible that these heroin users access drug and alcohol treatment services, but are not engaging in pharmacotherapy.

Drug-related crimes had a strong positive correlation with amphetamine seizures by WAPol. Cannabis seizures also increased with drug-related crimes; whilst

heroin-related treatment episodes decreased as drug offences increased. Drug-related crimes included both trafficking and possession and, therefore, it is likely for this offence type to not have many strong associations with a particular drug compared to crimes against property or persons. Detainees held at Australian police stations for drug-related offences are likely to have high prevalence of positive urinalysis for heroin, amphetamine, and cannabis; compared to other offence types that tend to have a noticeable drug preference (e.g. heroin and property crime).

Important indicators for each offence and drug type vary. Heroin indicators are positively associated with each other and strong indicators to use regarding heroin availability would be incidents of heroin seizures, heroin recently purchased by detainees (DUMA), numbers of heroin treatment episodes, narcotic related ambulance callouts and heroin hospital admissions. These findings are consistent with the Heroin Trends Tracking Project in 2007 (Santana, McGregor, Kirby and Wilkinson, 2007). Furthermore, an increase in heroin indicators, particularly heroin treatment episodes and heroin recent purchases by detainees are strongly related to an increase in burglaries. A moderate association is seen with these heroin indicators when including positive urinalysis of heroin in detainees, with crimes against property.

Crimes against the person are associated with a strong decrease in heroin recently purchased by detainees, heroin treatment episodes and CINs. However, this offence type is strongly associated with an increase in amphetamine seizures. Caution should however be taken to the seasonal nature of the offence type and its correlation with a high period of music festivals. Additionally, crimes against the person did not distinguish between assaults, homicide, robbery and other threatening behaviours. Heroin and robbery are significantly associated (Chilvers and Weatherburn, 2003) and by separating the offence types, it may show a stronger association between amphetamine indicators and crimes of a more personal nature (e.g. assaults and homicide).

The relationship between amphetamine indicators showed strong associations between amphetamine treatment episodes, sterile equipment distributed by NSP, and amphetamine seizures. These indicators illustrate well that if one were to increase, the others would soon increase as well. Amphetamine-related ADIS calls are moderately correlated with amphetamine purchased by detainees. The latter is strongly correlated with amphetamine treatment episodes. Therefore, there is a loose association between the number of amphetamine-related ADIS calls and amphetamine seizures by WAPol. However, this association is not as direct or strong as for heroin. This could be also complicated by the broad definition of amphetamines (e.g. dexamphetamine, ecstasy, and methamphetamine).

Cannabis indicators showed positive correlations between CINs, cannabis-related calls to ADIS, cannabis treatment episodes and cannabis recently purchased by detainees. However, cannabis did not have many strong

associations with offences except for CINs, which had an inverse relationship with crimes against the person.

It is important to note that the relationship between drug use and criminal behaviour is complex as not all regular users engage in crime of any kind, and not all people participating in criminal behaviour use illicit drugs of any kind. Some drug users were already criminally involved before they commenced using drugs, and some may have become criminally involved as a consequence of their drug use. The complexity of the relationships between crime and drug use, and the fact that it varies from person to person, must be taken into consideration when interpreting results.

In summary, strong indicators of criminal behaviour and drug availability are the number of:

- incidents of drug seizures by WAPol
- detainees self-reporting of drugs purchased in the 30 days prior
- positive urine results from detainees
- treatment episodes
- calls to ADIS
- narcotic related ambulance callouts
- sterile equipment distributed through the NSP
- CINs issued.

The findings of this report provide support for the provision of screening, referral and other harm reduction interventions for drug-related problems at point of contact with the criminal justice system.

4.1 Limitations

As the findings of this report are based on correlational data, causal relationships cannot be inferred. Other factors may affect the data and act as confounders such as improvement in reporting, changes in definitions and inconsistencies in recording data. However, while correlation does not imply causation, it does suggest a potential relationship which should be further investigated.

Another limitation is the amalgamation of amphetamine-type stimulants such as methamphetamine and ecstasy in many of the databases sourced. Ecstasy and dexamphetamine are more likely to be used by recreational drug users rather than methamphetamine, which are preferred by ‘street users’ or polydrug users (Drug and Crime Prevention Committee, 2004).

4.2 Future directions

This section addresses specific priority areas and topics for future use of the Drug Trends and Crime Tracking Project:

- action concerning existing data collection/monitoring system; and
- more specialist one-off projects.

