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**Estimating the cost-savings of reduced
crime while in methadone treatment**

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Acknowledgments:

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Executive summary

Aim

The aim of this study was to assess whether there was evidence of cost-savings due to crimes averted while individuals were engaged in methadone maintenance as a treatment for heroin use. Analyses were undertaken over a four year period for a population-based sample of NSW methadone clients.

Methods

Linked administrative data bases (methadone treatment records, court appearance records, and imprisonment records) were used to estimate the costs of crime *on-* and *off-*treatment, the costs of gaol and the costs of treatment for a sample of 10,925 NSW methadone clients.

Certain crimes were excluded due to uncertainty around the completeness of the data (e.g. homicide); lack of cost data (e.g. illicit drug use crimes, dangerous or negligent acts endangering a person, abduction and related offences); and potential for double counting costs (illicit drug use). Following data linkage, costs were applied to treatment days, charge and gaol data in order to estimate the economic costs and potential cost savings. Costs were attached to days in methadone treatment in and out of gaol (Warren et al., *In press*, Mattick et al., 2001); days in gaol (Department of Corrective Services, 2005); and to the various types of crime (Mayhew, 2003). All costs are reported in 2005 Australian dollars.

There are two sets of analyses in this paper. The first is descriptive and presents the total number of treatment days and crimes committed *on-* and *off-*methadone, and the costs of treatment, gaol and crimes for the sample over the four year study period. A second analysis was conducted using regression analysis to explore whether methadone treatment impacts upon the costs of crime and gaol.

Results
Days and charges

- The sample spent more free time *on*-methadone (53%) than *off*-methadone (47%).

- The large preponderance of time was spent out of gaol (92% of the total days).

- There was considerable variation across the sample with regards to the amount of time spent *on*-methadone with some individuals spending only one day in treatment during the four year study period while others spent the entire 1,461 days enrolled in treatment.

- With respect to crime, 46% of all crime was committed while on treatment and 54% while off treatment; which translates into 0.0026 crimes per free day *on*-methadone and 0.0034 crimes per free day *off*-methadone.

Costs

- The largest component of total costs was the cost of gaol, which accounted for 65% of the total despite only accounting for 8% of the days.

- Methadone treatment costs, both in and out of gaol, accounted for 26% of total costs, and the crime costs included accounted for 9% of total costs.

- Crimes committed *on*-methadone accounted for 43% and crimes committed *off*-methadone account for 57% of total crime costs.

Regression analysis

The results of the regression analysis suggest that the mean cost of treatment, crime and incarceration was $17,274 per episode. The coefficient for days in treatment was negatively related to cost of crime and gaol and highly significant, thus indicating that for each additional day in treatment the costs of crime and gaol decreases by $15. Gender was also significant: the cost per female was, all else constant, $5,129 less than the cost per male.

Discussion

The present study found a reduction in the cost of crime associated with enrolment in methadone consistent with the broader literature. When comparing only the treatment and crime costs, it was apparent that the investment in methadone treatment was only partially offset by savings from averted crime. However, the results from regression analysis, which examined the relationship between time in methadone treatment and costs of crime and gaol, found that every day an individual was enrolled in methadone treatment paid for itself in terms of a decrease in gaol and crime costs.

Introduction

There is a considerable body of evidence documenting a link between methadone maintenance as a treatment for heroin use and reduced criminal activity (Gossop et al., 2000, Anglin and Speckart, 1988, Gerstein et al., 1994). Much of this support for methadone maintenance as a crime control measure comes from small randomised controlled trials or observational studies which rely on self-report data (Hall, 1996).

Building on research examining the link between substance abuse treatment and reduced crime, a smaller body of work has examined the economic impact of averted criminal activity. This research indicates that the cost of investing in substance abuse treatment generally, and methadone treatment specifically, is offset by economic benefits (Godfrey et al., 2004, Healey et al., 2003, Daley et al., 2000, Anglin et al., 1989, Zarkin et al., 2005, Harwood et al., 1988). While the cost-benefit ratio of investment in substance abuse treatment varies across studies, it is consistently positive, suggesting a fairly robust effect (Belenko et al., 2005). A number of studies have found that the majority of the economic benefits resulting from investment in substance abuse treatment are accounted for by decreased crime costs (Koenig et al., 2005, National Evaluation Data Services, 2002, Belenko et al., 2005). For example, McCollister and French reviewed eleven economic evaluations of drug and alcohol interventions and found that avoided criminal activity resulted in more economic benefit than any other domain (e.g. health service utilisation, employment earnings) (McCollister and French, 2003).

