An Economic evaluation of inputs and outputs in policing: problems in efficiency and measurement

This item was submitted to Loughborough University's Institutional Repository by the/an author.

Additional Information:

- Economics Research Paper

Metadata Record: [https://dspace.lboro.ac.uk/2134/422](https://dspace.lboro.ac.uk/2134/422)

Please cite the published version.

Professor Leigh Drake and Dr Richard Simper*

Department of Economics, Loughborough University, Loughborough, LE11 3TU

The new Labour government has recently instigated an initiative to establish whether English and Welsh police forces should be ranked into groups based on an efficiency measure. The estimation techniques proposed in the Public Service Productivity Panel (2000) report in order to rank the efficiency of forces are Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA). These procedures allow for multiple input/output configurations in a cost or production model in order to obtain efficiency scores. In order to produce comparative efficiency measures, however, it is essential that the services provided by police forces (the outputs or outcomes) be related to the resources (inputs) utilised by the forces in delivering these outputs (outcomes). A particular problem, however, is that policing includes many inputs and outputs (outcomes) that could potentially be utilised in an efficiency model using DEA and SFA. Hence, this paper considers the problems associated with measuring relative police force efficiency given that a vast number of potential indicators must be reduced to a handful to allow feasible estimation. In addition, it discusses the input and output variables utilised in the first 'official' analysis of English and Welsh police force efficiency (Demonstration Project (Home Office (2001))).

KEY WORDS: Police; best value, cost and production functions, police inputs and outputs, and efficiency.

* Corresponding author: Richard Simper. email: r.simper@lboro.ac.uk. Leigh Drake and Richard Simper are members of the Public Services Productivity Panel (PSP), Home Office technical consultative team, on measuring police efficiency.
INTRODUCTION.
The recent programme of efficiency analysis of English and Welsh police forces, instigated by the new Labour government, has been analysed and discussed by the Home Office, H. M. Treasury and consultative teams since 1999. This programme began when the new Labour government commissioned a study to determine the viability of ranking police forces into efficiency groups, and hence allow differential funding based on these groupings; see the Public Services Productivity Panel report (PSP) (2000).

The PSP (2000) report led to the publication of the first ‘official’ analysis of police force efficiency rankings in the context of a Demonstration Project (Home Office (2001)). This project began with a large data set in which potential input and output variables were drawn from a variety of sources, for example, Home Office, British Crime Survey, Census, Local Police Authorities, etc. Within the Demonstration Project (2001), the consultant team presented results from a DEA analysis (reasonable SFA estimates were not obtained), showing that it is possible to rank forces based on nonparametric efficiency measures. However, during the consultative process of the Demonstration Project, extensive discussion was undertaken on what inputs and outputs should be specified in any cost or production function. For example, should a cost/production function of police forces include both proactive/preventative and response/reactive output (outcome) variables.

The limitations and problems inherent in choosing inputs and outputs from a wide range of possible variables, is also affected by the quality of the data set available for modelling. The aforementioned Demonstration Project (2001) listed over 250 possible variables which could have an effect on a policing cost or production function, and hence could be chosen in the context of the final model. These variables included; Best Value Performance Indicators (BVPIs); environmental variables (e.g., population, long term unemployment); cost data; raw performance measures; performance metric measures (e.g., total crimes per 1,000 population); and

---

1 Data Envelopment Analysis (DEA) is a non-parametric technique in the sense that it does not require the specification of an underlying cost or production function with which to characterise the translation of inputs into outputs (outcomes) in policing. Rather, DEA uses a linear programming technique to construct a non-parametric “best practice” frontier which envelopes the input-output data, see for
survey results (e.g., % of victims of road accidents satisfied with the police service at the scene of the accident). However, given the resources open to the Demonstration Project team, they found that the list of output (outcome) variables that could be used in any model would be considerably smaller than the total of 250 presented as possibilities.

The reasons for this reduction in possible outputs (outcomes) include problems associated with missing data. That is, “where data is missing, these forces and authorities must be removed from the analysis, weakening the force on force comparisons and reducing the power of the final message.” (Page 50). As the aim of the government is to efficiency rank forces and hence allow for differential funding, all forces must be included in the analysis. Hence, there can be no breaks in the data set. These problems were further exacerbated by the way in which some variables were compiled by individual police forces. For example, it

“was found that some variables exhibited a huge increase/decrease in the value from one period to the next. This creates a difficulty in that there can be swings in data values if they are genuine, but if the swings are due to external or some other factor, such as changing a reporting procedure, this could have a significant effect on the ranking of the police force." (Page. 50).

