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Inquiry into the Future for Lifelong Learning

Lifelong Learning and Crime: An Analysis of the Cost-effectiveness of In-prison Educational and Vocational Interventions

IFLL Public Value Paper 2

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NIACE has a broad remit to promote lifelong learning opportunities for adults. NIACE works to develop increased participation in education and training, particularly for those who do not have easy access because of class, gender, age, race, language and culture, learning difficulties or disabilities, or insufficient financial resources.

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Foreword

This is the second of the Inquiry into the Future for Lifelong Learning's Public Value papers. This series of papers grapples with a range of questions about how we should understand the effects of lifelong learning. The 'public value' of lifelong learning resides in the benefits it brings, not only to the learners themselves, but to wider society. If learning makes individuals healthier, for example, that is good for them, but also for their family, their community and for the health service and the taxpayer. It signals a general uplift in the quality of life. This is public value.

The notion of public value is easy to grasp but not so easy to measure. For many of us it is almost self-evident that lifelong learning brings personal and social benefits as well as economic ones. Yet we need to examine the evidence as rigorously as we can: what actually are the effects; can we get an idea of how big they are; and what is the process by which they occur? We know that we cannot produce perfect answers to these questions. But by assembling a range of responses, the Inquiry aims to fill in much more of the picture than is currently available; to give a clearer focus to the policy options involved; and to prompt further reflection and debate.

This paper, prepared by the Matrix Knowledge Group, addresses the question of how far learning can contribute to a reduction in crime. It takes a particular approach, applying cost-benefit analysis to different programmes. The analysis produces very specific results, quantified and given monetary values. It extends the analysis to potential lifetime savings from investment in learning. Of course, the results vary greatly according to the assumptions made, and such an approach is open to criticism, but beyond doubt it focuses the debate on alternative choices. For the Inquiry, this is a key part of our mission. The aim is not to prove that lifelong learning is always the best alternative, but to generate serious discussion around what its contribution might be – and how we can best estimate this. The Inquiry is also publishing a Thematic Paper on *Crime and Lifelong Learning*, which contains substantive proposals on this issue.

We are grateful to the Matrix Knowledge Group for their contribution to the Inquiry's work.

Published papers are available from the IFLL website: http://www.niace.org.uk/lifelonglearninginquiry/Publishedpapers.htm

Periodic updates on IFLL progress are to be found in our Bulletin (you can register for Inquiry Bulletins at: http://www.niace.org.uk/lifelonglearninginquiry/register.htm).

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Executive summary

- This paper estimates the efficiency of in-prison educational and vocational interventions in comparison with prisons without any adjunct interventions, where efficiency is measured by comparing the cost of the intervention with the avoided cost of crime associated with the intervention.
- The methodology employed comprised an economic model built upon a review of effectiveness. The review of effectiveness identified the short-term change in offending as a result of educational and vocational interventions in prison. The economic model extrapolated this change in offending over the lifetime of the offender, and valued the change in offending in terms of both public sector and victim costs.
- Five studies were identified that measured the relative effectiveness of prison and in-prison educational and vocational interventions and fulfilled the requirement of scoring three or above on the Maryland Scale of Methodological Rigour. The interventions identified included basic education, vocational and apprenticeship training and industrial employment.
- All the studies identified suggested that in-prison educational and vocational interventions reduced offending compared with prison alone.
- The economic analysis suggests that in-prison educational and vocational interventions are a good use of public resources. The net benefit to the public sector associated with educational and vocational interventions ranged from £2,000 to £28,000 per offender. When victim costs are included in the analysis, the net benefit ranged from £10,500 to £97,000 per offender.
- Further research is required before we can conclude definitely that in-prison educational and vocational interventions are an efficient use of public resources. In particular, UK-based research on the effectiveness of such interventions is required. All the studies identified in the review were undertaken in the US.

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1. Introduction

The Inquiry into the Future for Lifelong Learning (IFLL) website (www.niace.org.uk/lifelonglearninginquiry) identifies the 'connections between educational failure on the one hand, and criminal and anti-social behaviour, with its risk of social exclusion, on the other [...] Lifelong learning – the provision of learning opportunities for adults at all levels – has a significant role to play [...] in helping to prevent criminal behaviour'[1].This paper investigates the efficiency of one form of lifelong learning – in-prison educational and vocational interventions – at reducing offending. Specifically, it attempts to answer the question: 'is in-prison education a cost-effective use of public resources, and what types of intervention are most efficient for which offenders?'

At the time of writing, the UK prison population exceeds 80,000[2]. UK prison rates are currently the highest in Western Europe at 148 per 100,000. Plans by the UK Government to increase prison places by 9,500 over the next few years will give the UK an estimated imprisonment rate of 166 per 100,000, a rate higher than that currently found in a number of Eastern European countries (Slovakia and Romania currently have rates of 155 per 100,000 and Hungary a rate of 156 per 100,000)[3].

Relatively little has been written about the economic arguments for and against the use of prison. This is despite the substantial costs incurred by the state in building and maintaining prisons. In the UK it is estimated that each new prison place costs £119,000 and that the annual average cost for each prisoner exceeds £40,000[4]. The overall cost of the criminal justice system has risen from 2 per cent of GDP to 2.5 per cent of GDP over the last ten years[5].

Cost-benefit analysis is concerned with both measuring the effectiveness of an intervention and whether an intervention is efficient in that the benefits of the intervention are greater than the costs. In a cost-benefit analysis, the effects – the outcomes of an intervention – are valued in standardised monetary units, such as the dollar or the pound, and compared with the costs of the intervention's inputs. This approach creates a standardised measure that allows for a direct comparison of two or more interventions, even if those interventions vary in their goals and objectives and target heterogeneous populations and outcomes.

Economists make a number of arguments in favour of analysing the costs and benefits of criminal justice interventions[6]. First, even though an intervention may yield positive outcomes (such as desistance from crime and increases in pro-social behaviour), the cost of the intervention may outweigh the intervention's benefits; and

[1] http://www.niace.org.uk/lifelonglearninginquiry/Evidence-crime.htm
[2] Prison Reform Trust (2007).
[3] Ibid.
[4] Ibid.
[5] Ibid.
[6] Cohen (2000).

an alternative intervention may achieve the same outcomes for a lower cost. Second, whereas observational studies examine outcomes one at a time, cost-benefit analysis considers all outcomes jointly, using the standardised (monetised) estimates of costs and benefits as weights that generate a single measure of intervention effectiveness. Third, cost-benefit analysis allows for the valuation of hard-to-observe outcomes, such as fear, pain and suffering. Fourth, cost-benefit analysis has the potential to account for externalities – outcomes for individuals not directly involved in the intervention, but who are nevertheless impacted by its results. Finally, since public resources are scarce, it is incumbent upon policy-makers to choose the most efficient intervention; that is, the scheme where costs are minimised and benefits are maximised.