One limitation of many economic evaluations of substance abuse treatment is the reliance on self-report data to measure criminal activity, although self-reported criminal behaviour has been shown to be reasonably consistent with official records and reasonably consistent over time (Darke et al., 1992, Anglin et al., 1993). However, self-report data are subject to a number of biases such as deliberate under- or over-reporting as well as errors resulting from retrospective reporting (Hall, 1996). Additionally, estimates of the cost of various types of crimes have not been easily available. This current study makes use of actual charge data and cost estimates by type of crime to examine the cost-savings of reduced crime while on

methadone. This work builds on a previous study examining the extent of reduction in crime in this population (Lind et al., 2005).

Aims

Specifically this present study estimates the costs of crime, treatment and gaol between the 1st of January 1998 and the 31st of December 2002 for a sample of 10,925 methadone maintenance treatment clients. This study examines the costs of crime, treatment and days in gaol to assess whether there were cost-savings due to crimes averted while individuals were on methadone maintenance treatment. The impact of age and gender on treatment and crime costs are also explored.

The present study is the first large scale evaluation of cost savings of crimes averted while on methadone maintenance treatment conducted using administrative data and will add to the small number of economic evaluations conducted using official crime data. The methods section details the process of estimating the costs of the crimes and treatment as well as describing the analyses carried out.

Methods

Methadone maintenance is a treatment for heroin use where individuals receive daily doses of methadone for a number of months or years as a substitute for heroin. The present study uses four years of data for a sample of heroin users enrolled in the NSW methadone program. Data includes estimates of: the numbers and costs of crime for periods while receiving methadone treatment (referred to as *on*-methadone) and for periods while not receiving methadone treatment (*off*-methadone); the costs of methadone treatment; and the costs of gaol. Additionally, regression analysis was used to assess the impact of treatment on costs of crime and gaol.

Data sources

The present study used the identical linked data as that used by Lind et al. (2005) in their assessment of the effect of methadone treatment on crime rates. These data are comprised of linked records from three sources: methadone treatment records, court appearance records, and imprisonment records. A brief description of each is provided below.

- Methadone treatment records for the period from 1 January 1998 to 31 December 2001 were obtained from a NSW Health database which contains records of all treatment episodes which occurred during the study period for individuals on the methadone program.

- Court appearance records were obtained from the re-offending database which provides information about offences dealt with in Local Court during the study period. Variables included type of offence and offence date.

- Imprisonment records were obtained from the NSW Offender Management System which is maintained by the NSW Department of Corrective Services. This database provided information about time spent in custody for individuals who had been identified as having a court appearance record in the re-offending database. The offender management system provided prison admission and release dates for individuals for whom a match was obtained.

Once data were linked, four years of methadone treatment data, charge data, and imprisonment data were available for each individual included in the study. Most of the selection criteria for inclusion in the present study were the same as those outlined by Lind et al. (2005). Individuals were included in the study if they:

- began an episode of methadone treatment, lasting at least one day, between January 1, 1999 and December 31, 2000 (note: for those included, four years of data were used);

- were aged 18 years or more on January 1, 1998;

- did not transfer to or from an interstate methadone program during the study period; and

- did not have 'deceased' as the reason for leaving treatment during the study period.

Two additional selection criteria were used in the present study. The sample was further limited to those individuals who:

- had spent at least 30 days out of gaol during the study period; and

- had spent at least one gaol-free day enrolled in methadone treatment during the study period.

Exclusions

As outlined previously, the data used in the present study were based on NSW Local Court records. While Local Court records include the majority of offences, some serious offences such as homicide are unlikely to be completely captured. For this reason, offences in the category of 'homicide and related offences' were excluded.

Another exclusion of note was illicit drug-use crimes. While this may appear an illogical exclusion, if all illicit drug-use crimes were included it is likely that many of the social costs attributed to illicit drug crimes would be counted twice. For example, the costs of offences committed to fund a drug habit have been included in the relevant offence categories (Mayhew, 2003); therefore, if drug offences were also included, several components of costs

would be counted twice. In addition, costs of treatment are already included in this study. Illicit drug offences accounted for 10.8% of all crimes; however, the majority of these were less serious "possess/use" offences. It is expected that the decision to exclude illicit drug-use crimes will lead to a more conservative estimate of any decreases in the costs of crime related to treatment. The implications of this decision will be explored in the sensitivity analysis.

Consistent with Lind et al. (2005), offences which occurred within prison were excluded from the present study. Offences occurring in prison constituted a small percentage of the total offences committed by the sample over the study period (3.28% of total offences committed occurred in gaol) and there were no costs available for most of these crimes.

Counting rules

Costs were calculated separately for crimes of any type and property crime. The category of any crime included all Australian Standard Offence Classifications (ASOC) categories for which a cost estimate was available (discussed below) (Australian Bureau of Statistics, 1997). The category of property crime included the ASOC divisions of:

- robbery, extortion and related offences (ASOC 611, 612, 621),
- unlawful entry with intent/burglary, break and enter (ASOC 711),
- theft and related offences (ASOC 811, 812, 823, 831, 821, 829).

