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COSTING DRUG PROBLEMS AND POLICIES

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Introduction

Evidence based policy making is a concept which has received considerable attention world-wide from both academics and politicians. Within health policy, the international Cochrane collaborations have drawn together available research using systematic techniques of review and data synthesis to examine the effectiveness of different interventions. The more recently formed Campbell collaborations are beginning to undertake similar work for social and crime interventions. Ranking interventions by effectiveness alone, however, ignores the costs of the policy interventions and the consequences of the problems the interventions are designed to reduce. A large amount of resource devoted to one effective interventions which only impacts on a few people or a small amount of the problem denies the same level of resource being devoted to some alternative which may be slightly less effective but if cheaper to apply may result in a much larger reduction in the health or social problem. The "science" of synthesising economic evidence is still developing (Cameron et al, 2002) but the "fourth hurdle" of satisfying cost effectiveness criteria is increasingly being introduced in health care financing decisions to adopt new technologies. Such systematic accumulations of evidence of effectiveness and cost-effectiveness of different alternative policies could be seen as a means of "science" directly informing policy makers.

However, while in some health jurisdictions these economic criteria have been formally adopted, there may be a number of reasons to believe that this approach may not be so readily adopted for assessing drug policies (Reuter, 2001). Political views of the drug problem may place different "values" on competing outcomes than more objective, scientific analyses. Research techniques required to conduct analyses in areas where data are difficult to obtain can be complex and obscure. Frequently modelling techniques are required and these models may seem like "black boxes" (Godfrey et al, 2001) especially when their results may seem at a simplistic level to be counter-intuitive.

The aim of this paper is to explore the methods and techniques which could be applied to building up an economic evidence base. It is illustrated by a series of research studies undertaken by the authors who have sought to add to the economic data about drug problems and policies for England in the United Kingdom.

Different types of costing studies and their uses

There are a range of different types of economic costing studies designed to answer different questions. These studies are often called by different names but for this paper the following terms will be used:

- Cost of illness;
- Externality;
- Public finance;
- Economic evaluations.

Cost of Illness studies

Cost of illness studies are designed to devise a total monetary estimate of a specific disease for example coronary heart disease or behaviour pattern such as drug misuse. The costs are defined on a prevalence bases for a specific year compared to the hypothetical counterfactual that there was no disease or specific risk behaviour in that year. In general top down approaches are used taking the total health care, crime costs etc and determining through epidemiological reviews the proportion of these costs which can be attributed to the risk factor or disease. The costs generally included are health care costs, costs of crime, lost productivity and total policy costs. For a drug misuse estimate, deaths occurring in the year in question attributable to drug misuse are valued in terms of their discounted future earnings. In general, such studies state they are confined to third party or external costs, not including any harm to drug misusers or their families. Productivity cost estimates of premature death are included as some value of lost productivity to society, not as a value individuals' may put on their own quality and quantity of life.

Cost of illness estimates provide a snapshot of costs in a particular year but there are problems in using such information to make policy priority decisions. In particular, the calculated total costs include policy costs designed to reduce problems. In the short term applying policies to reduce problems could increase total costs even if these policies have the effect to reduce costs in future time periods. These totals do not give any information about the amount of costs which would be avoided in the current time or future period if policies or behaviours change. Hence prioritising policy priorities by the relative size of total costs for different risk factors or diseases could be very misleading. The expenditure needed to reduce the same amount of costs for one disease or risk factor compared to another could be very different that the estimated total for that year.

More recently some attempts have been made to estimate avoidable "costs" using a similar top down approach but more sophisticated dynamic and

epidemiological approach to separate costs that would continue to occur, whatever future consumption patterns, and those costs that would change if consumption changed (Collins et al, 2006). Avoidable cost of illness estimates can be used in policy simulation models akin to some of the "bottom-up" economic evaluation models described below.

Externality Studies

This type of study is posing a specific policy question. That is given current policies and their effectiveness and cost effectiveness, what is the current balance between costs of policies (including any taxes raised from legal drugs) and external effects. If there is any evidence that net external costs exists at the current level of policy activity then there would be a case for more policy expenditure providing that this expenditure was matched by an equal amount in the reduction of social costs.

These studies begin with a simple economic model which assumes that drug users are rational and well informed. In this model only third party or external costs give a reason for government interventions. Drug consumers would be expected to take the costs and benefits of their consumption decisions into account, even the risk of premature death. Markandya and Pearce (1988) however extended this model when considering smoking. They suggested that there were reasons to believe both consumer ignorance and dependence implies that some private costs should be included in the assessment of whether welfare could be improved with more government policies. If an extreme form of addiction is taken it could be argued that drug users gain no utility or pleasure from their drug use and therefore as well including some value of private harms, the costs of producing addictive goods should also be considered. Government policies in such circumstances could increase overall social welfare. Buck et al (1996) extended this model to consider the impact of the notion of rational addiction, which suggests such that rationality of decisions may depend on a range of different characteristics particularly how individuals value future time periods. More recent economic theory work on the nature of preferences, regret theory and hyperbolic discounting also have implications for the simple economic model and it is clear that it is theoretically rational for some "addicts" to demand coercive policies, such as restrictions on availability or coercive treatments (Becker et al, 2006).

This model illustrates that different economic theories can determine which costs count and which do not. One of the difficulties of empirical costing estimates is that they are based on a large number of different items and totals tend to be taken at face value. Structured critical appraisals of such studies are not routinely undertaken and therefore differences between studies in

theories and methodologies adopted not identified. While rarely used as a practical tool, the externality model is useful in considering the implications of different economic theories. Indeed some cost of illness studies have widened the items included so that some private costs are included, for example by valuing life lost of not seeking work or including some private values of loss of quality and quantity of life as well as external effects.