Marsh et al (2008) have illustrated the importance of cost-benefit analysis to decision-making in criminal justice. They demonstrate that the effect of a criminal justice intervention at reducing offending is only weakly related to net benefits, and that in about one quarter of cases considering both costs and benefits would produce different policy recommendations to just analysing changes in offending rates. That is, there are criminal justice interventions that are effective at reducing offending that are not an efficient use of resources.

Despite the advantages of cost-benefit analysis, to date there have been few economic evaluations of criminal justice interventions[7]. In order to overcome this lack of economic evidence, The Matrix Knowledge Group built an economic model to estimate the cost-effectiveness of alternatives to prison[8]. This paper applies this model to estimate the efficiency of in-prison educational and vocational interventions in comparison with prison without any adjunct interventions. The research focused on the efficiency of sentencing options for adult offenders (defined as 18 years and older). Economic efficiency was specifically defined as the incremental cost of in-prison educational and vocational interventions when compared with prison alone, where cost is defined as comprising the following two components: the cost of implementing the sentence, and the cost of crime post-sentence.

[7] Dilulio (1996); Cohen (2000); Brown (2004); Bushway and Reuter (2005).
[8] Matrix Knowledge Group (2007); Marsh and Fox (forthcoming).

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2. Method

A detailed description of the method employed to estimate the relative efficiency of prison and in-prison educational and vocational interventions is available in *Appendix A*. This section provides a summary of this method, which comprised the following stages:

- A model was built to estimate the average long-term economic cost associated with offending post-release from prison. The modelling comprised the following steps:
  a. Home Office data were used to estimate the number and type of offences in the two years post-release from prison.
  b. Using the relationship between age and crime, the number of offences in the two-years post release were extrapolated to estimate the lifetime number and type of offences committed post-release.
  c. Estimates of the cost of crime were used to estimate the lifetime economic cost of offences committed post-release from prison.
  d. For the purposes of this exercise, it was assumed that an offender is 25 years old at the point of release. The data available allowed their cost of offending to be modelled until they are 50 years old.
  e. The cost of offending estimated using this model included both costs to the public sector, including the costs of healthcare, courts, police, prison and probation, as well as to the victim, including lost productivity, stolen and damaged property, and pain and suffering.
- The relative effectiveness of in-prison educational and vocational interventions when compared with prison alone was estimated by undertaking a Rapid Evidence Assessment (REA):
  a. The REA identified existing studies that compared post-intervention offending of comparable groups of offenders[9] receiving standard prison or in-prison educational and vocational interventions.
  b. Data on the intervention, the offending population, post-release offending, and the methodology employed in the study were extracted from the study.
- The change in the cost of offending attributable to providing educational and vocational interventions on top of standard prison interventions was estimated by applying the effect sizes derived from the REA (step B) to the lifetime cost of crime estimated in the model (step A).

[9] In order to ensure that the analysis is based on robust estimates of the effectiveness, only studies that achieve a score of three or above on the Maryland Scale of Methodological Rigour (Sherman et al, 1997) were used.

- The change in the cost of offending attributable to providing educational and vocational interventions on top of standard prison interventions was compared with the difference in implementation cost for prison and in-prison educational and vocational interventions to estimate the incremental cost-effectiveness of in-prison educational and vocational interventions.
- The average lifetime cost of offending post-release from prison was applied to the adult male offenders sentenced to custody in 2005 to estimate the total lifetime cost of offending associated with this cohort[10]. The relative risk of re-offending for in-prison educational and vocational intervention, when compared with prison alone, was applied to this estimate to calculate future cost of offending if this cohort were given educational or vocational interventions.

All estimates of the net benefit of in-prison educational and vocational interventions are discounted at a rate of 3.5 per cent and are presented in 2007 prices. The estimates are also produced from two separate perspectives: a public sector perspective that only considers the public sector cost of crime (healthcare and criminal justice); and a societal perspective that considers both public sector costs and victim costs.

The estimates of the cost of crime used in this analysis are taken from the Home Office's *Economic and Social Cost of Crime Against Individuals and Households* (Dubourg et al, 2005), and include: defensive expenditure; insurance administration; emotion and physical impact on direct victims; the value of property stolen and damaged; the cost to victim services; the cost to the health service; the cost of the criminal justice system; and the cost of lost output.

While these estimates are well regarded, it is important to acknowledge the limitations associated with these estimates. In particular, these estimates do not include the cost of the fear of crime, or the impact on indirect victims, such as witnesses of crime or family members of direct victims of crime. Furthermore, estimating the emotional and physical impact on direct victims is a challenging undertaking. The current method adopted by the Home Office involves estimating the impact of crime on Quality Adjusted Life Years (QALY), and valuing these impacts monetarily. However, there is still some debate about the appropriate value of a QALY[11].

[10] The calculation focused on male offenders, as the majority of studies identified in the REA were studies of the effectiveness of interventions targeted at male offenders.

[11] For further description of the methods adopted to estimate the cost of crime, and the limitations of these methods see Dubourg et al (2005).

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3. Results

The five studies of in-prison educational/vocational interventions identified in the review were as follows:

- Harer (1995) tested the effect of adult basic education on offenders released from federal prison with lengths of stay greater than one year.
- Maguire et al (1988) estimated the effect of prison industry employment on post-release recidivism among adult male offenders from seven maximum-security facilities in the New York State correctional system.
- Lattimore et al (1990) estimated the effect of a vocational interests and aptitudes intervention with support finding a job for 18- to 22-year-old male property offenders.
- Piehl (1995) tested the impact of basic education on the recidivism of male inmates in Wisconsin.
- Saylor and Gaes (1996) estimated the effect of industrial work experience and vocational and apprenticeship training.

The remainder of this section summarises the evidence on the effectiveness and cost-effectiveness of these interventions.

3.1 The effectiveness of in-prison educational and vocational interventions

Table 1 summarises the effectiveness of interventions for which the review identified evidence and a meta-analysis of these effect estimates. Each study was graded for methodology, where a '+' grade indicates that the study adopted a randomised controlled trial or a quasi-experimental design combined with statistical techniques for controlling for differences in the treatment and control groups, and a '–' score indicates that the study adopted quasi-experimental designs that made no attempt to control for differences between the treatment and control groups.

Table 1 demonstrates that in-prison educational and vocational interventions consistently reduce recidivism when compared with prison alone. Furthermore, this conclusion is based on high-quality research designs – studies that employ either a randomised controlled trial or a quasi-experimental design combined with statistical techniques for controlling for differences in the treatment and control groups.