With respect to calculating days on methadone and time in custody, and whether an offence occurred *on-* or *off*-methadone treatment or *in-* or *out of*-custody, this current study used the same counting rules as those employed by Lind et al. (2005).

- For each period spent in gaol, time in custody was calculated as the number of days between the date of incarceration and the date of release. Both the date of prison admission and release were counted as time out of custody, as part of the day was spent free and therefore the person had an opportunity to commit crime. As a result, if an offence occurred on either the date of prison admission or release, then it was considered to have occurred out of custody.

- For each treatment episode, time *on*-methadone was calculated such that the start date was counted as being *off*-methadone and the end date was counted as being *on*-methadone. As a result, if the date of an offence was the start date of an episode of methadone treatment, it was counted as occurring while *off*-methadone, while if the date of offence was the end date of an episode of methadone treatment it was counted as occurring while *on*-methadone

- Where an individual was charged with the same offence more than once on the same date, this offence was only counted once.

Costs

Following data linkage, costs were applied to treatment days, charge and gaol data in order to estimate the economic costs and potential cost savings. The following section provides additional description of how costs were estimated for the various components. All costs are reported in 2005 Australian dollars, with costs adjusted from previous years using the Australian Consumer Price Index (Australian Bureau of Statistics, 2005).

Treatment and incarceration costs

Estimates of the average cost per day of methadone both in and out of gaol were obtained from existing sources (Warren et al., *In press*, Mattick et al., 2001). The average cost per day of gaol was sourced from the Department of Corrective Services (Department of Corrective Services, 2005).

Costs of crime

When undertaking any assessment of costs, economists are interested in the full economic cost. Using crime as an example, this includes the cost to the individual, the victim, businesses and society at large. Therefore, costs of crime include not just criminal justice costs (law enforcement and courts) but also victims' medical costs and intangible costs. There are few studies which have attempted to estimate the economic costs of various types of crime. However, Walker (1992, 1997) and Mayhew (2003) have estimated the costs of some types of crimes in Australia. The present study used the more recent unit cost

estimates by Mayhew (2003) which captured property losses, victims' medical care costs, lost output as a result of the crime, and intangible costs for several types of crime.

The reader is referred to Mayhew's original work for a full description of the methodology used in estimating these costs. However, as many of the methodological assumptions are relevant for interpreting the present study, a summary of Mayhew's key methodological decisions are documented here (see Box 1).

BOX 1: Key methods/assumptions by Mayhew (2003):

- Crime costs were classified into three categories as per Brand:(2001) i) *in anticipation of crime* – expenditure on security, insurance resources;
  ii) *as a consequence of crime* – property lost or damaged, lost output, health services for victims where appropriate, intangible costs to victims (pain, suffering and lost quality of life were estimated for violent and property crime), victim support services; and
  iii) *in response to crime* – criminal justice system, probation and parole, and criminal injuries compensation.

- Cost of lost output was estimated using a human capital approach and included paid and unpaid work in present values (social discount rate of 4%). Lost output estimates were applied to the following crimes: homicide, assault, sexual assault, and robbery.

- Costs were estimated per offence (based on an estimate of the total number of each offence type committed) as opposed to recorded crime or crimes for which an arrest was made.

- Economists consider an exchange of goods or money with no resource consumption a transfer payment and these would not normally be included as a cost. However, as theft and fraud are non-voluntary transfer of resources, the value of the property theft is included. Insurance payments (a wanted transfer) were not included in the economic costs but administrative costs of insurance were included.

- Unit costs (average cost per crime) do not include criminal justice costs of investigation, prosecution, trial and imprisonment (see discussion below on how this was dealt with in the current study).

Mayhew attempted to estimate most cost components, although not all are included in the unit costs of crime (for example, criminal justice costs are estimated separately and this is discussed further below). Additionally, crimes within the same offence category may result in different costs, but the point estimates used here are the best available current estimates of

the economic impact of crime. The Mayhew study provided a cost estimate for many of the major types of crime including assault, robbery, burglary and theft, shop theft and car theft (See Table 1). These cost estimates were applied to the data using ASOC (Australian Bureau of Statistics, 1997) to match cost categories with charge data.

The unit cost estimates from Mayhew (2003) are the average cost of all crimes in a category, both those for which an arrest occurred, and those for which an arrest did not occur. Therefore, the unit costs used here are likely to be an underestimate of the true costs of crimes for which an arrest has been made.

As noted above, criminal justice system (CJS) costs were not included in Mayhew's unit crime cost estimates. As unit costs including CJS costs were considered necessary for this study, CJS costs were estimated by increasing unit costs by the proportion of total cost per crime that was attributed to CJS costs in a similar UK study (Brand and Price, 2001). For example, if 37% of the total cost of burglary in the UK was attributed to CJS, then the Australian totals were adjusted upward by this proportion. The costs of gaol were excluded from the UK CJS totals prior to estimating the proportion of CJS costs, as this study included data on actual days in gaol to which costs were applied.