Public finance studies

In externality studies, taxes and social benefits are considered in terms of the role of governments in the market for the good in question. Costs of illness studies only include the resource costs of government policies. Taxes and social benefits are excluded as they are considered transfers from one group in society – tax payers to others – social benefit recipients. Other than the resource costs of administration and any overall impact of taxation on economic activity they do not in themselves alter overall levels of social welfare.

However, governments are also concerned about the overall level and distribution of government finances. A third type of study therefore consists of considering all the government expenditure on drug related activities. This would include the resource costs of policies and drug related consequences such as health care and criminal justice costs. But it would also include any impacts on tax revenue (for example from drug misusers being out of the workforce while in treatment) or benefit payments. Forecasting changes in demands for public finances are a legitimate policy concern. A preventive policy may, for example, be much more cost effective than treatment in discounted present value terms. However, such preventive programmes may require large initial investments and this would have implications for the implementation of such a programme.

Economic evaluation methods

Economic evaluation methods involve the identification, measurement, valuation and comparison of the costs and consequences of two or more specific alternative interventions. Studies are of three main types depending on how the main outcome is measured. Cost-effectiveness studies take a single outcome for example abstinent days or reduction in the number of drug users. Cost-utility studies use specific measures aimed to mimic the "utility" change to the user. The most well known of such measures are Quality Adjusted Life Years (QALYs), which are measures of health related quality and quantity of life. They are constructed from measures of health states and their changes. Different valuations of these health states are then applied and finally some estimate is made of the time the health state change applies to, sometimes over the full life expectancy of the individual.

There are two main methods adopted for economic evaluation studies. First prospective studies usually conducted alongside a mainstream evaluation such as a randomised controlled trial. Second modelling studies based upon, wherever possible, systematic reviews of intervention effectiveness and modelled costs and longer term consequences. Often such studies are designed to answer a specific choice of intervention for a similar group of drug misusers in a specific locality at a certain point of time. Such studies can be very locally based and therefore their results could be limited in generalisability. They are also usually directed at specific interventions rather than at a more aggregated programme level of policy.

The advantage of economic evaluation techniques is their clear structure and that they address specific policy choices. They should provide data directly relevant to policy choices of interest. They are conducted in a dynamic framework focussing on changes rather than levels of policies and problems.

While the techniques are well founded in applied economics, this does not mean there are not a number of controversies about how they should be undertaken. One important consideration is the perspective taken for the study which determines the range of costs and consequences that should be included. A societal perspective would include all potential costs and consequences affected by the interventions being compared. In this case individual drug misusers' and their families' costs would be considered as would impacts on the private sector such as changes in productivity and wider social impacts such as impact of drug related crime on the community. This social perspective has been recommended in the United States in their consensus guidelines on economic evaluation (Gold et al, 1996).

However, often the policy maker who has to make the choice between different interventions may not consider costs outside their control of interest. So, for example, health authorities may have the stated aim of maximising the health of the population given their limited budgetary resources. Impacts on productivity of different groups of patients may not be of interest and the decision makers may consider that such changes should not alter their priorities. This is the decision taken by the National Institute for Health and Clinical Excellence in England (NICE, 2004) who consider evidence on the cost-effectiveness of health interventions from a health and personal social service perspective only. However, it was recognised by NICE that illicit drug treatments would have wider impacts on other areas of the public sector. Economic evaluations of public health and drug abuse interventions have been recommended to take a public sector perspective (NICE, 2006). This involves including the resource costs falling on different areas of the

public sector such as criminal justice expenditures but excludes the wider social costs of crime such as victim costs. This approach has been used in an alcohol treatment evaluation (UKATT Research Team, 2005) and the economic evaluation undertaken on rapid detoxification interventions (Adi et al., 2007). Like cost of illness studies all such evaluation exclude transfer payments of taxes and benefits.

Economic evaluation techniques usually involve a "bottom-up" approach to costing. Costs of policies and problems are attached to those involved with the interventions under evaluation. They require detailed costing information by different types of drug users in a disaggregated form. When economic evaluations are undertaken alongside evaluative studies this can provide information in an attributable form. However, there is a need for a large number of such evaluations before data are available for the full range of drug misusers, problems and policies. Not all interventions are suitable for controlled evaluations and it is difficult to conduct such evaluations at a more aggregate programme level. Simulation models can, however, fill some of these gaps. The applied studies considered in this paper have been undertaken within a broad economic evaluation framework.

Details of the different empirical studies

A range of different studies sponsored by different agencies and therefore subject to different controls by the research funder have been undertaken by the authors over the last nine years.

One of the major studies of substance misuse treatments in the UK has been the National Treatment Outcome Study (Gossop et al, 1998). This study was an observational cohort study. The participants were substance misusers presenting to treatment agencies (residential rehabilitation; in-patient and specialist prescribing services) for a new episode of treatment during a 5 month period between March and July, 1995. There was some initial economic analysis of baseline data (Healey et al, 1998) and further analysis of the two year outcome data (Godfrey et al, 2004). This study was used extensively as one of the inputs into a broader economic evaluation of the costs of drug misuse undertaken for the Home Office (Godfrey et al, 2002; Godfrey et al, 2005, Gordon et al, 2006). The purpose of this study was to provide an economic model capable of estimating changes in social costs of drug misuse arising from changes in policy expenditure. This model is described in more detail below.

Some data from three further studies are given to illustrate how policy models could be further developed and extended. Two studies are

randomised controlled trials drawn from a similar clinic population. One study was of an enhanced educational counselling programme about Hepatitis C risks compared to standard information delivered to sero-negative injecting drug misusers. The second trial compared standard methadone maintenance to an intervention delivering a cognitive behavioural therapy (CBT) in addition to the standard methadone programme. Finally a recent project sought to recruit injecting drug misusers not currently in contact with specialist services in different areas of the North of England. All three projects used a similar questionnaire to obtain data on drug misusers use of a range of services and the EQ-5D health state questionnaire in order to obtain data on quality adjusted life years (Brooks).