Table 1: Summary of evidence of effectiveness of in-prison educational and vocational interventions

Source	n	Follow-up	Effect (OR)	95% low	95% high	I^2	P (Q)	Location	Method
Harer M.D. (1995)	619	36m	0.647	0.635	0.659			US	+
Lattimore et al (1990)	247	18m	0.696	0.667	0.725			US	+
Maguire et al (1988)	896	24m	0.957	0.949	0.965			US	+
Piehl A.M. (1995)	1,483	36m	0.735	0.727	0.743			US	+
Saylor et al (1996)	2,660	120m	0.72	0.718	0.722			US	+
Meta-analysis	**5,905**	**–**	**0.753**	**0.707**	**0.802**	**99.94**	**0.0000**		

However, all of the studies identified were undertaken in the US, and caution is required when transferring these studies to a UK context. Furthermore, there is still substantial variability in effect sizes across studies, as indicated by the high I^2 statistic on the meta-analysis and the low p-value on the Q statistics.

3.2 The efficiency of in-prison educational and vocational interventions

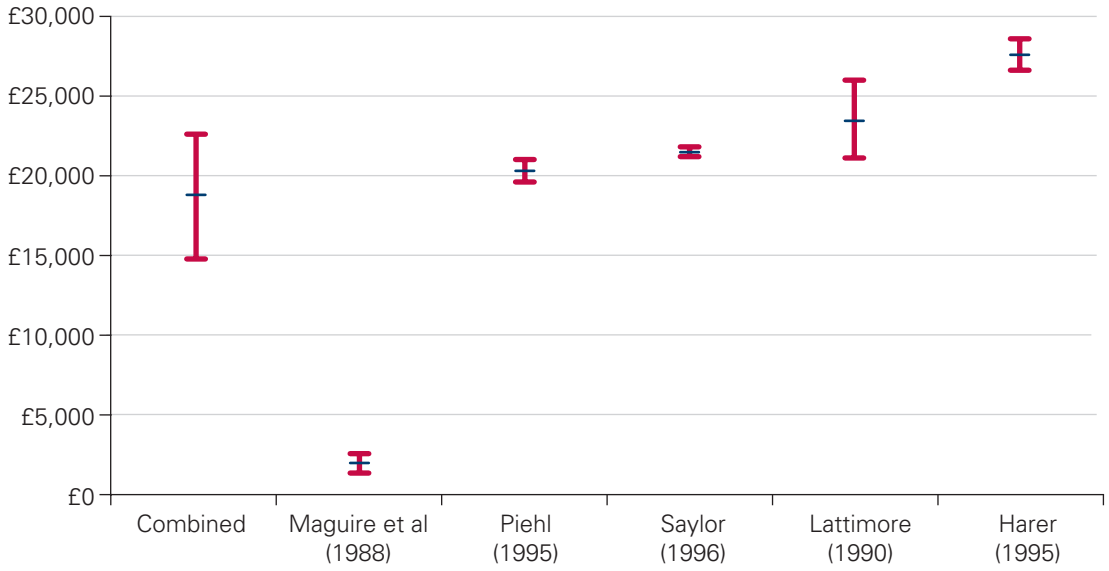
Figure 1 shows the net benefit to the public sector of in-prison educational and vocational interventions for adult male offenders compared with prison alone. It demonstrates that, despite the extra cost of in-prison educational and vocational intervention, it saves the public sector costs due to subsequent reductions in offending when compared with just prison alone[12].

The estimates of net benefit to the public sector based on the results of the meta-analysis ('combined') indicate that investing in in-prison educational and vocational interventions rather than prison without intervention would save the public sector £19,000 per offender (95 per cent CI:£15,000–23,000). However, this estimate hides a large amount of variation based on the effects identified in the individual studies. The intervention studied by Maguire et al (1988) has a net benefit to the public sector of just £2,000 per offender (95 per cent CI:£1,500–3,000), while the intervention studied by Harer (1995) has a net benefit to the public sector of £28,000 (95 per cent CI:£27,000–28,500).

There is no obvious variation in intervention type that explains the range of net benefits reported in Figure 1. However, the low net benefits associated with the industrial

[12] The confidence intervals around the estimates of net benefit are derived by applying the economic model to the confidence intervals on the estimates of effect derived from the meta-analysis. No other estimates of uncertainty are incorporated into the confidence intervals.

Figure 1: Net benefit per offender to the public sector of in-prison educational and vocational interventions compared with prison alone (mean and 95 per cent confidence intervals, 2007 prices)



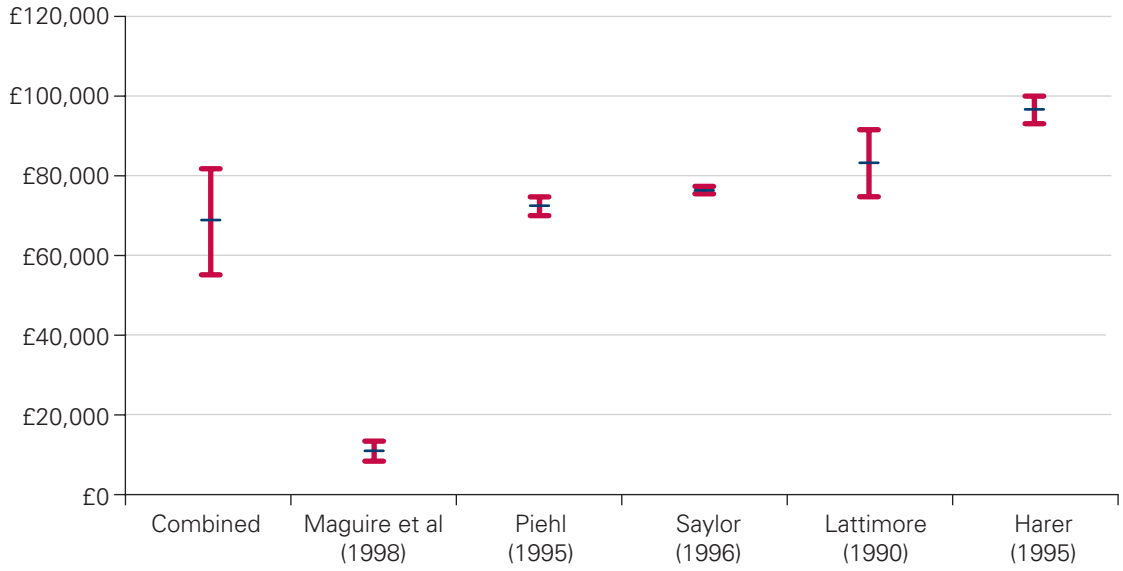
employment intervention studied by Maguire et al (1988) may well be a function of the fact that the intervention is given to offenders incapacitated in maximum security facilities.