While Mayhew et al. (2003) estimated the total cost of fraud, they did not report a unit cost. In part this was because the category of fraud includes a wide range of offences, varying from minor low-cost crimes to large scale accounting fraud valued at millions of dollars. However, a Victorian study (as reported in Mayhew, 2003) estimated the average cost of fraud recorded by the police at $3,000 with a median cost of $550. In the present study, the median cost was used, reflecting the lower cost type of fraud offences (e.g. fare evasion, prescription fraud). The impact of using the average cost of $3,000 was explored in the sensitivity analysis.

Unit costs were not available for a number of offence categories. After attempting to source cost estimates elsewhere, we were faced with either deleting these charges or applying a conservative cost estimate. For offence categories characterised as relatively minor offences, a conservative estimate of CJS costs was applied. This approach was taken for public order

and road traffic and motor vehicle regulatory offences. The impact of the application of this conservative estimate of criminal justice costs was tested in the sensitivity analysis. Offences

Table 1: Unit costs (AUD$ 2005)

Cost category	Unit cost	Multiplier	Source
Methadone			
• cost per treatment day in community	$11.70	-	Mattick et al., 2001
• cost per treatment day in gaol	$9.31	-	Warren et al., In press
Gaol cost per day	$186.84	-	NSW Department of Corrective Services, 2004/05
Offences (average cost)			
• Assault	$2,216	5.30	Mayhew, 2003 and CJS based on Brand and Price, 2001
• Sexual assault	$3,134	5.60	Mayhew, 2003 and CJS based on Brand and Price, 2001
• Robbery	$4,747	7.50	Mayhew, 2003 and CJS based on Brand and Price, 2001
• Residential burglary	$2,498	2.80	Mayhew, 2003 and CJS based on Brand and Price, 2001
• Theft of motor vehicle	$6,666	1.05	Mayhew, 2003 and CJS based on Brand and Price, 2001
• Shop thefts	$138	100.00	Mayhew, 2003 and CJS based on Brand and Price, 2001
• Other theft and handling	$443	4.50	Mayhew, 2003 and CJS based on Brand and Price, 2001
• Criminal damage	$813	6.00	Mayhew, 2003 and CJS based on Brand and Price, 2001
• Fraud (median)	$550	4.00	Victoria Police in Mayhew, 2003

for which there were no available unit costs, and which were expected to have a large variation in associated costs, were excluded. This included the categories of: dangerous or negligent acts endangering a person; abduction and related offences; offences against justice procedures, government, security; and miscellaneous offences. The distribution of the excluded offences was similar to those not excluded, with 44% of excluded offences committed *on*-methadone compared to 46% of the included offences committed *on*-methadone, suggesting that exclusion of these offence categories, while affecting the total costs, would not bias the results.

Table 2: Frequency of offences included and excluded

Offences	Frequency	Percentage
Total number of offences	57,114	100%
Number of offences committed in gaol	1,724	3%
Total other excluded offences	11,309	19.8%
- Illicit drug offences	6,000	10.5%
- Homicide	16	0.0%
- Dangerous or negligent acts endangering a person	1,320	2.3%
- Abduction and related offences	5	0.0%
- Offences against justice procedures, government security	3,284	5.7%
- Miscellaneous offences	684	1.2%
Total number of offences to which costs were applied	44,081	77%

Analyses

There are two sets of analyses in this paper. The first is descriptive and presents time (in days), number of offences, and costs of treatment, gaol and offences for the sample over the four year study period. Time *on*-methadone is presented both for in-community methadone and for total days (includes methadone received in gaol). Costs (for the whole sample over the four years) are presented for i) methadone received in the community and in gaol; ii) for days in gaol; and iii) for crimes committed *on-* and *off*-methadone.

$$\text{Total costs} = \sum_{1}^{10925} (MethdoneCost + GaolCost + CrimeCost)$$

Where:

$$\text{Methadone Costs} = \sum_{1}^{10925} \left(Days\_in\_MethC \times Cost\_MethC + Days\_in\_Meth\_Gaol \times Cost\_Meth\_Gaol\right)$$

$$\text{Gaol Costs} = \sum_{1}^{10925} \left(Days\_in\_Gaol \times Cost\_per\_Day\right)$$

$$\text{Crime Costs} = \sum_{1}^{10925} \left(\sum_{1}^{j} Crime\_Type \times Cost\_Crime\_Type_j\right)$$

where 10,925 is the number of subjects in the study; j is the type of crime, Methadone Cost is

the total cost of methadone provision for the sample; similarly Gaol Cost is the total cost of all days in gaol; and the Crime Cost is the total cost of crimes included.