Identifying, measuring and valuing the costs of drug problems and policies

In Table 1, a taxonomy of the costs of drug interventions and the consequences of drug problems is set out. These are divided into the same grouping as would appear in a general economic evaluation framework (Drummond et al, 2005). All costs and consequences are included whether private or external.

Does the perspective matter?

The economic framework can be adapted to include or exclude impacts and costs depending on the perspective taken but this is an area clearly requiring further debate. Choices of outcome domains to include and the primary outcome of interest have been shown to change the relative cost-effectiveness of the same interventions. Sindelay et al (2004) compared a number of different enhanced drug treatments from the Philadelphia Target Cities Project. Calculating cost-effectiveness ratios based on the 7 different outcomes: drug and alcohol use; family; social relationships; medical; psychiatric symptoms; employment; and illegal activities gave different ranking for different interventions compared to the control treatment. In terms of employment, standard care was cheaper and provided equivalent or additional benefits to enhanced care but in terms of alcohol and drug use the enhanced programme produces the unit of effect at a lower cost than the standard care.

The range of costs and consequences included in any economic evaluation does depend on the perspective taken. This is illustrated in the results of one of our studies. The trial of an enhanced educational programme for Hep C negative injecting drug users produce an interesting interaction between the educational programme and the standard drug treatment offered to these users. The participants in the intervention arm took up less standard treatment than those in the control arm and this led to both poorer health

outcomes and more criminal activity in the intervention arm compared to the control arm. Overall from a social perspective the simple educational programme delivered in the control arm resulted in net savings of £3515 per person whereas the enhanced educational programme resulted in net cost of £3,270 per person (in £2001/02 prices). However, from a health care perspective the total costs for the intervention arm, intervention costs plus any change in overall health care costs (including addiction treatment) was lower per person at £65 compared to £1,466 per person in the control arm of the trial (Abou-Saleh et al, 2007).

Table 1: Costs of drug policies and costs

COSTS

1. Direct Intervention Costs
    - Resource costs e.g. for treatment, media campaigns, legislative procedures
    - Implementation and administration
2. Costs to Other Agencies
    - For example, increased demand for treatment from media campaigns or other spillover impacts
    - Other agency input required for intervention e.g. housing, employment or social care services
3. Costs to Individuals and Families
    - Time and other direct costs involved
    - Lost consumption benefits

CONSEQUENCES

1. Benefits to Individuals and Families from Reduced Drug Problems
    - Improved quantity (less premature death) and quality of life
    - Improved social and family functioning – including reduced violence, financial problems etc.
    - Improved earnings and employment
    - Impact on children and family members
2. Resource Savings
    - Health care costs
    - Criminal justice expenditure
    - Reduced resources from social care etc from reduced drug related problems
3. Other Value Created
    - Increased productivity
    - Value from reduced accidents, death and injury to third parties
    - Value to communities from reduced drug related problems, fear of crime etc.
4. Adverse Consequences
    - Allowance for any spillover impact of policies directed at one problem that may increase others.

Should the expenditure on drug use be included?

The framework set out in Table 1 does not include expenditure on illicit drugs as a consequence of drug use. McCollister and French (2004) did suggest this was a potential outcome domain. The rationale for inclusion is related to the nature of addictive consumption – it could be argued that this expenditure is an adverse social outcome and resources devoted to drug consumption could be put to alternative use. However, it could be thought that by including the value of acquisitive crime in consequences the expenditure is already included under a different heading. The alternative model is not to see drug consumption as totally without benefit to consumers. Consumers get benefit from this consumption and balance this against its financial cost but do not necessarily take into account the full harms to themselves of this consumption – the modified externality model described above. Indeed, Table 1 includes the potential to include costs to the drug user from loss of consumer benefit through some coercive policies. This may be of concern for some users who are using some drugs recreationally without causing external costs. Some policies for some drugs, for example, decriminalisation of possession, may be seen as being in line with such an evaluation framework. However, in some jurisdictions both the public and policy makers may put a negative value on any illicit drug use. The main aim of policy could be to reduce use per se rather than some minimisation of harm from that drug use.

Measuring the quality and quantity of life of the drug misuser

It can seen in Table 1, the domains are much broader than the four external cost domains: health care; criminal activity; productivity; and alcohol and drug use; considered by McCollister and French (2004). In general cost benefit studies have been confined to such external effects and not included any impact on the quality and quantity of life of the drug user. This is contrast to cost-effectiveness studies where such individual outcomes are the main focus of the study. Dijkgraaf et al. (2005) for example considered a wide range of costs and consequences, including costs to the drug user and to the private sector and well as public resource use in their evaluation of co-prescribed heroin and methadone maintenance to methadone maintenance alone. The interventions were compared in terms of differences in these costs and consequences for a change in quality adjusted life year of the drug misuser. This decision puts evaluations for drug misuse interventions on the same footing as other health care interventions. Ignoring completely the impact of programmes, especially treatments, on the individual drug misusers seems problematic. Would priority be given for example to programmes which reduced external costs but had some adverse effects for drug misusers? It may be that different economic evaluations are addressing different policy questions and the "external" economic evaluation

programmes are assessing whether there should be public funds devoted to such treatments rather than the interventions being funded by individual drug users. In other health care systems such treatments are already part of the package of care included in the social insurance or publicly funded health care systems and therefore evaluated using the same methods as other health care interventions.

One generally applied outcome measure increasingly used in health care evaluations are QALYs. The measure used to generate changes in health states in three of our empirical studies is the EQ-5D. This measures individuals' responses to 5 health dimensions: mobility; self-care; usual activities; pain-discomfort; and anxiety-depression using a three point scale (Brooks, 1996).