A common solution used to overcome wide swings in data in many economic studies is to difference the variables, that is use year on year changes (this solution was proposed in the Demonstration Project (2001)). However, this can undermine the efficiency measurement of forces. For example, suppose there are two forces with similar costs. Force A exhibits the largest number of RTAs (or RTAs per 1000 population) of any police force and experiences a 2% increase year on year. Contrast this with Force B which has the lowest level of RTAs (or RTAs per 1000 population) of any police force, but which experiences a 3% increase year on year. In this case it is self evident that Force A is much less efficient than Force B. If, however, the analysis was conducted in terms of the change in RTAs, then the efficiency rank orderings would be reversed. The efficiency analysis should relate inputs used in a period to outputs produced in the same period, and this is not the case if changes in outputs are used.

example, Drake and Simper (2000). In contrast, Stochastic Frontier Analysis (SFA) assesses relative efficiency in terms of deviations from a “best practice” parametric cost or production function.
As mentioned above, some of the variables listed in the Demonstration Report (2001) were census data and environmental factors that could be included in the efficiency analysis, or alternatively be used as a basis for a second stage analysis. The latter would allow the investigators to determine whether efficiency scores were systematically influenced by such environmental factors (unemployment, poverty, etc), and hence could lead to a re-evaluation of the "raw efficiency scores". However, in relation to the census data it was found that “some of the data available was sourced from the 1991 census. Data was not automatically removed because it wasn’t current, but the age of the data was an additional factor considered when assessing the quality of the data.” Page 50. Hence, the age of the data is another problem that has to be addressed, as there are sure to be changes in demographics over a 5-10 year period within a police force area.

The above analysis has presented a few of the possible limitations associated with data sample periods and data quality that must be taken into account in the specification of a police force cost or production function. The remainder of the paper presents a discussion of the possible input and output (outcome) variables that could be utilised in a future efficiency analysis, given the wide range of variables on offer for modelling. We consider how previous studies have captured the role of policing in their specification of inputs and outputs (outcomes) and whether these studies can be used as a basis for a specification adhering to the aims of PSP (2000). In addition, we discuss whether these variables could constitute a viable set of inputs and outputs (outcomes) to be used in an actual programme of efficiency measurement of English and Welsh police forces.

INPUT VARIABLES IN AN ECONOMIC ANALYSIS OF POLICING

In an analysis of police force efficiency it is important to specify input relationships correctly within a cost or production model specification. The inputs in both functions should be price or cost/expense related respectively, and in standard economic modelling they are assumed to consist of capital and labour.\(^2\) When

\(^2\) The choice of whether to use a cost or production includes factors such as whether prices rather than output quantities are exogenous to the police force.
analysing industries, for example, the input requirement set will also include materials and other related production costs as well as capital and labour expenses. In policing, these costs can be broken down, as shown in the Chartered Institute of Public Finance and Accountancy (CIPFA) accounts into four categories; total employment costs, premises related costs, transport related costs and capital and other costs. However, even though policing is not related to the competitive nature of industrial firms, an aim of the Public Service Productivity Panel (PSP) (2000) report is to utilise nonparametric and parametric techniques based on cost minimisation. Hence, the policing function should present input costs that map to outputs. Indeed, in PSP (2000), it was noted that in both non-parametric and parametric model specifications there needed to be a common set of inputs and outputs.

The basis for modelling policing as a cost or production function relationship can be found in early works by Popp and Sebold (1972) and Votey and Phillips (1972). In the former study, an average cost function was regressed on a range of 13 variables covering population and demographic factors, and in the latter a crime production model was specified by regressing crime clear up rates on offences, employees and other expenditures. These studies gave an impetus to subsequent economic analysis which specified more complex models, utilising flexible functional forms, such as the Translog cost function. The latter is a second order approximation to an underlying cost function. The Translog cost function, improved the analysis considerably as it allowed the modelling of a U-shaped average cost curve for policing, and hence the testing for scale economy efficiency (for an early study see Darrough and Heineke (1979) and more recently Drake and Simper (2002a)).