Figure 2 shows the net benefit to society of in-prison educational and vocational interventions for adult male offenders compared with prison alone. While Figure 1 just considers the public sector costs of crime in the calculation of net benefit, Figure 2 also considers the cost of crime to victims (including lost productivity, damaged and stolen property, and pain and suffering). As crime has a greater cost to society than to the public sector alone, it is not surprising that the net benefit of in-prison educational and vocational intervention compared with prison without intervention is greater from a societal perspective.

The estimates of net benefit to the society based on the results of the meta-analysis ('combined') indicate that investing in in-prison educational and vocational interventions rather than standard prison would save the society £69,000 per offender (95 per cent CI:£55,000–81,500). However, once again, this estimate hides a large amount of variation based on the effects identified in the individual studies. The intervention studied by Maguire et al (1988) has a net benefit of just £10,500 per offender (95 per cent CI:£8,500–13,000), while the intervention studied by Harer (1995) has a net benefit of £97,000 (95 per cent CI:£93,500–100,000).

The economic analysis is subject to a number of caveats. In particular, the economic model assumes a zero decay rate in the effect of the sentencing options. That is, it is assumed that any short-term reduction in offending achieved as a result of in-prison

Figure 2: Net benefit per offender to society of in-prison educational and vocational interventions compared with prison alone (mean and 95 per cent confidence intervals, 2007 prices)



educational and vocational interventions will be maintained for the lifetime of the offender. Despite the follow-up period of one of the studies[13] being ten years, this assumption will overestimate the effect of the alternatives to prison alone.

In order to test the implications of this assumption, a sensitivity analysis was run to determine how the estimate of the net benefit of in-prison educational and vocational interventions varies with the decay rate. Figure 3 summarises the results of this analysis, based on the estimate of the effect of in-prison educational and vocational interventions derived from the meta-analysis. It demonstrates that the decay rate (the annual percentage reduction in the effect size) would have to be at least 80 per cent before in-prison educational and vocational interventions would no longer generate a net benefit compared to prison alone.

Figure 4 shows the estimated annual social cost of offending of the cohort of male offenders given custodial sentences in 2005 for each year post-release. The annual cost is estimated separately for a scenario in which there is no in-prison educational and vocational intervention, and for a scenario in which all offenders are given such an intervention. The latter scenario requires the assumption that the effect of in-prison educational and vocational interventions identified in the REA is applicable to all offender types.

[13] Saylor et al (1996).

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Figure 3: Sensitivity of the estimate of net benefit to society of in-prison educational and vocational interventions to changes in the decay of intervention effect

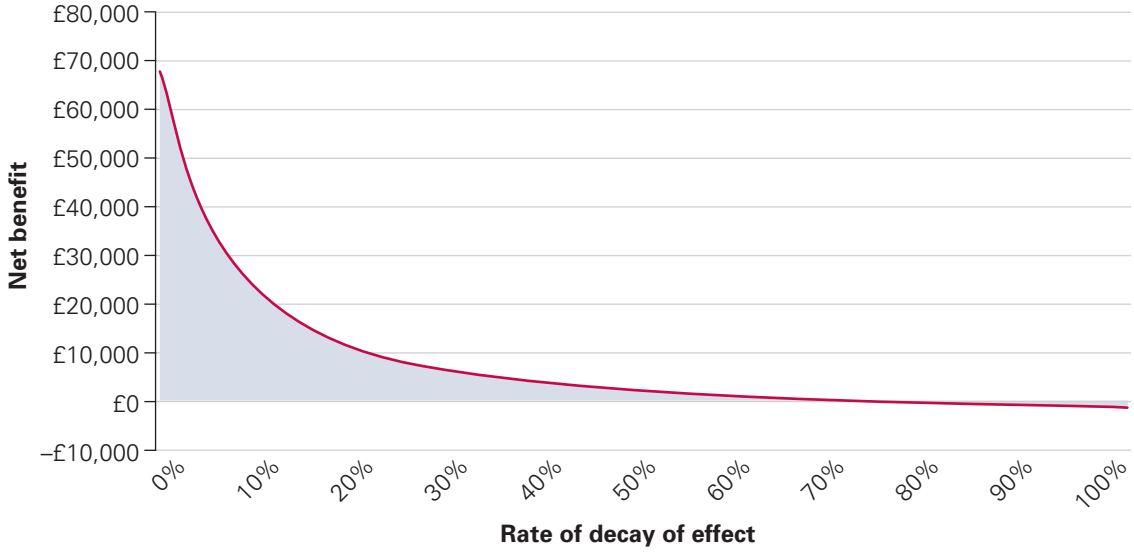

Figure 4: Annual total cost of offending post-release (£000, 2007) with and without in-prison educational and vocational interventions

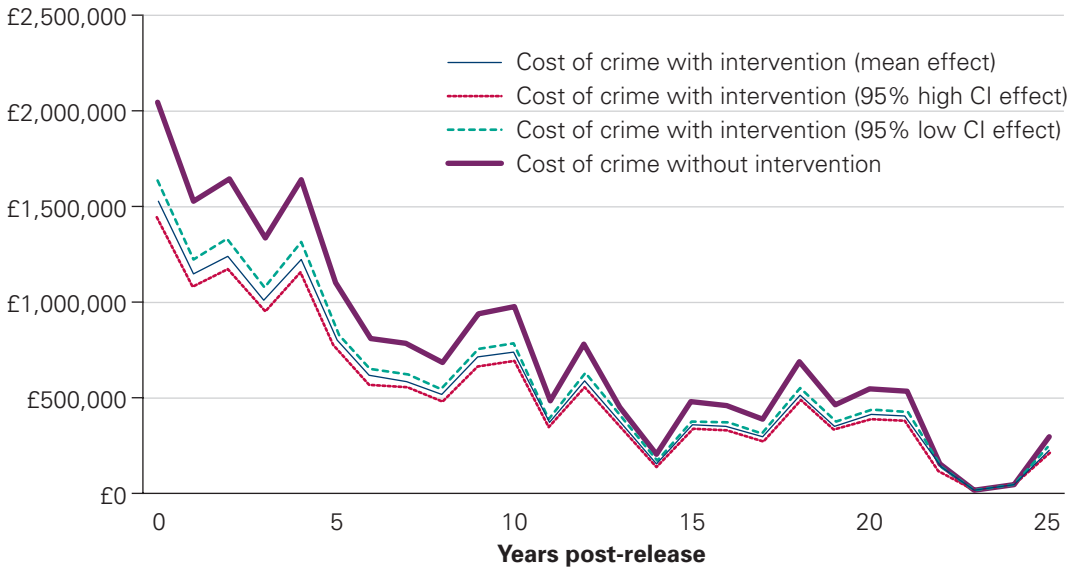

Figure 4 estimates that, without in-prison educational and vocational interventions, the total cost of offending associated with this cohort of offenders in their first year post-release would be approximately £2 billion. It is estimated that the introduction of in-prison educational and vocational interventions would reduce this cost of re-offending by £0.5 billion.

