Measuring the benefits of drug law enforcement: the development of the Australian Federal Police Drug Harm Index

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ABSTRACT

The present paper describes the historical development of the Australian Federal Police Drug Harm Index and its application in the evaluation of strategic approaches to combating the importation of illicit drugs into Australia. The index encapsulates the potential value to the Australian community of drug seizures made at the border and represents the dollar value of harm that would have ensued had the seized drugs reached the community. The index was developed and refined over almost a decade in response to the expanding body of literature estimating the cost of illicit drug use and the changes in drug types, production, availability and consumption. It is estimated that the Australian community receives approximately $A 5 of benefit for every dollar invested in federal drug law enforcement. Higher rates of return were achieved for drug policy strategies, including partnerships with other agencies and those that focus on serious crime.

Keywords: benefit-cost analysis, evaluation, harm index, illicit drugs, law enforcement, performance

Background

The impetus for the development of an index of policing performance regarding the importation of illicit drugs came initially from government accountability reporting requirements. All Australian federal agencies are required to define and report on the outcomes expected to be achieved through their activities. The Australian Federal Police (AFP) required a measurement of social impact that summarized the potential effect of their drug investigation operations.

AFP provides a federal law enforcement capacity across a large range of national interests. It enforces federal laws covering border crime (such as drug importation and smuggling of persons), economic crime (including fraud,

money-laundering, tax offences, identity crime and corruption) and cybercrime (including online child sex exploitation). Other AFP programmes deal with such matters as counterterrorism, aviation security and the protection of high office holders, and an international deployment group provides capacity-building programmes and offshore law enforcement initiatives in the Pacific region and elsewhere. General community policing is the responsibility of separate law enforcement agencies specific to each Australian state and territory. The exception is the Australian Capital Territory, where such services are provided by AFP through a contracted service with the Australian Capital Territory government. Thus, the law enforcement activity referred to in the present paper relates primarily to preventing the importation of large to medium-sized consignments of illicit drugs or their precursors into Australia, and not to domestic production, trafficking or possession of drugs.

This paper provides an overview of a drug-law enforcement performance measurement developed by AFP, the Drug Harm Index (DHI), from its initial, simpler forms [1, 2] to the most recent enhancements. In doing so, it reports for the first time the results of the latest version of the AFP Drug Harm Index, which included a number of methodological changes increasing the accuracy of the index. This version is a significant improvement on previous versions of DHI. It covers a wider range of drugs (e.g. sedatives) through the use of a relative harm rating [3]. It also includes purity adjustments and a separate analysis of the potential damage associated with precursor chemicals. Precursor chemicals are largely ignored in other drug harm indices. This paper also provides an update of previous benefit-cost analyses evaluating drug law enforcement that were based on smaller and less recent seizure and offender data sets and previous versions of DHI [1, 4]. From an operational policing perspective, it is important that the funds being directed to drug law enforcement can be justified.

Drug Harm Index methodology

The original AFP Drug Harm Index was the first index of its type and has been followed by others in the United Kingdom of Great Britain and Northern Ireland [5], the United Nations Office on Drugs and Crime (UNODC) [6] and New Zealand [7]. All are used as summary measurements to compare policy outcomes either internally or externally [8]. However, there are differences in approach and method. The United Kingdom index concentrates on a set of measurable indicators that are related to the social harms caused by drugs. The index for the base year (1988) was set at 100, and subsequent levels of harm were plotted against that point. Thus, it is a relative rather than an absolute measure of harm. The AFP and New Zealand indices share the same methodology, the only difference being that AFP had an independent estimate of the economic cost of drug use in the community [9, 10], whereas the New Zealand study developed its

own measurements. Both forms of measurement provide absolute estimates of the level of harm in economic terms, and both are used by their respective law enforcement agencies to report performance. There are differences: the bottom-up approach used in New Zealand resolved the issue of double-counting harm by counting polydrug users in each of the relevant drug categories. The top-down approach used in Australia avoided this problem by segmenting harm at the aggregate level. The issue remains important if harm at the drug-user level is of interest.

The basic notion of the AFP DHI is that the primary benefit from drug seizures at Australian borders is that drugs are prevented from entering the community. Thus, the various costs that would have been associated with the use of these drugs are avoided. The AFP DHI is defined simply as the dollar estimate of harm avoided per kilogram (denoted c) multiplied by the seizure weight in kilograms (denoted w). However, the relative harm differs for various classes of drugs, so this needs to be repeated for each drug type and then summed across the different drug classes. Mathematically, this can be written as:

$$DHI = \Sigma_i \, c_i w_i$$

where $i = 1,\ldots,n$, n is the number of different drug classes and c_i and w_i are the costs and seizure weights for drug class i.