Regression analyses

One of the objectives of the study was to assess whether methadone treatment resulted in a net savings in criminal justice costs (including crime, gaol etc). However, the original data did not enable incarceration, which accounted for 65% of the costs, to be linked to specific offences. In order to further explore whether treatment was associated with an overall decrease in criminal justice costs, each individual's four years of data were separated into episodes where each episode was comprised of a period of freedom followed by a subsequent period of incarceration (where relevant) under the assumption that a period of incarceration could reasonably be linked to the period of freedom preceding it. Each episode also contained the relevant days spent in treatment.

As a first step, a linear regression on the costs of crime and gaol was estimated with days in treatment as the explanatory variable and the covariates of gender and age. However, as repeated observations may lead to an overestimation of the significance levels, a generalised estimating equation (GEE) model was also estimated with a correction for the possible within-subject correlations using an exchangeable (independent) correlation structure. Covariates included age at each episode, and gender. While both sets of results are presented, as there were no substantive differences in the results between the two models the results from the simpler linear model are included in the discussion. The final model is:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 t + \beta_3 Z_{ti} + \beta_4 M_i + \varepsilon_{it}$$

where β_0 is the constant, β_1 is the regression coefficient on the explanatory variable days in treatment during an episode (X_{it}), β_2 is the coefficient on the episode number (t), β_3 is the coefficient on the covariate age at time of episode (Z_{it}), β_4 is the coefficient on gender (M_i) and Y_{it} is the total cost of crime and gaol in a given episode.

Results

Sample demographics

A final usable sample of 10,925 subjects was obtained. Table 3 presents the age (at start of the study period) and gender of the sample (N=10,925). Roughly two-thirds (67%) of the sample were male, and over half (53%) were over the age of thirty. Of the roughly one-third (33%) of the sample who were female, 57% were over the age of 30.

Table 3: Age and gender of sample (N=10,925)

Age on Jan 1 1998	Female		Male	
	N	% of total sample	N	% of total sample
18–24	1,213	11%	2,137	20%
25–29	851	8%	1,714	16%
30–34	739	7%	1,361	12%
35–39	493	5%	1,189	11%
40+	311	3%	917	8%
Total	**3,607**	**33%**	**7,318**	**67%**

Overall, the sample had approximately 16 million days in treatment. Table 4 presents the number of days during the four year study period that the sample spent *on-* and *off-*methadone and the number of days spent in gaol. The sample spent more free time *on-*methadone (53%) than *off-*methadone (47%). As is evident, the large preponderance of time was spent out of gaol (92% of the total days) with 49% of free time spent as free days *on-*methadone and 43% as free days *off-*methadone.

There is considerable variation across the sample with regards to the amount of time spent *on-*methadone. Some individuals spent only one day in treatment during the four year study period while others spent the entire 1,461 days enrolled in treatment. Similarly, some individuals spent no time in gaol while others experienced only 31 days of free time.

In relation to crime, 46% of charges were while *on*-treatment and 54% of charges were while *off*-treatment; which translates into 0.0026 crimes per free day *on*-methadone and 0.0034 crimes per free day *off*-methadone.

Table 4: Frequency of days and crimes over 4 years

Days and Crimes	Total	% of total
Total days	15,961,425	100%
Days *on*-methadone	8,524,194	53%
Days *off*-methadone	7,437,231	47%
Days free	14,623,643	
Free days *on*-methadone	7,753,161	49%
Free days *off*-methadone	6,870,482	43%
Days in gaol (*on*- and *off*-methadone)	1,337,782	8%
Crimes committed *on*-methadone	20,438	46%
Crimes committed *off-m*ethadone	23,643	54%

Economic costs

We now turn to presenting data on the costs of treatment, crimes and time in gaol. Table 5 presents the total costs associated with each of the components quantified above, including the costs of methadone treatment (in and out of gaol), gaol, and crime (*on*- and *off*-methadone). The largest component of total costs is the cost of gaol, which accounts for 65% of the total cost despite only accounting for 8% of the days. Again the range of costs was wide, from $12[1] to $307,199 per person, with 7,499 individuals having no gaol costs. Methadone treatment costs, both in and out of gaol, accounted for 26% of total costs, and the crime costs captured in this study accounted for 9% of total costs.