Table 2: Quality of life scores for different groups of drug misusers

Study	Mean Baseline QALY score
General population	0.93
HEPC	0.84
UKCBTMM	0.73
INJECTING	0.64
Large city	0.65
Medium town	0.67
Rural	0.61

Sources: Kind et al (1999); Abou-Saleh et al (2007); UKCBTMM Research team (2004); Neale et al (2006).

The figures in Table 2 show that drug misusers have considerably lower health related quality of life than the general population. Also the longer the drug career, the results suggest the lower the average quality of life. In the Hep C trial, the participants who were not Hep C positive have better quality of life than those in the main treatment sample in the UKCBTMM study. For injecting drug users recruited in the community average quality of life is even lower, particularly low in the more rural area.

Table 3 shows the changes in quality of life for those in the two trials where both baseline and follow-up data were available. For the UKCBTMM trial this was at 12 months but it was only at 6 months for the HepC trial. The differences shown were not statistically significant but both trials suffered from low recruitment. Changes were broadly in line with other outcome variables but currently there are insufficient data to judge whether this particular measure is sensitive enough to detect changes in drug misusers.

Another issue is whether many current treatments in the UK do significantly improve the health of the drug misuser. More fundamental is the question as to whether the health of the drug user is the main outcome of interest.

Table 3: Changes in QALYs following an intervention

study	intervention		control		Difference
	Baseline	Follow-up	Baseline	Follow-up	
Hep C	0.86	0.87	0.82	0.92	-0.09
UKCBTMM	0.67	0.70	0.77	0.81	-0.003

Sources: Abou-Saleh et al, 2007; UKCBTMM Research team (2004).

An alternative method of valuing many of the consequences set out in Table 1 is to use willingness to pay methods. These studies seek monetary valuations of a range of consequences rather than trying to seek to count and value different individual items. Zarkin et al (2000) and Tang et al (2007) have used these techniques to value what communities may be willing to pay to provide treatment for problem drug misusers. Such valuations would include the allowance for drops in crime and improvements in health of the drug misusers. There would therefore be double counting if such effects were measured and valued separately.

Lost productivity – is it important?

In Table 1, loss productivity is included as a private cost to individuals and families. This is in contrast with cost of illness studies where such loss of earnings is seen as an external cost.

There are also arguments about whether double counting can arise when using QALY measures. Gold et al (1996) suggests that in valuing changes in health status, individuals take into account how health impacts on their productivity and earnings. This view is not universally held by economists although economists have suggested that rather than valuing loss work time by foregone earnings some "friction cost" should be used. Not all productivity is lost in short term absences from work as other workers adjust (Koopmanschap et al, 1995).

In studies of the studies of problem users reported in this paper, productivity gains were not included in practice. Dijkgraaf et al (2005) also excluded these impacts in their study of heroin prescribing in the Netherlands. All studies indicated that at least in the short term, treatment did not significantly increase the numbers of drug misusers in paid employment. This is in contrast to evaluations in the United States where enhanced programmes have been shown to have employment impacts (Belenko, 2005)

Sensitivity analyses and broader comparisons

There are two potential advantages of using economic evaluations especially if country specific guidelines are followed. First it provides a framework for testing the sensitivity of results. Generally studies conducted alongside other evaluations are using statistical techniques such as bootstrapping. An example of applying these techniques to the net costs and net effects for the UKMMCBT trial are shown in Figure 1. This figure illustrates the uncertainty of the result. Results below the horizontal line show the number of the 1000 replications where CBT with methadone maintenance saves more than methadone maintenance alone, the majority of cases. However, differences in effects, negative average effects to the left of the vertical line and positive effects to the right are evenly balanced, as may be expected from the average result in Table 1.

Second if studies use general outcome measures such as QALYs broad comparisons can be made across health interventions. By combining bootstrapping techniques with different values decision makers may wish to pay to achieve these health gains, cost acceptability curves can be constructed. Figure 2 shows the results from the Hep C trial. If a social perspective is taken, the control intervention is preferred with a high level of confidence whatever value of a QALY is taken. If a more restrictive health care perspective is taken however the enhance programme would be preferred at 0 value of a QALY in over 80% of cases. However as the value of a QALY rises, the number of estimated cost-effectiveness ratios which favour the standard programme rises and is over 80% at the threshold level of £30,000 per QALY.

Can we improve economic evaluation techniques applied to drug programmes?

Economic evaluation techniques are constantly improving and many guidelines exist both to help undertake studies and critically appraise published results. However, there are differences between guidelines. Hjelmgren et al (2001) found that despite 75% agreement in methodological aspects of most health care economic evaluation guidelines, the choice of perspective, ranges of costs and consequences to be included and valuation of outcomes are the major factors which differ.

Economic evaluations of drug and alcohol interventions are growing but are still limited in number and quality (Belenko et al, 2006). It is also clear that there may be wider differences in policy objectives between countries than for more general health care interventions.

It is clear that there are differences in published studies which have often appeared unexplained. There is some potential for some international panel to more fully explore the different issues that arise in evaluation illicit drug programmes and providing some specific guidelines for economic evaluation of illicit drug interventions. While such guidelines may not be prescriptive given that these tools will be used in different countries with their own more general guidelines it would at least help the reader identify decisions taken by evaluators and the applicability of these decisions for their own context.

Modelling the social costs of Class A drug use in England and Wales and how such costs may change with changes in policies.

In general economic evaluation techniques have been used to examine the choice between specific drug interventions. There is however a wider potential to use modelling techniques to collate economic data and evaluate policy choices at a broader policy level. In this last section of the paper, a project to supply a relatively simple model in England is described.