Both the complexity and evolution of DHI are associated with deriving the most valid, accurate and up-to-date estimates of social cost per kilogram, and the choice of the most appropriate and comprehensive groupings of drugs to which these estimates can be applied. The AFP DHI was first derived in 2001 and was revised in 2003. In 2007 an interim adjustment was made, and another major revision was made in 2009 (see table 1).

Table 1. Overview of the development of the Australian Federal Police Drug Harm Index, in the period 2001-2009

DHI version	*Year of primary source data*	*Drug classes*	*Purity adjustment*	*Precursor conversion*	*Primary limitations*
2001	1999	Heroin Cocaine Amphetamines Cannabis	Yes	No	Based on street values, not Australian-based estimates of social costs
2003	1998	Opioids Amphetamines Cannabis	No	No	Based on 1998 source data; amphetamine harm underestimated

Table 1. Overview of the development of the Australian Federal Police Drug Harm Index, in the period 2001-2009 *(continued)*

DHI version	*Year of primary source data*	*Drug classes*	*Purity adjustment*	*Precursor conversion*	*Primary limitations*
2006	1998	Opioids Amphetamines Cannabis Precursors	No	Nominal	Based on 1998 source data; excludes sedatives, only nominal inclusion of precursors
2009	2004	Opioids Amphetamines Cocaine Cannabis Precursors Sedatives	Yes	Yes	Based on 2004 source data; cost estimates extrapolated for certain drugs

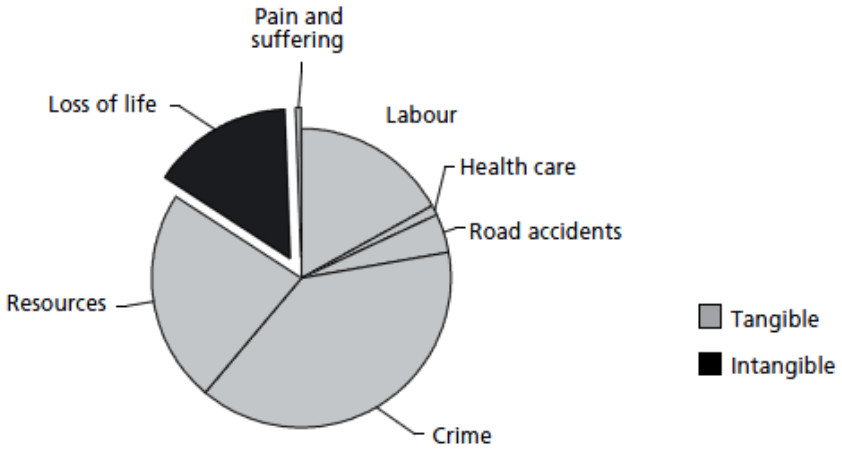
2001 version of the Drug Harm Index

In the absence of a comprehensive estimate of the social cost of drug abuse in Australia, the original index was based on street price converted to cost per kilogram. McFadden et al [1] reasoned that street price could be substituted for economic value, since estimates from separate studies using these different measurements in the United States of America differed by no more than 5 per cent. Regional Australian street prices were then obtained for heroin, cocaine, amphetamines and cannabis and used in the DHI formula after an adjustment for a difference in purity between drugs seized at the border and drugs on the street.