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[1] The minimum total cost per person is $12 as the inclusion criteria required spending at least one free day *on*-methadone

Table 5: Total costs for the sample for the years 1998–2001 (N=10,925)

	Total	% of total	Mean/ person	Range	
				Min/ person[1]	Max/ person
Methadone treatment costs	**$97,890,301**	**26%**	**$8,960**	**$12**	**$17,094**
• *Cost of methadone in the community*	$90,711,984	24%	$8,303	$12	$17,094
• *Cost of methadone in gaol*	$7,178,317	2%	$657	$0	$13,295
Cost of days in gaol	**$249,951,189**	**65%**	**$22,879**	**$0**	**$267,181**
Offence costs	**$35,900,031**	**9%**	**$3,286**	**$0**	**$77,565**
• *Cost of offences committed on-methadone (% of crime costs)*	$15,457,809 (43%)	4%	$1,415	*$0*	$63,839
• *Cost of offences committed off-methadone (% of crime costs)*	$20,442,222 (57%)	5%	$1,871	*$0*	$77,565
Total Costs (treatment, gaol, and crime)	**$383,741,521**	**100%**	**$35,125**	**$12**	**$307,199**

[1]The minimum total cost per person is $12 as the inclusion criteria required spending at least one free day *on*-methadone

As a proportion of the total cost of crime, crimes committed while *on*-methadone account for 43% and crimes committed *off*-methadone account for 57% of total crime costs. When analyses were restricted to theft offences (Table 6), the proportion of crime costs accounted for by crimes committed *off*-methadone increased to 59%.

Property crimes comprised $25.9 million of the $35.9 million of crime costs included in this study. While the pattern for property crimes is similar to the pattern of overall costs of crime (see Table 6), the difference between the costs of crime committed *on*- and *off*-methadone widens when property crime is examined separately.

Table 6: Cost of property offences committed on- and off-methadone while out of gaol (N=10,925)

	Total	% of property crime costs	Mean	Range	
				Min /person	Max/ person
Cost of property crime	$25,961,123				
Property offences committed *on*-methadone	$10,609,565	41%	$971	$0.00	$63,618
Property offences committed *off*-methadone	$15,351,558	59%	$1,405	$0.00	$68,127

Another way of looking at the data is in terms of the average cost of crime per free day (See Table 7). As in the previous data there was considerable variation. The average cost of crime committed *on*-methadone was $3.60 per free day compared to an average cost of crime committed *off*-methadone of $4.63. A similar pattern of costs was evident for property crimes.

Table 7: Average crime costs per free day

	Average cost per free day
Any crime committed *on*-methadone	$3.60
Any crime committed *off*-methadone	$4.60
Property crime committed *on*-methadone	$2.70
Property crime committed *off*-methadone	$3.65

Sensitivity analyses

The impact of varying several key assumptions on total costs and crime costs was assessed using sensitivity analyses (see Table 8). The impact of excluding crimes for which there was no cost available, rather than applying the lowest CJS cost, was minimal, with a one percent

change in the cost of crimes committed and less than a 1% change overall. On the other hand, the impact of using a unit cost of fraud of $3,000 (the estimated mean cost of fraud) instead of $550 (the estimated median cost of fraud in the same study) resulted in a more substantial difference. The cost of crime committed while *on*-methadone increased by 22% and *off*-methadone by 18%. The impact on total costs was a 2% increase when fraud costs changed.

Table 8: Sensitivity analyses: The impact of applying alternate crime costs

	Original cost	Excludes all crimes for which low order CJS cost was used	% change	Using $3,000 a fraud cost	% change
Total costs	$383,741,521	$383,462,636	<1%	$390,772,881	2%
Total cost of crimes committed	$35,900,031	$35,621,146	-1%	$42,931,391	20%
Total cost of crimes committed *on-*methadone	$15,457,809	$15,320,721	-1%	$18,826,257	22%
Total cost of crimes committed *off-*methadone	$20,442,222	$20,300,425	-1%	$24,105,134	18%

Effect of excluding illicit drug costs

As discussed elsewhere, the costs associated with the 6,000 illicit drug offences were excluded for two key reasons: lack of cost data and the potential for double counting costs. Of the excluded illicit drug offences, the majority (85%) were "possess/or possess use" offences with the remainder being "deal/deal non-commercial quantity/manufacture or cultivate". Relative to the former, the latter is likely to result in higher costs. Here we disregard the issue of potentially double counting costs and assume that the costs of "possess/use" are similar to one of the lesser costing crimes (say $550, which is the median cost of fraud), and apply this cost to all "possess/use" charges. This increases the total cost of crime by about $2.5 million. Given illicit drug crimes occur predominantly when individuals are *off*-methadone (59%), the exclusion of illicit drug crimes leads to a more conservative estimate of the impact of methadone treatment on crime costs by decreasing the gap between the costs of crime *on*- and *off*-methadone.

Estimating the number and costs of recorded and unrecorded offences

The offence data used in the present study represent crimes for which an individual was charged. As only a subset of crime committed comes to the attention of police and only a subset of these crimes result in a charge, using only charge data will result in an underestimate of the frequency and cost of crimes. In order to estimate the total number of crimes which occurred, Mayhew (2003) constructed multipliers for each of the types of crime for which a cost was estimated. In this next section, the impact on costs of applying these multipliers is examined.

The application of multipliers increases the total cost of crime four-fold from $35.9 million to an estimate of $153 million, with the impact greater for the cost of crime committed *on*-methadone compared to *off*-methadone. The use of this assumption presumes that the rates of charges to crimes are constant across all individuals by type of crime.