4.2.1 Action concerning existing data collection/monitoring systems

There are four areas for action concerning the existing data collection/monitoring mechanisms. These are:

- maintaining the Drug Trends and Crime Tracking database
- minor changes to existing systems
- maximising the utility of the Drug Trends and Crime Tracking database
- coordination between agencies.

4.2.1.1 Maintaining the Drug Trends and Crime Tracking database

For the existing data collection system to have current and ongoing value, it needs to operate and report on an ongoing basis. Funds for the development of this database were provided through the Office of Crime Prevention Research and Development Grant Program. This grant provided resources to identify, collect, and analyse the data used for the Drug Trends and Crime Tracking Project. The continuation of the project is to be assessed in relation to the time and resources required to maintain it.

Regular maintenance and use of the integrated database would be valuable in a range of ways including forecasting possible changes and developments in crime likely to occur in the future based on the associations found between particular drug use indicators and crime types. This information could be used for strategic policy development, for planning and resource allocation for both the WAPol and alcohol and drug services, and for identifying demands for crime prevention resources.

4.2.1.2 Minor changes to existing systems

The current project analyses indicated weak correlations within cannabis-related indicators. Future use of this resource could remove cannabis indicators and focus on stronger correlations for other drug types, such as heroin and amphetamine.

Other indicators could also be added to determine the strength of their relationship to criminal behaviour. For example, in a Western Australian tertiary hospital, 39.7% of amphetamine presentations to the emergency department in three months were admitted in to hospital (Gray et al, 2007). By only using hospital admissions as a drug indicator, the analysis has missed the numbers of individuals who access emergency services and do not get admitted into hospital. Emergency department presentations may provide a better indication of the relationship between drugs and crime compared to hospital admissions.

4.2.1.3 Maximising the utility of the Drug Trends and Crime Tracking database

Caulkins, Tragler and Feichtinger (2002) argue that it is important to look at past trends in order to learn from previous drug epidemics and to reduce the likelihood that future will recreate the past. Therefore, it would be beneficial to apply time series analysis to the Drug Trends database to provide a more rigorous analysis of past and current trends on which to base conclusions. Time series analysis may provide statistically significant links between trend data. The analysis could assess the use of the data in terms of forecasting crime trends from indicators of drug use, and is recommended for future applications.

Looking at trend lines is useful in identifying what stage the community is at in terms of the prevalence or extent of use of a particular drug. Trend lines also aid to inform decision makers of an appropriate response. Caulkins (2007) suggests that drug use can be modelled as an epidemic, whereby one user 'infects' another. This model proposes that drug epidemics, especially for expensive and dependence-causing drugs, follow relatively predictable courses involving rapid growth, overshoot, peak, partial decline, and potentially subsequent undershoot and oscillation around a stable level.

By estimating the drug epidemic stage, law enforcement, education and harm minimisation activities are developed so that they are suitable and effective for the identified situation. For example, depending on the trend line indicating the stage of the epidemic, decision makers could determine whether a harm reduction or drug use reduction (attempting to control drug use per se) would be the most effective strategy. Both harm reduction and controlling use through legislation have a role in reducing the harmfulness of drug use, but at different points in a drug epidemic. Caulkins and Tragler (2004) suggest that it is of great importance to take into consideration the stage of the drug epidemic as policies which may be extremely effective at one point in time could be counterproductive at another time.

Rossi (2004) agrees that considering changes in a drug epidemic curve is important for planning policy interventions, and real-time monitoring systems should be used for this purpose. The type of policy intervention can be informed by the monitoring system. For example, it has been argued by Behrens, Caulkins, Tragler and Wallner (2009) that law enforcement is most effective at influencing drug use during the early stages of a drug epidemic, but this declines markedly as the size of the market grows. Therefore, they suggest that law enforcement can interrupt the spread of a new drug, but is less effective in attempting to control established markets. This theory emphasises the importance of law enforcement responding quickly to the emergence of new illicit drug trends before they become more entrenched. Looking at what stage the drug epidemic is at can also be used to determine the suitability for diversion strategies, whereby drug law offenders are diverted from the criminal justice system to a program of education and rehabilitation.

4.2.1.4 Coordination between agencies

The outcomes of drug use impact individuals, families and the community with noticeable impacts to law enforcement. In developing key strategies and actions to reduce the harms of drug use, interagency collaboration is imperative to maintain an efficient and effective use of resources.