History of the project

The original aim of this project was to provide a tool for the policy team involved in determining and monitoring drug policy. It was designed to allow this team to simulate how both social costs and public finances may change over a five year period if the balance of policies were changed. However, before the project was complete the drug policy team changed and in launching the new drug policy only half of the data in the model was originally published (Godfrey et al, 2002). The use of the model to simulate policy changes, the other part of the original report was published at a later date (Godfrey et al, 2005). More recently the data for the model was updated and methodology improved. It was converted to a spreadsheet model and constructed so that new data can be added when available (Gordon et al, 2006). It is interesting to note that across the five years the policy climate had changed with a much broader acceptance of the need for modelling and evidence based policy making.

Structure of the model

The basic structure of the model is set out in Figure 3 and Figure 4. It can be seen from Figure 3 it is assumed various policies could impact on the number of drug users of various types directly. Some policies may reduce the number of users, some may result in a change from problematic to less problematic use. In turn different numbers and types of drug users would result in different consequences. Alternatively some policies may not change the number of users but may reduce harmful consequences. Some interventions and policies could of course impact on both the number of users and consequences.

In figure 4 the link between the number of users and social costs are shown. This assumes there is sufficient and detailed disaggregated data to attribute different consequences to drug use. Combining the number of different "effects" with the unit costs or values for these different effects yields the social costs. The evaluation model involves estimating the impacts from Figure 3 for both the "control" and intervention scenarios.

Three main groups of drug users were defined for the model. These were chosen with the expectation they would have different levels of problems. First there were younger (under 25) recreational drug users. Of this group there may well be a high risk group with higher probability of becoming problem drug misusers although we were not able to find sufficient data to clearly identify this group in our original project. The second group were defined as older regular class A drug users (which includes "recreational" drugs such as ecstasy). Such drug users may have some adverse effects from their consumption but they are not dependent or problematic users. Problem users were the last group and could be of any age. It was considered it would be useful to further divide problem drug users into injecting and non injecting users. Other subdivisions were considered but were also limited by data availability.

In the final model a distinction was made between problem drug misusers in and out of treatment. Analysis of the NTORS data (Godfrey et al, 2004) suggested that treatment has a significant impact on the social costs associated with problem drug use. These data were used in the following way. Data from the period before the NTORS sample entered treatment were used to represent the costs of those users not currently in treatment, while the data for the costs at one year were used for those assumed to have been in some contact with treatment agencies for one year. The data from the two year follow-up were assumed to represent the social costs in the second and subsequent years after a treatment episode. The NTORS data including the costs of the initial addiction treatment but also the costs of any other addiction service used in these periods.

The average costs for different types of users are given in Table 4. Problem drug users were found to be of significantly higher costs than other drug users.

Table 4: Average cost per drug user type, £2000

YOUNG RECREATIONAL USER	£72
Older regular user	£3
Problem drug user	£35,455
Different problem drug user types	
Out of treatment	43,963
In treatment one year	18,368
In treatment 2 years or more	23,223

Source: Godfrey et al (2002); Godfrey et al (2005)

Data Limitations

Even such a simple model is demanding of data. While there are some population surveys in England to estimate the numbers of younger recreational and older regular drug users, there was no single source of data suitable to estimate the number of problem drug users. Several estimates were made but the methods did not allow clear confidence intervals of the number of problem users to be made and therefore clear sensitivity analyses of the model undertaken. Further research has now been undertaken and better estimates are available. However, this research has not been undertaken regularly, so there are no time trends on the number of users. For the purposes of the simulations it was assumed that current policies would result in a constant number of problem users.

There were also severe data limitations on a number of consequences. In particular there was no clear data on work and driving problems related to younger recreational and older regular users. While small for any individual drug users, there are relatively large numbers in these groups compared to problem users. Empirical studies are a means of highlighting data gaps but there is a great danger that however detailed a report it is the summary figures that are used and warnings about the limitations of research can go unheeded.

If models and data are used, there are more incentives to improve information. However, if methodology or data are changed this does create further problems. When the costing model was updated in 2004 a number of

changes were made. New estimates of the unit costs of crime were available. Similarly there were new incident costs of infectious disease caused by injecting drug misuse. Their present value was included in the model, being in total £23 million for HIV, £608,475 for Hepatitis C and £580,568 for Hepatitis B out of total baseline cost in 2003/04 of £15.4 billion. The total cost per problematic drug user was estimated to be £44,231 compared to £35,455 in 2000.

A breakdown of the original figures by type of cost is shown in Table 5. Two figures for criminal justice expenditure are shown. One is based on the actual contacts with different agencies within the criminal justice system. This shows an increase in those drug users in treatment less than one year but then falls considerably in the second year after entering treatment. However, the criminal justice costs based on the number of self reported offences shows a different pattern. For these figures unit costs per type of offence were applied to these self reported offences. Offence rate drops in treatment and therefore so does the anticipated costs to the criminal justice system. However there is some rise in the average costs in the second year of treatment, despite a fall in the overall number of offences. This is due to some drug users changing the nature of offences committed.

Table 5 Cost per type of problem drug user, £ in 2000, per year.

Selected Items	*Out of treatment*	*In treatment less than 1 year*	In treatment more than 1 year
Health Costs	956	1,072	1,277
Premature deaths	2,957	2,957	2,957
Costs of childcare	187	187	187
Victim costs of crime	30,827	8,893	13,464
CJS costs (actual)	7,037	8,397	5,538
CJS costs (based on offences committed)	9,036	5,260	5,308
TOTAL (offences committed)	43,963	18,368	23,223

Source: Godfrey et al (2005).

As shown in Table 6, data from our other studies suggest that the costs for different types of problem users could be further refined. Overall costs from these studies were generally below those from the NTORS study. This may be due to the fact that there is a selection bias in research studies especially randomised controlled trials which NTORS did not suffer from. New studies

are repeating these more naturalistic designs and it will be of interest to compare these results with data from these and other trials.