However, even though these studies have given economists a basis to estimate scale economies and the relative efficiency of police forces, there has been a considerable divergence of opinion as to what inputs should be utilised in the modelling framework, see Table 1. These differences partly reflect the data availability and the model to be estimated (both problems encountered in the Demonstration Project (Home Office (2001))). That is, in a parametric cost function study (for example Stochastic Frontier Analysis (SFA)) the model needs to be specified in terms of costs, input prices, and outputs (outcomes), whereas this is not necessary in a nonparametric study (Data Envelopment Analysis (DEA)) which utilises only inputs (or input costs) and outputs (outcomes). This difference is evident in the literature where for example, Darrough and Heineke (1979) estimate a cost
function which has one input price, labour, specified as the weighted average of all police wages. On the other hand, Thanassoulis (1995) does not relate inputs costs to outputs, but rather crimes rates to clear up rates, in a nonparametric specification.

The problems associated with specifying input costs can be further complicated if specific data are not available and hence proxy variables are utilised. For example, in Gyapon and Gyimah-Brempong (1988) their input set consists of a police wage rate ('calculated as the average (unweighted) salary of a police officer in a department'), and a civilian wage rate, which as figures where unavailable was proxied by the average clerical wage for employees in a city adjusted upwards by 20% (to account for fringe benefits). The capital input price, a four-door Oldsmobile Delta 88 car, was utilised as a proxy for the cost of a patrol car. Again, the use of proxy variables can lead to spurious results if these are themselves flawed in their construction and measurement.

In addition, Nyhan and Martin's (1999) input set included, total department cost and total full time equivalent staff. The reasons given for the use of both variables is that they "are used in BASB's (Governmental Accounting Standards Board) service efforts and accomplishments reporting." (page. 23). However, there are possible problems associated with the above specification in that, if total department costs include employment costs, then there will be double counting between the two input variables as employment numbers would be correlated with total employment cost. The Nyhan and Martin (1999) model would therefore be better specified as having total department costs excluding employment costs, and the number of employees (or employment costs), in a two input variable set.

A further complication in determining an input requirement set which produces an appropriate specification of police force production modelling (an aim of the PSP (2000) and Demonstration Project (Home Office (2001)), relates to the use of techniques such as DEA. For example, in Thanaoulis (1995), the input variable set is specified such that there is a direct correspondence between the inputs and outputs, but this relationship does not necessarily imply an associated cost to output configuration. In this particular case, for example, the input set consists of the incidence of various categories of crime. If the aim is to model a stochastic cost
function as well as DEA (as proposed in PSP (2000)), however, then these non-cost inputs cannot be used. That is, a cost function specification requires input prices as well as total costs and outputs; see Drake and Simper (2002a).\(^3\) Furthermore, as stipulated above, if we wish to estimate nonparametric and parametric models to determine an efficiency ranking of police forces, then both specifications need the same input variable set and hence should be based on cost data. A recent example of the use of cost data in a DEA model can be found in Drake and Simper (2000), where the authors followed CIPFA convention and utilised; employment, premises, transport and capital costs. In essence, these costs are used as proxies for the input usage in these categories.

In relation to the specification of inputs in the Demonstration Project (Home Office (2001)), a particular problem was related to sample size. At present there are 43 police forces in England and Wales, thus creating degrees of freedom problems when estimating multiple input/output specifications. Drake and Simper (2000) and (2002b), avoided this problem by utilising a panel data sample spanning a number of years, thus creating a larger data set available for estimation. However, in terms of the PSP (2000) report, this will not be an option, until there has been at least three years data available. The implication of the latter is that any initial model will be severely restricted in respect of the number of both the inputs and outputs that can be utilised.

The Demonstration Project (Home Office (2001)) attempted to circumvent this multi-input, and hence degrees of freedom problem, by specifying a model that had one cost (input), the Adjusted Net Cost of Service. This input variable did not represent capital costs, but the cost of the provision of policing in a force area, net of specific grants and local income, which is funded by; Police Grant; Revenue Support Grant (RSG); Non-Domestic Rate (NDR) Income; and Precepts. This measure excluded; investment income, interest payable and transfers to or funding from reserves. To arrive at an Adjusted Net Cost of Service, the Demonstration Project

\(^3\) There are additional problems in calculating certain input prices. For example, Drake and Simper (2002a) have argued that it is not possible to specify a premises related or capital price for English and Welsh police forces because in its calculation the denominator would usually be fixed assets. Using a valuation of a fixed assets figure as the denominator in a capital or premises price calculation for the police will bias the efficiency results due to the age and prime site location of many of the buildings.
team also removed the non-controllable costs of NCS and NCIS levies; the capital charges and operating lease costs; the loan charges specific; the net cost of police pensions and the employer’s contribution to the civilian staff pension scheme; the costs of security and terrorism (assumed to be equal to the funding provided); and the effects of other costs specific to the force area that were of a one-off nature outside the control of a force and authority and not applicable to all force areas. Finally, the cost variable was given an adjustment relating to the location of the force (using the area cost adjustment factor used in the police funding formula).