The Drug Trends and Crime Tracking database has used data sources from a range of stakeholders. Each stakeholder is affected by drug use and has a role to play in harm reduction. The Drug Trends and Crime Tracking Project can be used to monitor trends within Western Australia and assist these key agencies in making evidence-based decisions.

4.2.2 More specialist one-off projects

4.2.2.1 Geographical areas

One project that could extend from the Drug Trends and Crime Tracking Project is to investigate is the relationship between crimes and drug use in particular suburbs or regional areas. These analyses would identify key locations of drug and/or crime trends in Western Australia. Many of the original datasets contain variables with corresponding postcodes or suburb information, which enhances the feasibility of this project. These datasets include the treatment agencies ADIS, NSP, the WAPol crime figures, DUMA detainee data, CIN data and the NCIS.

4.2.2.2 Relationship between crime and particular kinds of drugs

Drugs other than heroin and amphetamines could be included in the Drug Trends and Crime Tracking Project. Indicators of use and related harms of other drug types, such as cocaine, inhalants, prescription drugs, and hallucinogens could be added to the database. In addition, emerging illicit drugs such as mephedrone (also commonly known as miaow miaow or bubbles) could be included to investigate emerging trends in their use and to ascertain their relationship to indicators of crime.

4.2.2.3 Particular sub-populations

The Drug Trends and Crime Tracking Project could also be used to target specific sub-groups of users, such as Aboriginal peoples, young people, women and people from non-English speaking backgrounds. Whilst all of these populations are generally included in research studies, very few studies separately report the findings for these sub-groups.

The key reason behind why drug and crime research rarely report the findings from these sub-groups is the low sample sizes. In a sample of drug-using offenders, any of these sub-groups will typically constitute a minority.

5. References

Australian Bureau of Statistics (2005). Crime and Safety, Australia. April 2005.

Australian Institute of Health and Welfare. (2002). 2001 National Drug Strategy Household Survey: detailed findings. AIHW cat. no. PHE 41. Canberra: AIHW (Drug Statistics Series No.11).

Australian Medical Association. (2008). *Methamphetamine – 2008*. Retrieved from http://www.ama.com.au/node/3020.

Behrens, D.A., Caulkins, J.P., Tragler, G. and Feichtinger, G. (2002). Why present-oriented societies undergo cycles of drug epidemics. *Journal of Economic Dynamics and Control, 26*(6), 919-936.

Bennett, T. and Holloway, K. (2006). Variations in drug users' accounts of the connection between drug misuse and crime. *Journal of Psychoactive Drugs, 38*(3), 243-254.

Bennett, T., Holloway, K. and Farrington, D. (2008). The statistical association between drug misuse and crime: A meta-analysis. *Aggression and Violent Behavior*, *13*(2), 107-118.

Caulkins, J.P. (2007). The need for dynamic drug policy. *Addiction, 102*(1), 4-7.

Caulkins, J.P. and Tragler, G. (2004). Dynamic drug policy: An introduction and overview. *Socio-Economic Planning Services, 38*(1), 1-6.

Caulkins, J.P., Tragler, G. and Wallner, D. (2009). Optimal timing of use reduction vs. harm reduction in a drug epidemic model. *International Journal of Drug Policy, 20*(6), 480-487.

Chilvers, M. and Weatherburn, D. (2003). The impact of heroin dependence on long-term robbery trends. *Crime and Justice Bulletin: Contemporary Issues in Crime and Justice no.79.* Sydney: New South Wales Bureau of Crime Statistics and Research.

Cohen, J. (1988). *Statistical Power Analysis for the Behavioural Sciences.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Collins D, and Lapsley H. (2008). *Counting the cost: estimates of the social costs of drug abuse in Australia 1998–9. National Drug Strategy Monograph Series No. 49*. Canberra: Commonwealth Department of Health and Ageing.

Degenhardt, L., Roxburgh, A., Black, E., Bruno, R., Campbell, G., Kinner, S., and Fetherston, J. (2008). The epidemiology of methamphetamine use and harm in Australia. *Drug and Alcohol Review*, *27*(3), 243–252.

Degenhardt, L., Conroy, E., Gilmour, S. and Hall, W. (2005). The effect of a reduction in heroin supply on fatal and non-fatal drug overdoses in New South Wales, Australia. *The Medical Journal of Australia, 182*(1), 20-23.