In all studies crime costs were the highest single item, see for example Table 7. It is interesting to note that overall costs do not vary in the same way as the health status data. While the injecting drug user had lower average quality of life than those drug misusers in the two treatment trials, their costs were lower. This is not totally explained but may in part be because the injecting drug users were generally less in contact with mainstream services. The large standard deviations on all these cost estimates should be noted. In particular the crime figures can be very skewed. Further work is required as such data accumulates to determine whether any factors predict variations in such costs between different types of drug misusers. In particular, are changes in these costs linked to interactions between intervention and drug misuser characteristics.

Table 6: Social cost per drug user from various studies

	Total Costs per Person in 6 months prior
Hep C (£2001/02)	6,791
UKCBTMM (£2001/02)	9,389
Injecting drug users (£2004/05) Large city Medium town Rural	5,936 6,299 3,563 8,170

Source: Abou-Saleh et al. (2007); UKCBTMM Project Group (2004); Neale et al (2006).

Table 7: Costs per person by type of area – injecting drug user study

mean (s.d) by Type of cost	Large City (n=28)	Medium Town (N=25)	Rural (N=22)
Health Service	1,419 (5,892)	559 (992)	734 (1726)
Addiction treatments	719 (841)	891 (2912)	436 (594)
Crime	3,867 (4,756)	2,018 (4222)	6,914 (23,362)
Social and other welfare services	294 (475)	95 (220)	86 (292)
TOTAL	6,299 (7,141)	3,563 (5563)	8,170 (23,236)

Source: Neale et al (2006)

While some data were filled in the updated figures, others from Table 1 were still omitted. Other than some data on drug related deaths for younger recreational drug users there is little data on the excess death rates for problem drug misusers. The NTORS study was not designed to be able to detect such changes. Also while it is known that the substance misusers had poor health, there was no data using a standard health status measure which could be converted to QALYs. Data from other studies described above suggest this misses some of the potential benefits from policy interventions.

Similarly there was little change in employment of drug misusers in treatment and no attempt was made to estimate these effects.

Policy Simulations

Further assumptions are required if this basic costing model can be used for policy simulations. The policies change which was simulated was the change in the policy expenditure on treatment which had been announced (Godfrey et al, 2005) which was aimed to increase the numbers in treatment by about 10,000 per year.

The first decision was to state the time period over which the changes are forecast to occur. While some effects in the original costing model involved lifetime gains from prevented deaths or disease incidence, in the treatment simulations a relatively short period was projected for the gains from treatment. The total period over which the model was run was five years from the baseline, 2000.

The second assumption was required for the counterfactual. What would be the number of drug misusers of different types given no change in policy? It was decided that for convenience it would be assumed that current policy would have resulted in a constant number of drug users and problems. This is something that obviously could be changed although there was not sufficient information to build in other assumptions at that time.

Other assumptions included making an estimate of the number of problem drug users who as a result of treatment may cease to be drug users. Data from the NTORS study was again used and from this study it was estimated that 5% of treatment entrants would become drug free after 2 years. The costs of additional treatment were estimated using the data from the NTORS study.

Costing the policies

The main focus of this paper has been on costing problems rather than policies. Parts of the consequences of drug problems include the "reactive" policy responses to drug problems. That is the costs of health and social care and criminal justice responses to levels of drug problems. Another finding from all the empirical studies was that problem drug users in England also take up a range of addiction services. However, it does mean that estimates in these models do not take account directly of prevention, education and other availability controls.

For the purpose of using the model for simulations the costs of the policy of interest needs to be separately estimated. For the simulations with our basic model this involved estimating the costs of additional treatment. While showing less variation than other social costs, intervention costs present a number of challenges. In particular, the take-up of interventions is difficult to predict and there can be interactions when additional elements such as the Hep C educational programmes are added to standard care. "Expert" opinions of the costs of the interventions based on planned programmes could result in very misleading estimates.

Results

A range of different simulations were undertaken using different numbers of people entering treatment and variations of the proportion of those entrants who would become drug free, see Table 8

Table 8: Results of policy simulations over five years from 2000, total amounts undiscounted, £ million 2000.

Scenario (nos; effect rate), per year	Predicted social cost Savings	Additional Treatment costs	Net savings
10,000 (5%)	3,470	138	3,331
10,000 (10%)	3,586	134	3,452
15,000; 13,000; 11,000 ..(5%)	4,250	168	4,083
10,000; 11,000 .. (5%, 6% ..)	4,076	161	3,915

The total reduction in the number of problem users predicted from the model was modest between 5,000 and 13,000 out of a total of 337,350 problem drug users in 2000.

This was a very simple model and lacked many of the more dynamic features of other models. Caulkins et al (2005) demonstrated, for example, the usefulness of such dynamic features in examining how costs and cost effectiveness may vary across the course of a drug epidemic. Similarly more complex models especially for programme evaluation could include the impacts of major changes on drug markets (e.g. Caulkins et al, 1999).

The model was used to give some estimate of the total "social" costs in the year 2000 and this estimate has recently been updated for 2003/04. It can be seen that multiplying the costs attached to each type of drug misuser in a particular year by the numbers of different types does proxy a cost of illness type of estimate. The totals found of £12 billion in 2000 (Godfrey et al, 2002) and £15.4 billion (Gordon et al, 2006) are not comparable because of differences in the studies. More debatable is whether these figures can be compared to say estimates of the cost of alcohol misuse (Leontaridi, 2003) which were undertaken using the more traditional top down cost of illness approach.

Conclusions

There are demands from a range of policy makers for a range of costs estimates of drug problems and policies. There are a range of different study types which are addressing different policy questions. However, there are also different theoretical models in use. Particular issues considered in this paper were: using a welfarist approach to included all costs and consequences versus the more restrictive decision maker perspective; whether or not drug use should be included as a consequence; what is the appropriate measure of individual outcomes for drug misusers; and whether or not productivity changes should be included.