2003 version of the Drug Harm Index

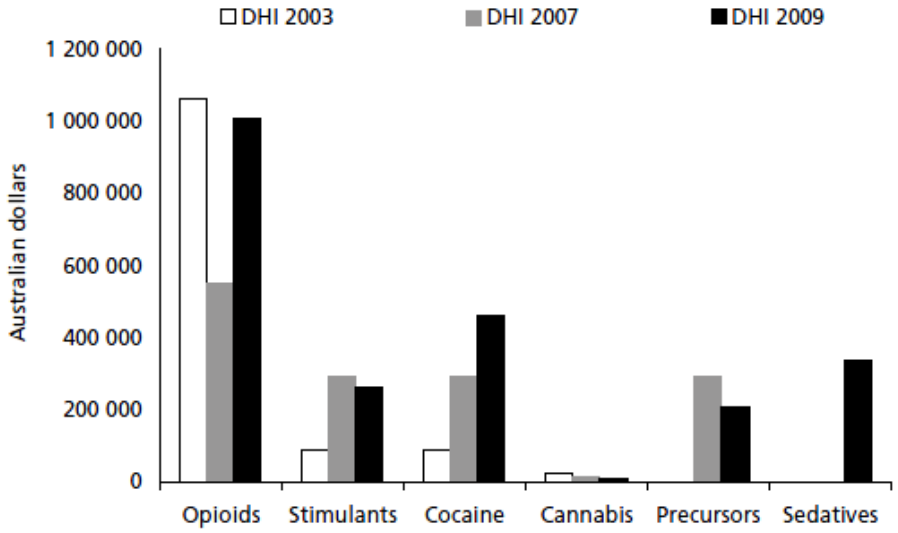
The primary improvement in 2003 was basing the index on Australian social-cost data. Full details are available in McFadden (2006) [2]. The harm value per kilogram for different classes of drugs was estimated by dividing the total annual cost of drug harm derived from Collins and Lapsley (2002) [9] by an estimate of total, annual consumption of drugs from Australian surveys [11, 12]. The Collins and Lapsley study was one of a series of studies commissioned by the Commonwealth Department of Health and Ageing to measure the social costs of drug abuse. Total social costs were obtained by summing separate component estimates of tangible and intangible costs (figure I). Crime was the largest cost component, accounting for 39 per cent of the total. The component costs were disaggregated by drug type (opioids, stimulants and cannabis) by McFadden (2006) [2] in order to obtain a total social cost for each of those three classes of drugs. Dividing by the estimates of consumption gives the per kilogram estimates, approximately $A 1 million for opioids, $A 90,000 for stimulants and $A 25,000 for cannabis (figure II).

Figure I. Distribution of tangible and intangible costs of social harm attributable to illicit drug use in Australia, 1998-99



Source: David J. Collins and Helen M. Lapsley, *Counting the Cost: Estimates of the Social Costs of Drug Abuse in Australia in 1998-9*, Monograph Series, No. 49 (Canberra, Commonwealth Department of Health and Ageing, 2002).
Note: The resources category includes resources used in abusive consumption.

Figure II. Estimated social cost per kilogram by drug class in successive versions of the Drug Harm Index



Note: Cocaine was included with stimulants until 2009.

2006 version of the Drug Harm Index

An interim update was undertaken in 2006 because a peer review and a review of the literature suggested that the harm associated with heroin was overestimated and the harm associated with amphetamines was underestimated. Hence, the heroin and amphetamine weightings were adjusted using relative weightings later published by Moore (2007) [13] but still keeping the total estimated harm consistent with Collins and Lapsley (2002) [9]. The results are shown in figure II.

2009 version of the Drug Harm Index

The main factors prompting the latest review were the availability of new source data (updated from 1998 to 2004) and the need to evaluate the impact of an additional drug type (sedatives) that had not previously been included, but that had become more prominent in recent seizures by AFP.

Despite an update in the Collins and Lapsley series [10], Moore [13] was used as the basis for the index, since separate specific estimates of social cost for different drug types were provided, and other limitations of Collins and Lapsley were addressed. Although Moore also estimated drug consumption, the estimates were inconsistent with the trends observed in the 2007 National Drug Strategy Household Survey statistics [14], so total consumption of the different drug types was calculated in a manner similar to that used in the previous version of DHI. Estimates of average consumption from the *World Drug Report 2007* [15] were applied to estimates of the total number of illicit drug users in Australia derived from the 2007 National Drug Strategy Household Survey [14] and the population census [16]. Since the *World Drug Report* presents consumption figures in terms of pure drugs, the values were scaled according to the purity of drugs in typical AFP border seizures.

An extension of the previous methodology was the extrapolation of the estimates of social cost per kilogram from the limited set of drugs for which they were available (heroin and amphetamines) to other drugs within the same or a similar class using relative harm ratings derived from Nutt et al [3]. In that work, a panel of experts from medical, scientific and judicial disciplines rated the harm associated with specific drugs using a four-point scale on three dimensions (physical harm, dependence, social harm). The authors of the present article derived an overall rating for each drug by taking the average across the three categories of harm. For the extrapolation, heroin was used as the reference drug for opioids and amphetamine was used for stimulants and sedatives. In a final step, the individual social cost estimates for each drug within a class were averaged into the final proposed DHI classifications weighted by prevalence of use in Australia (see table 2 and figure II).