Table 9: The impact of the multiplier

	Costs with multiplier	Original costs	Multiplier effect on costs
Total costs (treatment, gaol, crime)	$501,016,484	$383,741,521	1.31
Total cost of crime	$153,174,934	$35,900,031	4.27
Total cost of crime *on*-methadone	$69,649,702	$15,457,809	4.51
Total cost of crime *off*-methadone	$83,525,232	$20,442,222	4.09
Total costs of property crime *on*-methadone	$45,202,209	$10,609,565	4.26
Total costs of property crime *off*-methadone	$57,816,369	$15,351,558	3.77

Regression analysis

Table 10 presents the results of the multivariate analyses examining the impact of days in methadone treatment on the costs of crime and gaol per episode (defined as a period of freedom followed by a subsequent period of incarceration). Two models, ordinary least squares (OLS) and general estimating equations (GEE) were run, with both models producing similar results. As expected, the GEE model's ability to adjust for repeated observations resulted in smaller standard errors compared with the OLS model. However, the levels of significance in both models were such that this made little difference, and while both sets of results are presented the simpler OLS model results are discussed.

The variables included in both the OLS and GEE models were days in treatment, number of episodes, and the covariates of gender and age at each episode. The intercept, the mean cost of an episode, was $17,274. The coefficient for days in treatment was negatively related to cost of crime and gaol and highly significant, indicating that for a unit increase (one day) in treatment, the costs of crime and gaol decreases by $14.74. Gender was also significant: the cost per female was, all else constant, $5,129 less than the cost per male. Age at time of episode was not significant in this model.

Table 10: Regression analyses

Variables	OLS (standard errors)	GEE (standard errors)
Constant	17274.315*(788.75)	22403 9* (744.7244)
Days in treatment	-14.745* (.407)	-14.7449 * (.3308)
Gender (f=0, m=1)	5129.32* (385.585)	-5129.32* (323.37)
Age at episode	-12.26 (25.195)	-12.26 (23.834)
Number of episodes	-844.969 *(91.474)	-844.969 *(89.885)
R^2	0.29	

* Statistically significant at p <.001 for OLS and z <0.001 for GEE

Discussion

The present study found enrolment in methadone produced a reduction in the cost of crime consistent with the broader literature (Godfrey et al., 2004, Healey et al., 2003, Daley et al., 2000, Anglin et al., 1989). In this sample of 10,925 individuals enrolled in the methadone treatment for at least one day over a four year period, the sample spent more time on treatment than off treatment, and more time out of gaol (8%) than in gaol (92%); however, gaol accounted for 65% of the total costs.

Analyses which included only treatment and crime costs found that the cost of investing in methadone treatment was only partially offset by savings from averted crime. However, when regression analyses examined the relationship between time in methadone treatment and costs of crime and gaol, results indicated that every day an individual was enrolled in methadone paid for itself. That is, for each additional day enrolled in methadone treatment (at cost of $12), the cost of providing treatment was offset by a reduction in crime and gaol costs of approximately $15.

There are a number of limitations in the present study. While in general the identified limitations were likely to have made overall cost saving estimates more conservative, it is worth considering these limitations. In relation to applying costs to crime, the most important limitation of the present study was the approach taken to crimes for which no cost estimate was available; a conservative estimate of criminal justice system costs was applied for crime categories characterised by relatively minor offences while those crime categories with large variability in associated costs were excluded. A total of 20% of all crimes were excluded and half of these were illicit drug crimes, most of which were possess/use. For these crimes, the missing costs would be police and court cost as other societal costs (the property crimes committed in order to purchase drugs, treatment and gaol coasts are likely already included).

The cost of crime is likely to have been further underestimated by the application of unit crime costs or an average cost per crime calculated on the basis of both detected and undetected crimes. As crime data in the present study only included detected crimes, the use

of an average which included the cost of undetected crimes is likely to have resulted in an underestimate of actual costs. Criminal justice system costs are also likely to have been underestimated in the present study as gaol costs were included but costs associated with probation and parole and non-incarceration penalties were not.

A further limitation of the present study relates to the estimation of treatment days. Time spent enrolled in methadone was calculated using official treatment records. These treatment records may be inaccurate with regards to program end dates as it is possible for individuals to remain on the official methadone database for a period of time after ceasing treatment. While this represents a possible source of error, any inaccuracies are likely to result in a more conservative estimate of overall cost savings.

The cost-offset results are not surprising when the components of total costs are examined. Results indicated that the key factor in total costs was the cost of time in gaol (65% of the costs but 8% of the days), followed by treatment costs (26% of the costs and 53% of the days) and finally costs associated with crime (9%).