A similar trend – with the annual cost of offending being lower with in-prison education than without it – is observed throughout the next 25 years post-release. The declining cost of offending over this period is a function of the relationship between age and crime – once they reach their twenties, people commit fewer crimes as they get older.

Figure 5 shows the estimated accumulated social cost of offending of the cohort of male offenders given custodial sentences in 2005 for each year post-release. It demonstrates that, over the 25 years post-release, the accumulated cost of offending for the cohort of male offenders given custodial sentences in 2005 would be £4.75 billion lower if they were provided with in-prison educational and vocational interventions than if they were not.

It is important to note that the estimates of total cost of crime avoided represented in Figures 4 and 5 is based on the assumption that there is no decay in the effect of in-prison educational and vocational interventions over time. Therefore, it is reasonable to assume that these are top-end estimates.

Figure 5: Accumulated total cost of offending post-release (£000, 2007) with and without in-prison educational and vocational interventions

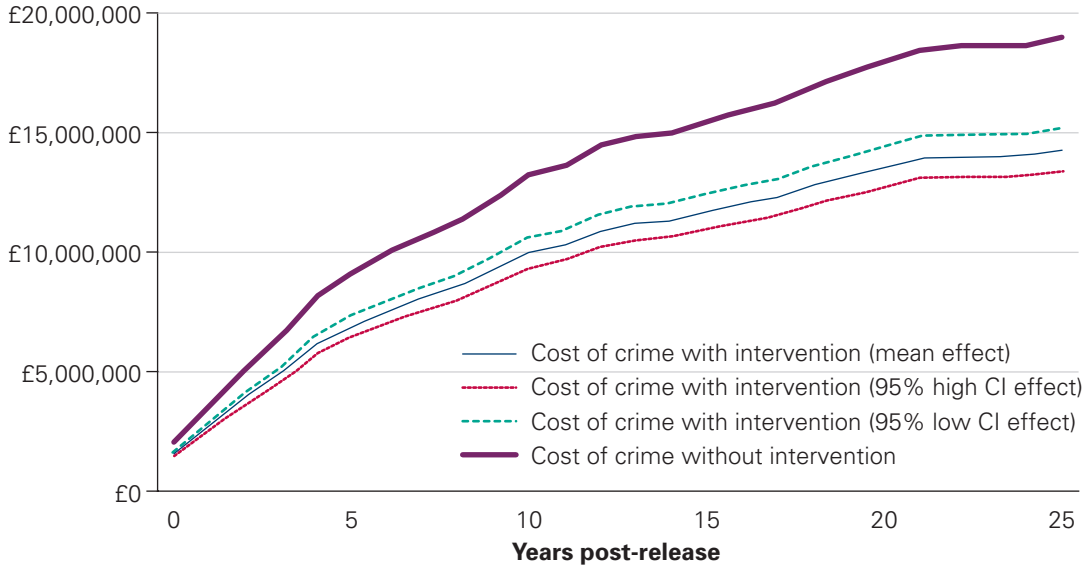

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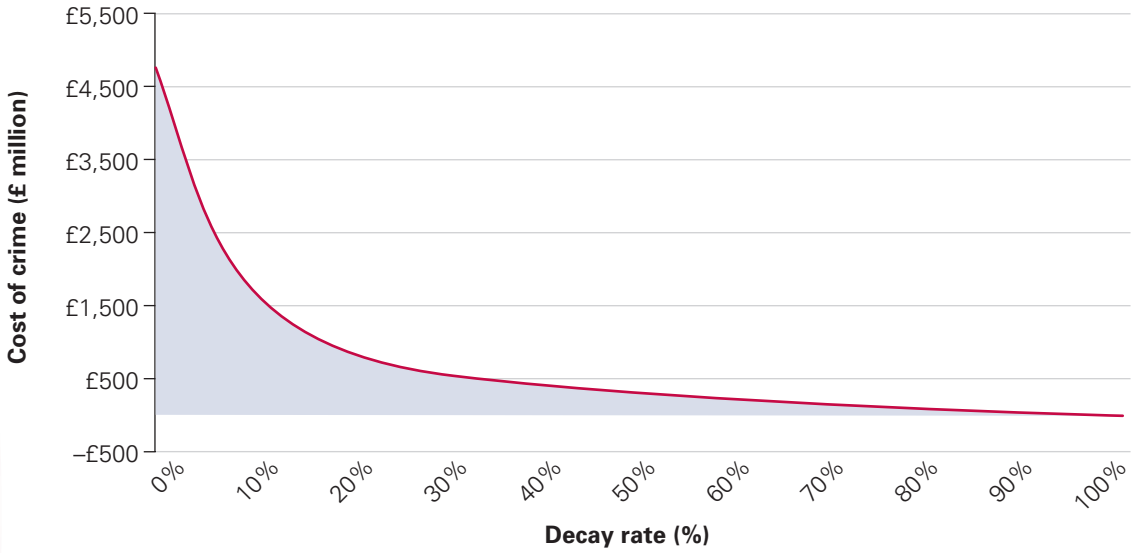
Figure 6 shows the results of a sensitivity analysis run to determine how the estimate of the accumulated cost of crime avoided varies with the decay rate. It demonstrates that the decay rate (the annual percentage reduction in the effect size) would have to be around 98 per cent before in-prison educational and vocational interventions would no longer generate a reduction in the cost of crime.

Figure 6: Sensitivity of the estimate of the accumulated avoided cost of crime as a result of in-prison educational and vocational interventions to changes in the decay of intervention effect



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4. Conclusions: headline messages for the Inquiry

This paper supports the idea that in-prison educational and vocational interventions are both effective at reducing offending compared with prison alone, as well as the idea that extra cost of in-prison educational and vocational interventions is justified by the costs of the crimes avoided as a result of these interventions.

However, there are a number of important caveats to concluding that educational and vocational interventions are an economically efficient investment in the UK. First, there are limitations with the effect data on which this result is based. For instance, while all the studies included in the analysis employ research designs that are a grade three or above on the Maryland Scale of Methodological Rigour[14], there is the possibility that some of the effect sizes are subject to sample selection bias. Also, all the data available were collected in the USA. There were also large amounts of variability in the effect sizes identified. Finally, the analysis was based on a relatively small number of studies.

Secondly, due to limited data on the rate of decay in intervention effects, it is necessary to assume a zero decay rate in the economic model. That is, it is assumed that any reduction in offending compared to prison alone identified in the short term by effectiveness studies will be maintained for the lifetime of the offender. This assumption will obviously overestimate the effect of the alternatives to prison alone. However, sensitivity analysis suggests that the decay rate would have to be substantially higher (approximately 80 per cent) before the conclusion of the paper is overturned.