Table 2. Extrapolation and aggregation, within drug class, of initial social cost per kilogram values (estimate 1) to the final values (estimate 3) used in the 2009 version of the Drug Harm Index

Drug class	*Drugs of interest*	*Social cost per kg: estimate 1*[a] *(Australian dollars)*	*Relative harm ratio*	*Social cost per kg: estimate 2*[b] *(Australian dollars)*	*Prevalence of drug use (percentage)*	*Social cost per kg: estimate 3*[c] *(Australian dollars)*
Opioids	Heroin	1 148 914	2.77/2.77	1 148 914	0.2	1 009 000
	Street methadone		1.94/2.77	802 307	0.05	
	Buprenorphine		1.58/2.77	653 169	0.05	
Stimulants	Amphetamine	333 472	1.66/1.66	333 472	2.3	263 000
	LSD		1.23/1.66	246 421	0.6	
	MDMA ("ecstasy")		1.09/1.66	218 966	3.5	
Cocaine	Cocaine		2.30/1.66	461 369	1.6	461 000
Sedatives	Barbiturates		2.08/1.66	417 844	0.1	336 000
	Ketamine		1.74/1.66	350 212	0.2	
	GHB		1.12/1.66	224 323	0.1	
Cannabis	Cannabis	7 658	1.33/1.33	7 658	9.1	8 000

[a]*Estimate* 1 based on total costs (Tim Moore, *Working Estimates of the Social Costs Per Gram and Per User for Cannabis, Cocaine, Opiates and Amphetamines*, Drug Policy Modelling Program Monograph Series, No. 14 (Sydney, National Drug and Alcohol Research Centre, 2007)) and estimated total consumption (*World Drug Report 2007* (United Nations publication, Sales No. E.07.XI.5) and Australian Institute of Health and Welfare, *2007 National Drug Strategy Household Survey: Fir-st Results*, Drug Statistics Series, No. 20, AIHW catalogue No. PHE 98 (Canberra, 2008)).

[b]*Estimate* 2 = estimate 1 × relative harm ratio (based on average harm scores derived from David Nutt and others, "Development of a rational scale to assess the harm of drugs of potential misuse", *The Lancet*, vol. 369, No. 9566 (2007), pp. 1047-1053).

[c]*Estimate* 3 = weighted average of estimate 2 within drug classes with weighting based on prevalence of recent drug use in Australia (persons aged 14 years or older) (Australian Institute of Health and Welfare, *2007 National Drug Strategy Household Survey: First Results*, Drug Statistics Series, No. 20, AIHW catalogue No. PHE 98 (Canberra, 2008)) (rounded to nearest thousand dollars).

Another enhancement was a more accurate estimation for precursors, which were previously given the same weighting as stimulants. Conversion ratios from precursor to final product [17] were applied to amphetamine costs for the common precursors, ephedrine and pseudoephedrine (0.70), and to costs for MDMA ("ecstasy") precursors (0.10) according to the following formula:

$$cost\ per\ precursor\ kg = cost\ per\ product\ kg\ X\ conversion\ rate$$

These two estimates were combined according to a prevalence weighting (as described in table 2) to obtain a final average social cost per kilogram of precursor ($A 208,000).

Impact of Drug Harm Index development

Figure II illustrates the change in relative weights for each primary drug class across the historical development of DHI. In all versions of the index, heroin has the largest weighting and cannabis the lowest. The high relative weighting for cocaine in the latest version of the index is consistent with its high ranking on all three dimensions of harm in Nutt et al [3]. McFadden (2006) [2] made detailed comparisons of the impact of applying the 2001 version and the 2003 version to AFP seizures in the period from 1987 to 2003. It was concluded that the results were comparable (a difference of only 3 per cent) and trends in annual values were similar. The impact is greater in the most recent review, but this is largely due to large *gamma*-hydroxybutyrate (GHB) seizures in 2008. The total savings to the community from AFP drug seizures during the period from July 1999 to December 2008 were estimated to be $A 7.8 billion using AFP DHI 2007, but increases by 30 per cent, to $A 10.1 billion, using AFP DHI 2009. A breakdown of costs indicates that, of that 30 per cent increase, 15 per cent is based on the inclusion of sedatives, 2 per cent is due to increases in the consumer price index and 13 per cent is due to changes in the cost estimates.