The regression analysis revealed that costs of gaol and treatment costs varied by gender but not by age. Costs for men, holding the variables of "days in treatment" and "age" constant, were significantly higher than women. These differences in costs are generally consistent with the differences in crime rates reported by Lind et al (2005) who found that charge rates for men were higher than charge rates for women.

Applying multipliers to address the underestimation of crime costs (resulting from the use of official crime records) increases the total cost of crime from $35.9 million to $153 million, with a greater impact on costs associated with crime committed *on*-methadone compared to *off*-methadone. While the application of multipliers to crime costs is likely to have resulted in a more accurate estimation of crime costs, it relies on a couple of assumptions. Specifically, the application of multipliers to crime costs in the present study assumes that the same individuals who were charged with offences committed undetected offences, and those individuals *on*- and *off*-methadone behaved similarly with regards to the number and type of undetected offences committed. To the extent that these assumptions are true, the costs

estimated using multipliers are likely to more accurately reflect the actual costs of crime committed by the study sample.

In considering these results it is important to keep in mind that the present study was not a comprehensive examination of all benefits associated with methadone treatment but rather was focussed on estimating cost-savings associated with averted crime. A review of literature in the area suggests that, while the largest proportion of the economic benefits associated with methadone treatment accrues from reduced crime, there is evidence for economic benefits in other areas; for example, health service utilisation and employment (National Evaluation Data Services, 2002). In addition, methadone impacts a range of other outcomes which are not considered in the present study; for example, wellbeing and mortality (Healey et al., 2003). Thus, while the present study provides valuable information about the impact of methadone on crime-related costs, the results are best considered along with information about the impact of methadone on other outcomes.

The present study also provides information useful for informing policy questions regarding public spending on methadone treatment for heroin dependence. The results from the regression analysis suggest that for each additional day enrolled in methadone treatment the cost of providing treatment ($12) was offset by a reduction in crime and gaol costs of $15, which is not dissimilar to the current cost per day of providing methadone or buprenorphine treatment.

These results clearly demonstrate large savings with regards to crime associated with methadone treatment. In addition they indicate that when flow-on savings associated with incarceration are taken into account, the cost of investing in methadone treatment is saved in averted crime and incarceration costs.

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Appendix

Description of how costs were calculated

Variable name	Variable description
Cost per individual over the study period	The total cost for each individual over the study period obtained by summing methadone treatment costs (in and out of gaol), gaol costs and crime costs (on and off methadone).
Cost of gaol	The total cost of time in gaol (not including the cost of methadone in gaol) obtained by multiplying the number of days an individual spent in gaol by the per day cost of gaol ($186.84)
Total cost of methadone	The total costs of methadone (including methadone both in and out of gaol)
Cost of methadone in the community	The cost of methadone (excluding methadone in gaol) was calculated by multiplying the number of free days an individual was enrolled in a methadone program by the per day cost of methadone treatment ($11.70)
Cost of methadone in gaol	The cost of methadone in gaol was obtained by multiplying the number of days an individual spent *on*-methadone in gaol by the cost per day of methadone treatment in gaol ($9.31)
Total cost of any crime committed	The cost of any crimes committed on free days while *on*-

on-methadone (excluding methadone in gaol)	methadone.
Total cost of any crime committed *off*-methadone (excluding time in gaol)	The cost of any crimes committed on free days while not on methadone.
Total cost of **property** crime committed *on*-methadone (excluding methadone in gaol)	The cost of property crimes committed on free days while *on*-methadone.
Total cost of **property** crime committed *off*-methadone (excluding time in gaol)	The cost of property crimes committed on free days while not on methadone.
Average cost of crime per free day *on*- and *off*-methadone	The average cost of crime committed per free day *on*-methadone. Individual average costs per day were calculated by dividing an individual's total cost of crime committed *on*-methadone by the number of free days they spent *on*-methadone. Individual averages were calculated in the same way for per day cost of crime committed *off*-methadone. An overall sample mean was then calculated as the average of the individual averages.
Average costs of property crime per free day *on*- and *off*- methadone	This is calculated in the same way as the above but using property crime costs rather than any crime costs.

Multipliers

Cost Category	Multiplier	Source
Assault	5.30	(Mayhew, 2003)
Sexual assault	5.60	(Mayhew, 2003)
Robbery	7.50	(Mayhew, 2003)
Residential burglary	2.80	(Mayhew, 2003)
Theft of motor vehicle	1.05	(Mayhew, 2003)
Shop thefts	100.00	(Mayhew, 2003)
Other theft and handling	4.50	(Mayhew, 2003)
Criminal damage	6.00	(Mayhew, 2003)
Fraud (Median)	4.00	(Mayhew, 2003)
Public order offences	No multiplier used	
Road traffic and motor vehicle regulatory offences	No multiplier used	
Dangerous or negligent acts endangering a person	Excluded	
Abduction and related offences	Excluded	
Offences against justice procedures, government security	Excluded	
Miscellaneous offences	Excluded	