Drug and Crime Prevention Committee. (2004). *Inquiry into amphetamine and 'party drug' use in Victoria*. Melbourne, Australia; DCPC, Parliament of Victoria.

Fetherston, J. and Lenton, S. (2003). Western Australian drug trends 2002: Findings from the Illicit Drug Reporting System. *NDARC Technical Report No.149.*

Fetherston, J. and Lenton, S. (2004). Western Australian drug trends 2003: Findings from the Illicit Drug Reporting System. *NDARC Technical Report No.179.*

Fetherston, J. and Lenton, S. (2005). Western Australian drug trends 2004: Findings from the Illicit Drug Reporting System. *NDARC Technical Report No.216.*

Fetherston, J. and Lenton, S. (2006). Western Australian drug trends 2005: Findings from the Illicit Drug Reporting System. *NDARC Technical Report No.252.*

Fetherston, J. and Lenton, S. (2007). *Effects of the Western Australian Cannabis Infringement Notice Scheme on public attitudes, knowledge and use: a comparison of pre- and post change data.* National Drug Research Institute, Perth. ISBN: 1 74067 564 9 [T177]

Fetherston, J. and Lenton, S. (2007). Western Australian drug trends 2006: Findings from the Illicit Drug Reporting System. *NDARC Technical Report No.268.*

Fetherston, J. and Lenton, S. (2008). Western Australian drug trends: Findings from the Illicit Drug Reporting System. *Australian Drug Trends Series No.7.*

Fridell, M., Hesse, M., Jaeger, M.M. and Kuhlhorn, E. (2008). Antisocial personality disorder as a predictor of criminal behaviour in a longitudinal study of a cohort of abusers of several classes of drugs: Relation to type of substance and type of crime. *Addictive Behaviors, 33*(6), 799-811.

George, J., Fetherston, J., Lenton, S. and Santana, L. (2009). Western Australian drug trends 2008: Findings from the Illicit Drug Reporting System. *NDARC Technical Report No.25.*

Goldstein, P. J. (1985). The drugs/violence nexus: A tripartite conceptual framework. Journal of Drug Issues, 39, 143−174.

Gottfredson, M. R., and Hirschi, T. (1990). A general theory of crime. Stanford: Stanford University Press.

Gray, S.D, Fatovich, M.D., McCoubrie, D.L. and Daly, F.F. (2007). Amphetamine-related presentations to an inner-city tertiary emergency department: a prospective evaluation. *Medical Journal of Australia, 186*(7), 336–339.

Griffiths P, Kalic R, McGregor C and Gunnell A (2009). National Drug Strategy Household Survey 2007: Western Australian Households, DAO Surveillance Report: Number 02. Perth, Western Australia; Drug and Alcohol Office.

Hargreaves, K. and Lenton, S. (2000). Western Australian drug trends 1999: Findings from the Illicit Drug Reporting System. *NDARC Technical Report No.85.*

Hargreaves, K. and Lenton, S. (2001). Western Australian drug trends 2000: Findings from the Illicit Drug Reporting System. *NDARC Technical Report No.110.*

Hargreaves, K. and Lenton, S. (2002). Western Australian drug trends 2001: Findings from the Illicit Drug Reporting System. *NDARC Technical Report No.134.*

Haynes, R., Kalic, R., Griffiths, P., McGregor, C. & Gunnell, A. (2010). *Australian School Student Alcohol and Drug Survey: Illicit Drug Report 2008 – Western Australia results.* Drug and Alcohol Office Surveillance Report: Number 09. Perth: Drug and Alcohol Office

Kalic R, Gunnell A.S, Griffiths P and McGregor C (2009). National Drug Strategy Household Survey 2007: Summary Tables, Western Australian Households, DAO Surveillance Report: Number 01. Perth, Western Australia; Drug and Alcohol Office

Kosten, T. R., and Singha, A. K. (1999). Stimulants. In M. Galanter, H. D. Kleber (Eds.), Textbook of substance
abuse treatment (2nd ed.) (pp. 183–193). Washington, DC: American Psychiatric Press.

Kinner, S.A., George, J., Campbell, G. and Degenhardt, L. (2009). Crime, drugs and distress: patterns of drug use and harm among criminally involved injecting drug users in Australia. *Australian & New Zealand Journal of Public Health, 33*(3), 223-227.