In practical terms there have been two main methods to generate data on the costs associated with drug problems. The "top down" approach uses data for whole localities in a particular time period with epidemiological analyses to attribute a share of the expenditure data to drug misuse. The approach use in the studies described in this paper have been based mainly around more specific interventions and used a "bottom-up" approach where different levels of problems for different types of drug misusers subject to different drug policies have been observed. Ideally both types of studies could be compared. One omission from the bottom up approach is that they would not directly include the total costs of drug policies.

A simple model was presented using some of this "bottom up" type of data to model a simple change of drug policy, increased numbers of drug misusers in treatment programmes. One question is whether better social cost data could be combined with some of the more sophisticated dynamic models. These could combine some of the market model interactions with some of the statistical techniques including Bayesian analyses currently being used in health economics. It may also be possible to extend models to examine more complex policy choices including regulatory changes or various prevention programmes. However, the data available in England is very restrictive on the wider group of drug users as shown in Godfrey et al (2002).

There is also some potential for more work to be undertaken to devise specific guidelines on undertaking economic evaluations of substance misuse interventions. Such studies are likely to provide the data which more sophisticated and programme level policy evaluation could use. Such guidelines could never be proscriptive, given that different countries have different recommendations on some aspects of economic evaluations for their regulatory frameworks.

Economic techniques can be powerful in providing data of policy interest. They do provide a framework but as suggested in this paper there is not one right answer or method to adopt. Evaluators of drug policy interventions face severe challenges in obtaining reliable data and undertaking empirical studies can be reduced to measuring the measurable. However, as the use of techniques is increasingly used in other areas of public policy it is vitally important that these problems do not deter the future research which is clearly required.

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Figure 1: Scatterplot showing 1000 bootstrapped replications of the cost effectiveness rations comparing CBT and MM with MM alone