Hence, a small sample size can result in a very restrictive cost/production function, to be estimated both non-parametrically (DEA) and parametrically (SFA). In economic terms, the aggregation of a number of inputs into a single composite input implies that all inputs are perfect substitutes and that all have identical input prices. These assumptions are likely to be unrealistic, however, and may result in less robust efficiency results.

OUTPUT VARIABLES IN AN ECONOMIC ANALYSIS OF POLICING

The output variable sets that have been utilised in the literature, and in the Demonstration Project (Home Office (2001)), also show that the modelling of police force efficiency is far from straightforward. It is clear from the sample of studies presented in Table 1 that various output permutations have been utilised, ranging from clear up rates, to the number of breathalyser tests and the total km travelled by police cars. This divergence shows just how difficult it is to specify an appropriate output set given the large range of services that police forces provide. In addition, earlier studies primarily included response/reactive variables, whereas recent studies have also included proactive/preventive variables; see Carrington et al (1997) and Drake and Simper (2002c).

The use of clear up rates as a police output is based on a methodology proposed by Todd and Ramanathan (1994), and Byrne et al (1996) who argue that, even though half of the police’s community work cannot be modelled, a production function can still be estimated. They break down police activities into crime prevention “where crime is contemplated but not committed”, and crime repression,
where the “crime has occurred,” and use an argument from Schmidt and Witte (1984) that any criminal is likely to assess the probability of getting caught after committing a crime; the deterrence effect of Becker (1968). It is argued in such studies, therefore, that the probability of arrest is linked to clear up rates. Hence, the clear up rates take account of the response/reactive nature of policing.

However, the aim of PSP (2000) is to estimate a model whereby a range of outputs (outcomes) covering the diverse nature of the policing can be captured. As mentioned previously the Demonstration Project (DP) (2001) had over 250 variables that were considered as possible outputs (outcomes) in English and Welsh police forces. These variables, were finally reduced until the Demonstration Project came up with the 7 outputs/outcomes listed in Table 2. These were specifically related to the three main police aims; promote safety and reduce disorder, reduce crime and the fear of crime, and contribute to delivering justice in a way which secures and maintains public confidence in the rule of law.

**INSERT TABLE 2**

In relation to these chosen variables, the most obvious omissions relate to police service quality measures and to what might be termed "proactive policing measures". With respect to the former, no detailed consideration was given to the inclusion of variables such as: Number of complaints per 1000 officers (BVPI 21) (or % of Complaints substantiated (BVPI 22)); % of 999 calls answered within target (BVPI 134); % of incidents graded immediate response answered within target time (BVP133); and % of immediate responses within target. Many of these "quality of service variables" are % figures and we have some sympathy with the reservations expressed in the Demonstration Project over the use of such variables. Specifically, the use of percentage figures may bias the efficiency scores against the larger forces as similar percentages on these output (outcome) measures would necessarily be related to large input values, thereby indicating lower efficiency. Nevertheless, as with the survey data on "fear of burglary", such percentages can be used to derive absolute numbers (i.e., number of people not very worried about burglary). The latter is an example of a variable that was used in the Demonstration Project (see Table 2). Hence, the same translation could be done in respect of these "quality of service variables", with possible further adjustments considered (i.e., per 1000 population).
The Demonstration Project also discussed problems associated with data consistency and comparability across forces in respect of these “quality of service variables”, and hence why these should be excluded. However, many of these variables are defined as BVPIs and it can therefore be argued that a high priority should be given to ensuring that the data quality of such variables is improved over time to the extent that they might be considered for inclusion in the relative efficiency analysis.

In terms of "proactive policing measures", these variables might be seen as alternatives to the use of realised outcomes. The Demonstration Project, for example, used the variable, Road Traffic Accidents (RTAs) resulting in death or serious injury (see Table 2), which may be open to wide ranging external influences. As an alternative, however, the efficiency analysis could focus on measures likely to reduce the incidence of RTAs, such as: Number of breath tests positive or refused (per 1000 population); Number of traffic offences prosecuted (per 1000 population), etc. Although it might be argued that the extra resources devoted to such activities would imply less resources directed elsewhere, all police forces face the task of deploying their limited resources most effectively. Hence, provided that an appropriate multi-output (outcome), and possibly multi-input, specification is adopted, the efficiency of police forces in respect of this relative deployment of resources can be assessed.