Lasnier, B. Brochu, S., Boyd, N. and Fischer, B. (2010). A heroin prescription trial: Case studies from Montreal and Vancouver on crime and disorder in the surrounding neighbourhoods. *International Journal of Drug Policy, 21*(1), 28-35.

Longo, M., Henry-Edwards, S., Humeniuk, R., Christie, P. and Ali, R. (2004). Impact of the heroin 'drought' on patterns of drug use and drug-related harms. *Drug and Alcohol Review, 23*(2), 143-150.

Lundqvist, T. (2004). Cognitive consequences of cannabis use: Comparison with abuse of stimulatns and heroin with regard to attention, memory and executive functions. *Pharmacology Biochemistry and Behaviour, 81*(2), 319-330.

Macalino, G.E., Hou, J.C., Kumar, M.S., Taylor, L.E., Sumantera, I.G., and Rich, J.D. (2004). Hepatitis C infection and incarcerated populations. *International Journal of Drug Policy, 15*(2), 103-14.

Makkai, T., and Payne, J. (2003). *Drugs and crime: A study of incarcerated male offenders.* Research and Public Policy Series No. 52. Canberra: Australian Institute of Criminology.

Maxwell, J. (2005). Emerging research on methamphetamine. *Current Opinion in Psychiatry, 18,* 235−242.

McGregor, K., and Makkai, T. (2003). *Self-reported drug use: How prevalent is underreporting?* Trends and Issues in Crime and Criminal Justice No. 260. Canberra: Australian Institute of Criminology.

Moffat, S., Weatherburn, D., and Donnelly, N. (2005). What caused the recent drop in property crime? *Crime and Justice Bulletin: Contemporary issues in Crime and Justice, no. 85.* Sydney: NSW Bureau of Crime Statistics and Research.

Nicholas, R. (2008). Understanding and responding to alcohol-related social harms in Australia: Options for policing. *A discussion paper prepared at the request of the Conference of Commissioners of the Police of Australasia and the South West Pacific Region.* Hobart, Tasmania: National Drug Law Enforcement Research Fund, Commonwealth of Australia.

Nurco, D.N., Hanlon, T.E. and Kinlock, T.W. (1991). Recent research on the relationship between illicit drug use and crime. *Behavioural Sciences and the Law, 9,* 221-242.

Pernanen., K., Cousineau, M., Brochu, S., and Sun, F. (2002). *Proportion of crimes associated with alcohol and other drugs in Canada.* Canada: Canadian Centre on Substance Abuse.

Reiss, A. J., and Roth, J. A. (1993). Alcohol, other psychoactive drugs and violence. In A. J. Reiss, & J. A. Roth (Eds.), Understanding and preventing violence (pp. 182–220). Washington, DC: National Academy Press.

Roberts, M. (Minister for Police) 2003, *New laws to pull the plug on illegal drug laboratories,* media release, 11 June, Government of Western Australia, Perth, viewed 3 June 2010, <http://www.mediastatements.wa.gov.au/Pages/ByPortfolio.aspx?ItemId=119941&search=amphetamine&admin=&minister=&portfolio=Police&region= >.

Rossi, C. (2004). Operational models for epidemics of problematic drug use: the Mover-Stayer approach to heterogeneity. *Socio-Economic Planning Sciences, 38*(1), 73-90.

Santana, L., McGregor, C., Kirby, G., and Wilkinson, C. (2007). Heroin trends tracking: relationships between indices of heroin use and crime. *Drug and Alcohol Office Monograph no. 3*, Perth, Western Australia: Drug and Alcohol Office.

Tyner, E.A. and Fremouw, W.J. (2008). The relation of methamphetamine use and violence: A critical review. *Aggression and Violent Behaviour, 13*(4), 285-297.

Weatherburn, D., Jones, C., Freeman, K. and Makkai, T. (2003). Supply control and harm reduction: Lessons from the Australian heroin 'drought'. *Addiction, 98*(1), 83-91.

Western Australian Police. *Anti-Social Behaviour Strategy 2009-2011.* Retrieved 3 June 2010 from <http://www.police.wa.gov.au/Aboutus/Strategyandplanning/Informingstrategies/tabid/1525/Default.aspx>.

Wodak, A. (2008). What caused the recent reduction in heroin supply in Australia? *International Journal of Drug Policy*, *19*(4), 279-286.

Delivering a **Healthy WA**