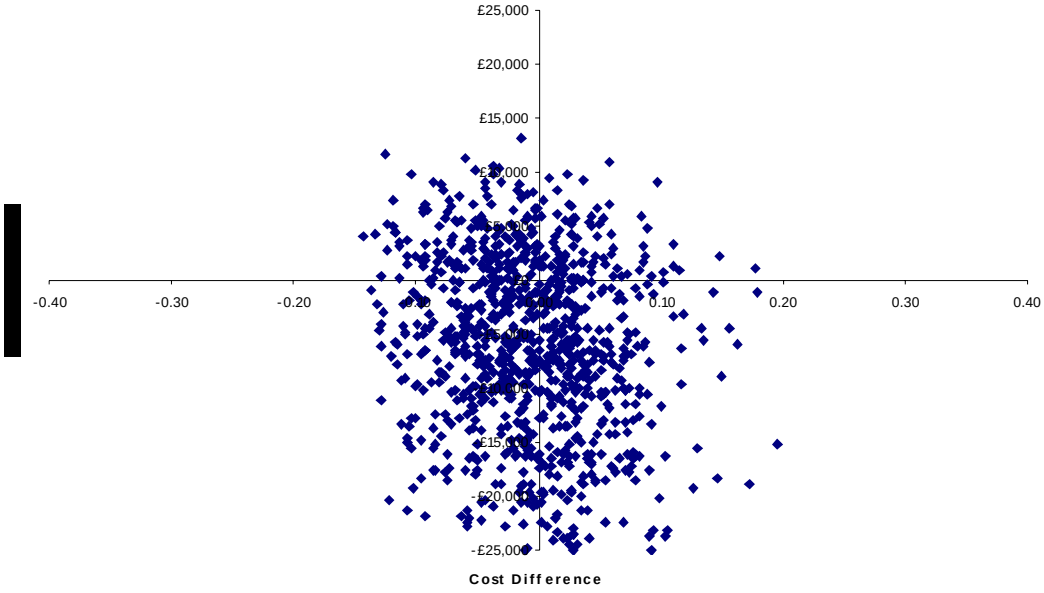

Figure 2 Cost-effectiveness acceptability curve

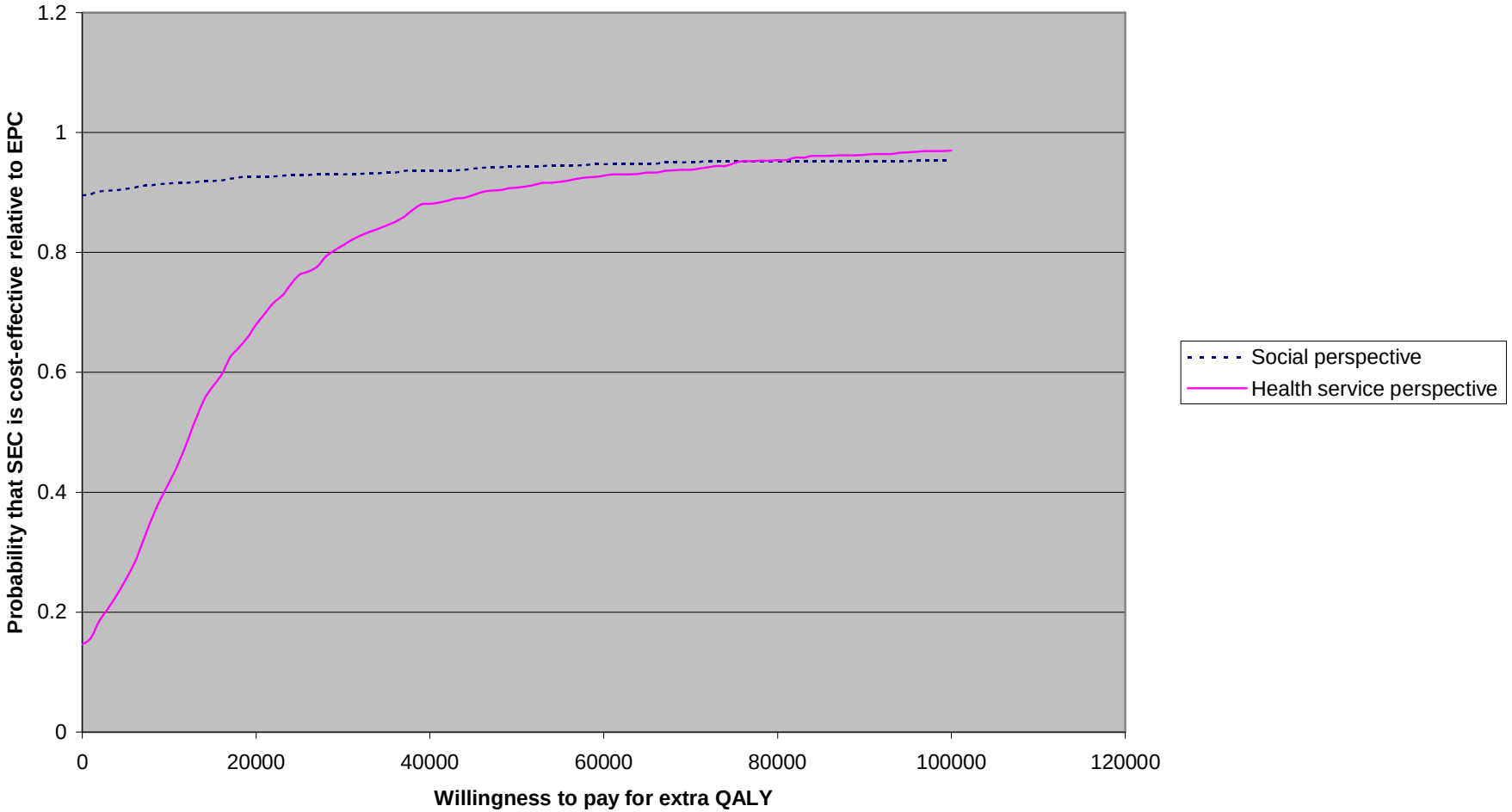

Figure 3: Impact of policies

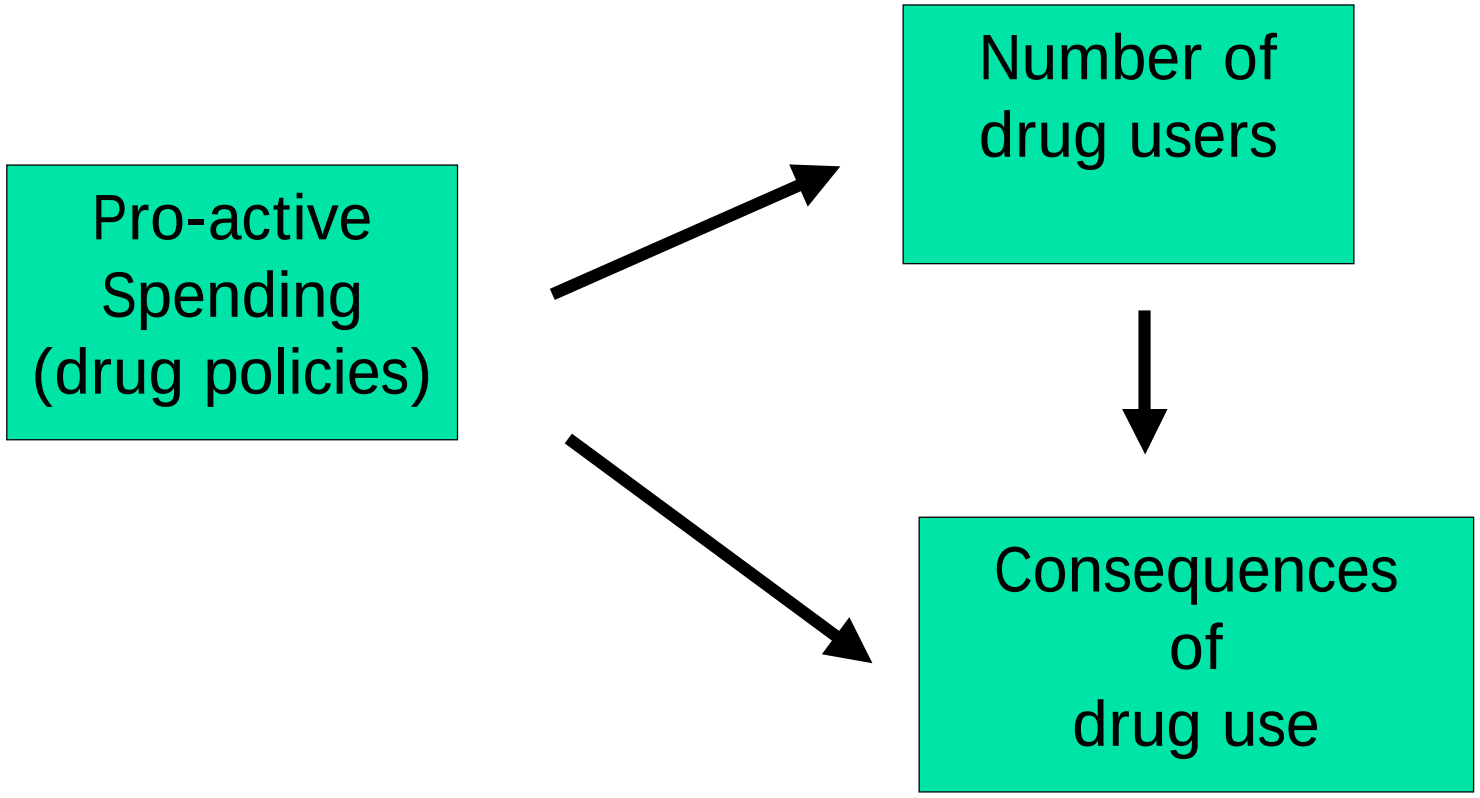

Figure 4: From drug user to cost estimate