Return on investment methodology

Benefit-cost analysis provides a way of quantifying the economic performance of a programme. Firstly, benefits and costs are estimated in dollar terms, and then they are compared by calculating either a ratio (of benefit to cost) or a difference (benefit minus cost). The ratio is termed the "return on investment" and is interpreted as the return achieved for each dollar spent. The difference is termed the "net present value", the net return after costs are taken into account.

This type of analysis was used in evaluating AFP drug law enforcement for the 1999/00 to 2000/01 period [1] and the 2000/01 to 2004/05 period [4] and was repeated here with a more comprehensive data set including all drug investigations in the period from July 2000 to the end of 2008 (see table 3 and figures II and III). Given the volatility of drug markets and the accountability requirements under which law enforcement agencies operate, it would be preferable to have an ongoing estimate of the return on investment of drug-law enforcement programmes. However, given the complexity of the data collection and estimation required, it is more practical to attempt such reviews at regular intervals.

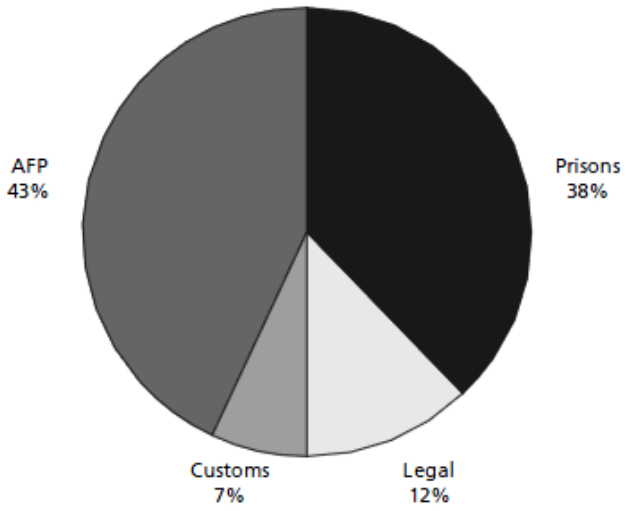
On the benefits side of the equation, successive versions of DHI were used to estimate the direct impact of the investigations based on the seizures that were made. DHI 2009 was used for the first time in the current study. An additional deterrence benefit of 10 per cent of the direct impact was included

by McFadden (2009) [4] to reflect the positive deterrence value of successful prosecutions for drug importations. In cases where fines were imposed by courts, they were also included in the current analysis, but this amounted to less than 1 percent of the total benefits. On the costs side of the equation, the original analysis included only estimates of policing and border-control costs incurred by AFP and the Australian Customs and Border Protection Service. This was expanded to include legal costs (Director of Public Prosecutions costs and court costs) and prison costs (based on Productivity Commission estimates of costs per prisoner per day) [4]. The policing and prison costs were the major component costs (see figure III).

Table 3. Estimates of costs, benefits, net present value and return on investment in drug law enforcement associated with 4,579 drug investigations carried out by the Australian Federal Police, 2000-2008

		Costs	*Benefits*	*Net present value*	*Return on investment*
	Cases	*(Millions of Australian dollars)*			*(Australian dollars)*
All AFP cases	4 579	647.5	3 423.8	2776.3	5.30
Subset involving:					
Domestic partner	3 039	357.8	1 940.0	1 582.3	5.40
International partner	140	24.5	277.2	252.7	11.30
High to very high impact	1 257	356.4	2 911.5	2 555.1	8.20
Low to medium impact	3 314	231.7	512.3	280.6	2.20

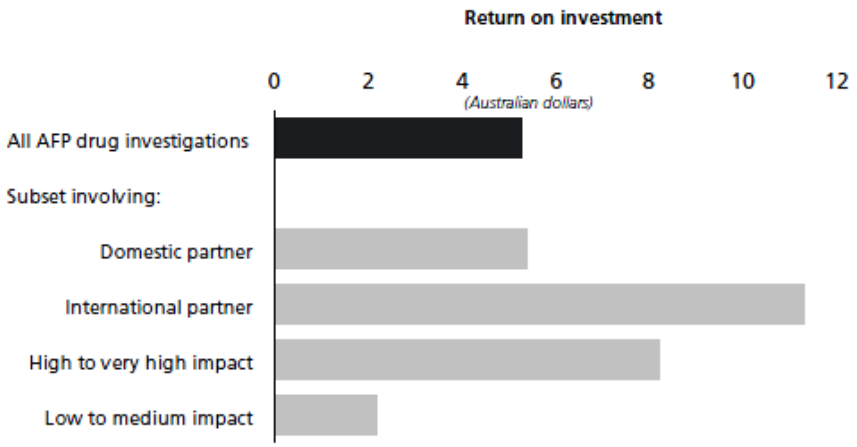
Figure III. Component cost distribution of drug investigations carried out by the Australian Federal Police, 2000-2008