The limitations of the analysis also suggest a number of areas where further research would be useful. In particular, more research needs to be undertaken on the relative effectiveness – compared to standard prison sentences – of educational and vocational interventions in the UK. It is proposed that this research agenda could follow a number of avenues. First, robust research needs to be undertaken on any in-prison education and training programmes currently available in the UK. However, it is acknowledged that this research is expensive and the results of any such research undertaken will not be available in the short term.

Second, an insight into the cost-effectiveness of in-prison education and training available in the UK can be gained through comparison of these interventions with those that have already been identified as being cost-effective in the US, and assessment of the transferability of US-based interventions to a UK setting. For instance, research is needed to compare the theories of change underlying these interventions, the processes involved in applying the interventions, the contexts in which they are implemented, and the types of offenders in receipt of these interventions.

[14] Sherman et al (1997).

Third, this work on the transferability to the UK of interventions that have been demonstrated to be cost-effective elsewhere should be undertaken in parallel with economic modelling. Modification of the parameters of the type of model employed in this paper on the basis of the insights of a comparison of UK- and US-based interventions can be used to assess the likely cost-effectiveness of interventions in the UK.

Finally, the economic model constructed for this research is constrained by the data available. A number of improvements in our understanding of offending would enhance the quality of the economic analysis possible in this field. Some of these data limitations have already been discussed, including: difficulties measuring the cost of crime; a lack of studies on the effect of interventions; and a lack of data on the rate at which the effect of an intervention decays over time. All these limitations impacted on the ability of the model to be populated once it was constructed. However, other limitations impacted on the way the model was conceived and constructed. In particular, a better understanding of the dynamic nature of offending, how offending in one period influences the probability of offending in subsequent periods, and how offenders' transition between different 'states' of offending – including desistance, low levels of offending, high levels of offending, incarceration – and how these 'transition probabilities' change with offender type and sentence type, would enable more dynamic modelling techniques to be employed and a more accurate estimate of the efficiency of different sentencing options to be calculated.

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References

Aos, S., Phipps, P., Barnoski, R. and Lieb, R. (2001) *The Comparative Costs and Benefits of Programs to Reduce Crime*, Document Number: 01-05-1201, Washington State Institute for Public Policy, www.wa.gov/wsipp

Bowles, R. and Pradiptyo, R. (2004) *Reducing Burglary Initiative: An analysis of costs, benefits and cost effectiveness.* Home Office Online Report 43/04

Bushway, S. and Reuter, P. (2005) 'Collaborating with Economists.' *The Criminologist*, 30, 1, 1-4

Cartwright, W.S. (2000) 'Cost-benefit analysis of drug treatment services: Review of the literature.' *The Journal of Mental Health Policy and Economics*, 3

Cohen, M.A. (2000) 'Measuring the Costs and Benefits of Crime and Justice.' (In Volume 4: *Measurement and Analysis of Crime and Justice* (pp. 263-316). National Institute of Justice, NCJ 182411)

Cuncliffe, J. and Shepherd, A. (2007) *Re-offending of adults: results from the 2004 cohort.* Home Office Statistical Bulletin

Dilulio, J. (1996) 'Help Wanted: Economists, Crime, and Public Policy.' *Journal of Economic Perspectives*, 10, 1-23

Dubourg, R. et al (2005) *The economic and social costs of crime against individuals and households 2003/04*. Home Office Online Report 30/05

Farrington, D.P., Coid, J.W., Harnett, L.M., Jolliffe, D., Soteriou, N., Turner, R.E. and West, D.J. (2006) *Criminal careers up to age 50 and life success up to age 48: new findings from the Cambridge Study in Delinquent Development*. 2nd edition. Home Office Research Study 299

Harer, M.D. (1995) *Prison Education Program Participation and Recidivism: A Test of the Normalization Hypotheses*. Federal Bureau of Prisons, Office of Research and Evaluation, Washington, DC

H.M. Treasury (2003) *The Green Book: Appraisal and evaluation in central government*. London, TSO

Lattimore, P.K., Witte, A.D., Baker, J.R. (1990) 'Experimental assessment of the effect of vocational training on youthful property offenders'. *Evaluation Review* 14(2): 115-133

Maguire, K.E., Flanagan, T.J. and Thornberry, T.P. (1988) 'Prison Labor and Recidivism.' *Journal of Quantitative Criminology* 4(1): 3-18.

Marsh, K., Chalfin, A. and Roman, J. (2008) 'What does economic analysis add to decision making? Evidence from the criminal justice literature.' *Journal of Experimental Criminology*, volume 4, 2, 117-135

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Inquiry into the Future for Lifelong Learning

Marsh, K. and C. Fox (forthcoming) 'The benefit and cost of prison in the UK. The results of a model of lifetime re-offending', in *The Journal of Experimental Criminology*

Matrix Knowledge Group (2007) *The economic case for and against prison*. London, The Matrix Knowledge Group. www.matrixknowledge.co.uk/prison-economics (accessed 30 November 2007)

McDougall, C., Cohen, M., Swaray, R., and Perry, A. (2003) 'The costs and benefits of sentencing: a systematic review'. *The Annals of the American Academy of Political and Social Science*, 587, 160-177

Nicholas, S. et al (2005) Crime in England and Wales, 2004/2005. Home Office Statistical Bulletin, 11/05

Piehl, A.M. (1995) *'Learning While Doing Time'*. John F. Kennedy School of Government, Harvard University, Cambridge, MA

Prison Reform Trust (2007) *Bromley Briefing: Prison Factfile*, December 2007, Prison Reform Trust

RDS NOMS (2007) *Sentencing statistics 2005, England and Wales*. Home Office Statistical bulletin

Saylor, W.G., Gaes, G.G. (1996) *PREP: A Study of Rehabilitating Inmates Through Industrial Work Participation, and Vocational and Apprenticeship Training*. Federal Bureau of Prisons, Washington, DC

Sherman, L.W., Gottfredson, D., MacKenzie, D., Eck, J., Reuter, P. and Bushaway, S. (1997) *Preventing Crime: What Works, What Doesn't, What's Promising*. Office of Justice Programs Research Report, US Department of Justice

Welsh, B.C. and Farrington, D.P. (2000) *Correctional Intervention Programs and Cost-Benefit Analysis*. Criminal Justice and Behaviour 27: 115-133

Appendix A: Method

As there is limited economic data available on sentencing options, the methodology comprised the following two parts. First, a Rapid Evidence Assessment (REA) of effectiveness studies was undertaken. This identified the change in re-offending resulting from moving an offender from a prison sentence without intervention to prison with an educational and/or vocational intervention. Second, an economic analysis was undertaken to transform the data on change in re-offending into an estimate of the economic efficiency of in-prison educational/vocational interventions compared with a prison sentence without intervention.