In any model specification a further complication arises in that many of the chosen variables need to transformed into a “more is better” output (outcome). For example, police and civilian days lost through sickness (see Table 2) needs transforming into a "more is better" variable, and “the number of days worked and not lost” seems entirely appropriate in this context. It can be further argued that this variable (number of days worked and not lost) should be expressed as a ratio relative to the total staff employed in the force in order to eliminate any potential size effects. Large forces, for example, would be expected to generate greater numbers of days lost through sickness irrespective of their efficiency or morale. This argument is also reinforced by the point made in the Demonstration Project (Home Office (2001)) that, “there is a potential that forces could manipulate this variable by hiring additional staff who have a very low cost” (Page. 57). Clearly, the use of a ratio would mitigate against this adverse incentive effect.

In addition, there were views expressed in the Demonstration project that police and civilian days lost through sickness is distinct from the other variables in the
sense that it does not correspond closely with any of the key aims and objectives in policing. While it would clearly be desirable to reduce the incidence of sickness absence in police forces, it may well be that days lost are actually a symptom of underlying morale or management problems, and may therefore be related to poor performance in other key output (outcome) areas.

The second variable proposed in the Demonstration Project, “the number of persons arrested for notified offences”, may be subject to adverse incentive effects since, in any efficiency analysis, police forces would be rewarded simply for making more arrests, even if they did not result in prosecutions. As the Demonstration Project correctly asserts, however, the variable, “number of arrests leading to a caution or prosecution”, would be a preferred variable. Nevertheless, given that the variable, “number of offences cleared up”, is available, we would argue that it would be better to use this latter variable (as there will be a strong correlation between offences cleared up and prosecutions) and to omit the variable, “number of arrests”, on the grounds of its adverse incentive affects. This proposal follows arguments discussed above in respect of the police literature, where clear up rates are widely utilised as outputs, see Table 1.

The third variable, “total number of crime incidents”, creates an adverse selection problem in that larger forces would be expected to record higher incidents of crime, and the relationship may well not be linear. This variable will also be affected by a whole range of environmental variables. Hence, it is very unlikely that this variable accurately reflects the activities of the police. It may well be dominated by other factors and it cannot be assumed that this is adequately accounted for by the influence of the Police Funding Formula on costs, see Carr-Hill (2000). The latter variable also suffers from not adhering to the “more is better” criterion necessary in cost or production studies, although, a translation into a "more is better" variable could be made, possibly expressed per 1000 population. The latter would help to purge the data of any size-related effects.

The fourth variable specified in the Demonstration Project, reflects the 2nd police aim "reduce crime and the fear of crime". The “weighted number of incidents of crime above (below) expected” is potentially an ideal variable in that it reflects the success of the police in “bearing down” on crime. Such a variable must somehow reflect the impact of police forces in reducing the incidence of crime, relative to what it would otherwise be. Although this is not measurable in practice, it is possible to
produce a measure of crime incidents relative to what would be expected and this is exactly what is measured by the variable, “weighted number of incidents of crime above (below) expected”. The latter is therefore a potentially highly informative variable, notwithstanding potential reservations concerning the validity/accuracy of the Police Funding Formula (see Carr-Hill (2000)) which forms the basis for predicting the expected incidents of crime. The Demonstration Project goes some way towards correcting for any possible inaccuracies in the latter variable, however, by re-scaling the predicted weighted total crimes so as to equal the weighted total actual crimes for all the forces considered. Clearly, the calculation of this particular variable could potentially be refined in the future via the building of more accurate (and possibly non-linear) models for predicted crime incidents across police force regions.

The variable “number of RTAs resulting in death or serious injury” also requires translation into a "more is better" variable prior to any efficiency analysis. However, as with the variable, “total incidents of crime”, this variable is also likely to be affected by size factors (i.e., the population in the police force area) and environmental factors such as: length of motorways in the area; proportion of young male (drivers), etc. As stressed previously, it cannot be assumed that these factors are adequately taken into account by the Police Funding Formula. Hence, this (transformed) variable should be expressed per 1000 population, and a rigorous second stage analysis employed to test for any residual impact on relative efficiency levels arising from environmental factors.