Return on investment results

An overall return on investment value of $A 5.30 was achieved, which was consistent with the earlier related studies ($A 5.20 in McFadden et al, 2002 [1] and $A 5.80 in McFadden, 2009 [4]). Specific policing strategies relevant to this period were able to be evaluated by recalculating the return on investment after restricting the analysis to those cases affected by the policy, such as those involving domestic or international partners, or those concentrating on serious, high-impact crime (see table 3 and figure IV). For example, 3,039 of the 4,579 cases were referred to AFP by the Customs and Border Protection Service. These cases resulted in a return on investment estimate of $A 5.40, as compared with the overall estimate of $A 5.30. Each policy-related estimate corresponded to a larger return than the overall estimate and thus provides an evidence base for recommending further implementation of the policies.

Figure IV. Estimates of return on investment in drug law enforcement associated with 4,579 drug investigations carried out by the Australian Federal Police in the period 2000-2008



Discussion

The simplicity of the AFP DHI as an aggregation of social cost by seizure weight across different drug types belies the difficulty of producing a valid and accurate index. The estimation of the social cost of illicit drugs is truly applicable only in the time frame and region in which source data are collected. However, the expense of conducting such studies makes it unlikely they would ever be conducted annually. The same limitation applies to estimating consumption. In addition, consumption estimates are notoriously difficult, and non-response and underestimation will always be a problem when posing questions about illegal

activity. Further limitations of the methodology include the assumption that harm is constant by weight and over time. Adjustments for dependent users and market supply may address these issues. Some consideration should also be given to environmental costs, such as those associated with the production of synthetic drugs, as presented in a recent report on the economic cost of methamphetamine use [18] and the estimation of statistical precision, or lack thereof, in the estimation process.

A range of issues relating to difficulties in the construction, use and interpretation of drug harm indices has been canvassed by Roberts, Bewley-Taylor and Trace [19], Reuter and Stevens [20] and Ritter [8, 21], including some outside the scope of the present paper. The most frequent criticism of the AFP DHI has been that it assumes that a kilogram of illicit drug seized is equivalent to a kilogram not consumed, and therefore also to the health and social benefits associated with this reduction in consumption. It is argued that illicit drugs are readily replaced on the streets and that a short-term shortage is probably the best expected outcome of a large seizure. The first point to make about this concern is the definition. DHI has been defined as the harm *that would have ensued* had the seized drugs reached the community. As such, DHI is a measurement of the potential harm saved through the seizure of drugs and does not purport to be a direct measurement of reduction in consumption. In fact, drug seizures that occur in conditions of oversupply, as critics note, may have very little real impact, whereas drug seizures that occur in periods of reduced supply may have an impact well in excess of that predicted by DHI. It should be noted that most high-level estimates of harm, e.g. aetiological fractions, are an average over time and across locations, which will always limit their applicability to specific instances of harm. DHI is certainly within this class of measurements. The second point concerns the availability of drugs and their production. At the level of individual drugs, there are plainly peaks and troughs in supply, and some of these are sustained over periods of time; e.g., the heroin drought in Australia has persisted since 2000. Empirically, there is no published evidence that drugs can be placed on the streets at will, and certainly DHI assumes that law enforcement activities have an impact on the availability of illicit drugs. The published evidence supports this assumption. Smithson et al [22], in the only large-scale time series analysis of its type, reported that the number and size of heroin seizures at the border was negatively correlated in the long term with the availability of heroin in the local community. It should be noted that the position of Australia as an island with relatively few entry points and as a terminal point rather than transit point for drugs may restrict the extent to which these findings can be applied to other countries.

Conclusion

Despite the limitations resulting from the paucity of social-cost data and the complexity required to keep pace with the changing illicit drug landscape, DHI

has proved to be of great utility as a performance measurement within AFP. Although originally designed as a reporting and accountability tool, it is also an essential component of the ability of AFP to monitor and refine specific operational strategies in drug law enforcement through its use in benefit-cost analyses. It also has potential applicability beyond law enforcement, for example, in the evaluation of drug-treatment programmes, where benefit is related to reduction in consumption.

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