Review of effectiveness studies

The following databases were searched to identify studies of the relative effectiveness of alternative sentencing at reducing re-offending: Applied Social Science Index and Abstracts, British Library Direct, Criminal Justice Abstracts, CSA Social Services Abstracts, CSA Sociological Abstracts, Social Policy and Practice, and Web of Knowledge[15].

A total of 986 studies were identified in the search. A number of selection criteria were applied to determine which studies would be included in the review. The study had to:

- include at least two distinct groups: a group receiving a standard prison sentence and a group receiving in-prison educational/vocational interventions;
- include at least one outcome measure of recidivism: offending, arrest, conviction, or incarceration;
- include data to enable the calculation of relative effect of the interventions (odds ratio) and the variance of this effect;
- be published in 1996 or after;
- be published in the English language;
- have been undertaken in a western context. That is, it had to have been undertaken in Europe, North America, Australia or New Zealand;
- employ an experimental research design that was scored three or above on the Maryland Scale of Methodological Rigour (Sherman et al, 1997).

[15] The following search terms were used to interrogate the databases: ((offender* or prisoner*) and ((violence and (domestic or person*)) or "partner abuse" or sexual or burglary or robbery or theft or rape* or fraud or paedophilia* or forger* or drug* or motoring or driving) and (conviction or recidivism or arrest* or re-arrest or reconviction or offending) and (discharge* or fine* or compensation or (community and (order*" or service or supervision or sentence*)) or probation or custody or reparation or curfew* or "house arrest" or suspended or surveillance or deferred or (electronic and (monitor* or tagging)) or licence or parole or "control order*" or licence* or parole or resettlement or imprisonment or incarcerat* or intervention* or attitude* or thinking or cognitive or "anger management" or "aggression replacement" or "victim aware*" or counsel* or therapy or mentor* or "offender management" or "after care" or "correctional intervention*" or "offender prevention" or restitution or mediation) and (effectiv*)) not (cctv or Africa* or Asia* or India* or "far east" or "south America" or mexico or "middle east" or mediterr*)

The abstracts for the papers were read by two researchers and were excluded if they did not meet the criteria outlined above. A total of five studies that met the above criteria and compared prison alone with in-prison educational/vocational interventions were identified. The studies were read to extract data for the analysis. Data were extracted on the intervention type, its components and intensity, the counterfactual, the location of the study, the characteristics of the offending population (including gender, age, and offending risk factors), study design, and the effect of the intervention.

A number of rules were applied to select the effect data from the studies:

- Where multiple crime outcomes were reported, the outcome 'closest' to the offence was extracted. That is, reported offending was preferred to arrest, which was preferred to convictions, which was preferred to incarceration.
- Where outcomes were reported for different follow-up periods, outcomes for the longest follow-up period were extracted.
- Estimates of effect adjusted for confounding variables were preferred.

Effect sizes were calculated as odds ratios using Comprehensive Meta-Analysis. In some instances, data was available to calculate effect sizes using more than one formula. Where this was the case, a hierarchy of effect size measurements was applied. First, odds ratios were calculated based on the proportions of participants offending post intervention and the sample size in the treatment and control group. Second, odds ratios were calculated from estimates of *Cohen's d* and the standard error associated with *Cohen's d*. Finally, odds ratios were calculated using estimates of mean offending post intervention; the standard deviation associated with mean offending and the sample size in the treatment and control group. A random effects meta-analysis was undertaken to estimate an overall effect size from the data collected for each combination of sentencing options.

Economic analysis

An economic analysis was undertaken to transform the data on change in re-offending into an estimate on the economic efficiency of alternatives to standard prison. All costs were calculated in 2007 prices.

The economic analysis involved the following three components:

- Estimating the change in the cost of crime post-sentence if an offender is provided an educational/vocational intervention in prison compared with receiving a standard prison sentence.
- Estimating the incremental cost of in-prison educational/vocational interventions compared to prison alone.
- Combining these two components to estimate the net benefit of in-prison educational/vocational interventions compared to prison alone.

The remainder of the methods section summarises the analysis undertaken for these components.

Change in offending post-sentence

The first component in the economic analysis was to estimate the change in the cost of crime committed post-sentence when an offender is provided with in-prison educational/vocational interventions compared with prison alone – the rehabilitation and/or specific deterrence effects. The effect data identified during the review measured the change in re-offending post-sentence when an offender is provided with in-prison educational/vocational interventions compared with prison alone. The objective of this element of the economic analysis was to translate this effect into a monetary value.

The first step in the analysis was to estimate the number of offences likely to be committed in each year post-release if an offender is given a prison sentence. The analysis is conducted for a male offender being released from prison at age 25 years. Equation 1 shows the function used to calculate this baseline level of re-offending.

$$NumberCrime_{sy} = ConvictChance_{s} * ConvictAve * OffConvict * CrimeRatio_{y} \quad (1)$$

Where:

- $NumberCrime_{sy}$ is the number of crimes committed in year y by offender in prison for offence type s[16].
- $ConvictChance_{s}$ is the chance that an offender in prison for offence type s is convicted of any offence in the year following release[17].
- *ConvictAve* is the average number of convictions in the first year post-release per adult male offender convicted[18].
- *OffConvict* is the number of offences committed per conviction[19].
- $CrimeRatio_{y}$ is the ratio of the number of crimes committed in year y (where y=1 corresponds with the first year of release when the offender is 25 years old) and the number of crimes committed at the age of 25 years[20].

[16] The following offence types were included in the analysis: violence, robbery, sexual offences, burglary, theft and handling, fraud and forgery, motoring offences, drug offences and other offences.
[17] Cuncliffe and Shepherd (2007).
[18] RDS NOMS (2007).
[19] The number of offences committed per conviction is calculated as the product of the average number of convictions per recorded offence (RDS NOMS, 2007) and the average number of offences per recorded crime estimated using data from the British Crime Survey (Nicholas et al, 2005).
[20] Farrington et al (2006).

The next step in the analysis was to estimate the average cost of a crime committed post-release. Equation 2 summarises the function used to calculate the average value of a crime:

$$ValueCrime_s = \sum_{r=1}^{R} \sum_{o=1}^{O} OffenceDist_{os} * CostCrime_{or} \quad (2)$$

Where:

- $ValueCrime_s$ is the average value of a crime committed post-release from prison by an offender sentenced for offence *s*.
- $OffenceDist_{os}$ is the chance that a crime committed by an offender released from prison for offence *s* will be a particular crime type *o*[21,22].
- $CostCrime_{or}$ is the cost of resource type *r* associated with offence *o*[23].

The analysis was run from two different perspectives. First, a public sector perspective was employed, where resource type *r* included criminal justice costs and NHS costs. Second, a societal perspective was employed, where resource type *r* included criminal justice costs, NHS costs, property stolen and not recovered, property damaged, lost output and the physical and psychological suffering of the victim.