The final variable considered by the Demonstration Project in Table 2, was the “estimated number of people very worried about burglary”. This variable also requires transformation, and the use of the variable, “estimated number of people not very worried about burglary”, is a sensible alternative which has a "more is better" interpretation. As mentioned previously, this variable should be expressed per 1000 population as a safeguard against any possible size related biases. However, there were concerns expressed in the Demonstration Project relating to variables based on survey data. Hence, if such variables are to be used in any future efficiency model, attention needs to be given to developing more reliable survey data based on the use of sufficiently large and representative samples, and to utilise sampling techniques which are consistent across police force regions. It would also be desirable that
confidence intervals associated with the survey results were sufficiently narrow so as
to inspire confidence in the validity of the findings.

As a final point, it is important to note that there is a potential circularity
problem in any analysis of police force efficiency if: inputs are proxied by costs; costs
are closely related to funding; funding is based on the funding formula, which
allocates police funds on the basis of perceived need (i.e., predictions of the level of
crime); and finally, if the outputs specified contain variables such as the level of
crime. It is important to recognise in this context that, in the economic analysis of
production, outputs can only be produced through the use of inputs (and hence the
expenditure of resource costs). In public sector services, however, outcomes such as
the level of crime will exist, to some extent, whether or not any police resources exist.
The key issue therefore is that the level of crime, for example, should be less than it
would otherwise be by virtue of the expenditure on police resources. Hence, any
measures of efficiency should reflect the impact of the police in “bearing down” on
crime, and this should be captured in the specification of appropriate outputs
(outcomes).

A variable such as the level of crime, for example, is influenced by a wide set
of environmental variables as well as by the efficiency of police forces. Hence, if this
variable were to be used it would be necessary to disentangle the environmental
effects from the effects of policing, which would be extremely difficult to do in
practice. It is for the above reasons, that variables such as various cleared up crimes
are used in the economic literature, see Thanassoulis (1995) and Drake and Simper
(2000). These types of variables largely reflect the effectiveness of policing, rather
than the impact of environmental variables. Although it could be argued that the use
of the police funding formula does take account of environmental variables, and
hence it should be possible to use variables such as the level of crime, this argument is
flawed for two main reasons. Firstly, it makes the implicit assumption that the police
funding formula is correct, which may or may not be the case, see Carr-Hill (2000).
Secondly, the police funding formula is based on a linear regression analysis. It may
well be, however, that the relationship between total crime and, for example,
population size, level of unemployment, etc., is non-linear. This would imply that
both the linear funding formula, and any efficiency analysis based on variables such
as total crime, could disadvantage the larger police forces.
CONCLUSIONS

Previous academic analysis (Drake and Simper (2002a, b, and c) and Thanassoulis (1995)) has indicated that it is feasible to assess the relative efficiency of police forces in England and Wales. However, the validity and robustness of these relative efficiency results will depend crucially on the specification of an appropriate set of inputs and outputs (outcomes). As has been argued in this paper, and demonstrated in the recent Demonstration Project (Home Office (2001)), however, this is not a straightforward matter.

On the input side, it is important that any specification is not overly restrictive, in the case with a composite input measure, for example. On the output (outcome) side, it is important that the specification encompasses the full range of functions/services provided by the police. Hence, the specified variables will need to encompass; response/reactive variables; proactive/preventative variables; and quality of service variables.

In order to specify an appropriately broad multi-input/output (outcome) efficiency model, it seem likely that priority will need to be given to developing a panel data set (in order to avoid degrees of freedom problems), and ensuring that the data used is of an adequate quality (particularly in respect of the use of survey data). With respect to the Demonstration Project (2001), the variables: Number of offences cleared up; and weighted number of crime incidents above/below expected (suitably transformed), would appear particularly useful variables. However, there are problems related to the latter variable in issues of variable reliability due to predicted crime figures. Furthermore, these two output (outcome) variables would need to be supplemented by a range of other variables in order to fully capture the aims and objectives set down for the police, and in order to reflect the range if Best Value Performance Indicators (BVPIs) specified.
<table>
<thead>
<tr>
<th>Table 1. Inputs and Outputs in Policing Studies.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inputs</strong></td>
</tr>
<tr>
<td><strong>Darrough and Heineke (1979)</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Carrington et al (1997)</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Table 2
Demonstration Project Variables.

<table>
<thead>
<tr>
<th>Variable \ Aim</th>
<th>Promote safety and reduce disorder</th>
<th>Reduce crime and the fear of crime</th>
<th>Contribute to delivering justice in a way which secures and maintains public confidence in the rule of law.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Police and civilian days lost through sickness</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Number of persons arrested for notifiable offences</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Number of offences cleared up</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Number of recorded crime incidents</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weighted number of incidents of crime above (below) expected</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimated number of people very worried about burglary</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of RTAs leading to death or serious injury</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
REFERENCES