The total cost of crime committed post-release from prison until the age of 50 years is thus given by the equation:

$$LifetimeCost_s = \sum_{y=1}^{25} \frac{ValueCrime_s * NumberCrime_{sy}}{(1 + DR)^{y-1}} \quad (3)$$

Where:

- $LifetimeCost_s$ is the cost of crime post-release from prison until the age of 50 years for offenders sentenced for offence *s* and released at the age of 25 years.
- $ValueCrime_s$ is the average value of a crime committed post-release for offenders released after being sentenced for offence *s* (from equation 2).
- $NumberCrime_{sy}$ is the number of crimes committed in year *y* by offenders released from prison after being sentenced for offence *s* (from equation 3).
- *DR* is the discount rate. In line with Green Book guidance[24], a discount rate of 3.5 per cent was employed in the analysis.

As the baseline cost of re-offending is calculated by original offence type, and those offenders receiving in-prison educational/vocational interventions may have committed

[21] The model specifies the following crime types: violence, robbery, sexual offences, burglary, theft and handling, fraud and forgery, motoring offences, drug offences and other offences. The sum of the probabilities that a crime is of a particular type is equal to one.
[22] RDS NOMS (2007).
[23] Dubourg et al (2005).
[24] H.M. Treasury (2003).

a number of different offence types, equation 4 summarises the function used to calculate the baseline cost of re-offending for those receiving educational/vocational interventions:

$$LifetimeCost_i = \sum_{s=1}^{S} ChanceOffence_{is} * LifetimeCost_s \quad (4)$$

Where:

- $LifetimeCost_i$ is the lifetime cost of crime committed post-release from prison of those offenders who could receive educational/vocational interventions (intervention *i*).
- $ChanceOffence_{is}$ is the proportion of offenders currently sentenced to intervention *i* who have been sentenced for committing offence *s*[25].
- $LifetimeCost_s$ is the lifetime cost of crime post-release if the offender had been sentenced to prison for offence *s* (from equation 3).

The change in the cost of crime if an offender is diverted from prison to an alternative sentence (in this case, in-prison educational/vocational interventions) was calculated as follows:

$$ChangeCostPost_i = LifetimeCost_i * Effect_i \quad (5)$$

Where:

- $ChangeCostPost_i$ is change in the costs of crime post-sentence as a result of diverting an offender from prison to intervention *i*.
- $LifetimeCost_i$ is the cost of crime post-release from prison if those offenders diverted to intervention *i* had instead been given a prison sentence (source: equation 4).
- $Effect_i$ is the relative risk of re-offending with intervention *i* compared to prison alone (source: effectiveness review[26]).

The incremental cost of alternative interventions

The third component of the economic analysis is the calculation of the incremental economic cost of implementing in-prison educational/vocational interventions compared to prison alone. A review of existing studies was undertaken to identify the economic cost of implementing prison and non-prison sentences. Three existing reviews of economic studies of criminal justice interventions were identified:

[25] RDS NOMS (2007). It is assumed that the distribution of offence types for any prison sentence is same as that for those receiving custody in the UK.

[26] The odds rations estimated in the meta-analysis were converted to relative risks using the following equation: RR = OR/((1-EC)+(OR.EC)), where RR is the relative risk, OR is the odds ratio, and EC is the baseline risk.

Cartwright (2000); Welsh and Farrington (2000); and McDougall et al (2003). The existing reviews were supplemented with a search of the following databases for the period 2000 to 2006: ASSIA; Criminal Justice Abstracts; NCJRS; Social Policy & Practice; International Bibliography of the Social Sciences; British Library Direct; Sociological Abstracts; PsycInfo; Social Services Abstracts; Social Care Online; Web of Knowledge; and Dissertation Abstracts[27].

An estimate of £27,109 (2007 prices) was used as the cost of in-prison educational/vocational interventions for adult males (adult males being the offender group assessed in the effectiveness studies identified[28].

Equation 6 summarises how this data was employed to estimate the incremental cost of alternatives to prison:

$$InterventionCost_i = (Cost_i * Length_i) - (CostCustody * LengthCust_i) \quad (6)$$

Where:

- $InterventionCost_i$ is the incremental cost of intervention i compared to standard prison.
- $Cost_i$ is the annual cost of intervention i (source: review of economic data).
- $Length_i$ is the average length of intervention i[29].
- $CostCustody$ is the annual cost standard prison (source: review of economic data).
- $LengthCust_i$ is the average length of a standard prison[30].

Net benefit of diverting offences away from standard prison

The final component of the economic analysis was to combine the estimates of the incremental implementation cost and the change in the cost of crime both during and after the sentence to estimate the net economic benefit associated with diverting an offender from standard prison to an in-prison educational/vocational intervention. Equation 7 summarises this calculation:

$$NetBenefit_i = ChangeCostPost_i - InterventionCost_i \quad (7)$$

[27] The following search strategy was employed to search the databases: (crim* or offend* or reoffend* or recidivis*) and (econ* or cost*) and (benefit*) and (intervention* or outcome*).
[28] Summary of calculation of the cost of in-prison educational/vocational interventions: cost of prison (average cost of male local (£23,801), open (£20,704), and remand (£26,249) prison (Bowles, R. and Pradiptyo, R., 2004), 2002 prices) multiplied by the ratio of the cost of educational training in prison in the US ($46,859, source: Aos (1999)) to the cost of standard prison in the US ($45,000, source: Aos (1999)).
[29] RDS NOMS (2007). It is assumed that the length of community service and community supervision is the same as that for a community order in the UK, that the length of residential drug treatment and surveillance with drug treatment is the same as that for a DTTR in the UK, and that the length of any prison sentence and surveillance is the same as that for custody in the UK.
[30] RDS NOMS (2007).

Where:

- $NetBenefit_i$ is the net economic benefit associated with diverting an offender from prison to intervention *i*.
- $ChangeCostPost_i$ is the change in the costs of crime post-sentence as a result of diverting an offender from prison to intervention *i* (from equation 5).
- $ChangeCostDuring_i$ is the change in the cost of crime during the sentence associated with diverting an offender from prison to intervention *i*.
- $InterventionCost_i$ is the incremental cost of intervention *i* compared to standard prison (from equation 6).

Applying the intervention to the prison population

The expected average future cost of re-offending post-release (equation 4) was multiplied by the total number of male adult offenders sentenced to custody in 2005 to estimate the expected total future cost of offending post-release associated with this cohort. The relative risk of re-offending associated with in-prison educational/vocational interventions, when compared with standard prison, was applied to this estimate of total future offending to estimate the total future offending of adult males sentenced to custody in 2005 if they are given in-prison educational/vocational interventions.