



National Audit Office

Improving Dementia Services in England – an Interim Report

Technical Paper

Economic model to assess the financial impacts of the Enriched Opportunities Programme for people with dementia in an extra-care housing setting

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Introduction

Background

1 Extra-care housing is increasingly put forward as a means of improving the quality of life of individuals who require support to maintain their independence. Between 2004 and 2008, the Department of Health invested over £147 million in extra-care housing, and a further £80 million is budgeted for 2008-10.¹ As at July 2008, there were about 935 schemes built in England, providing a total of around 40,000 dwellings.²

2 Services in extra-care homes for people with dementia have historically been less than adequate. Many extra-care housing schemes currently exclude those individuals with dementia. Where schemes do operate an inclusive policy, Valleley (2006)³ reported that over half of the people with dementia were admitted to other care settings during the first two years due to challenging behaviour, conflicts with staff and other residents, and distress on the part of the person with dementia.

The Enriched Opportunities Programme

3 The Enriched Opportunities Programme (EOP) is an initiative in the Bradford area developed to ensure that people experiencing mental health problems can continue to enjoy a good quality of life in extra-care settings through an integrated approach⁴. A key facet of the programme is employing specialist staff trained in dementia care, supported by an expert team, to provide leadership and engage with residents, their relatives, and health and social care teams in order to provide a coherent and proactive service.

4 EOP has been successful during its first two years. People on the programme, and other residents, have benefited from increased quality of life⁵. This initiative has demonstrated that, through the provision of proactive and integrated service between health, social care and housing services, people with dementia can be cared for effectively in extra-care housing.

1 Department of Health (2007) *Department of Health Extra Care Housing Fund* <http://www.dhcarenetworks.org.uk/IndependentLivingChoices/Housing/AboutHousingLIN/DHextra-careHousingFund/>.

2 Department of Health (2008) *Statistics on Housing with Care in England* http://www.dhcarenetworks.org.uk/_library/Resources/Housing/Housing_advice/Statistics_on_Extra_Care_Housing_in_England_EAC_April_2005.pdf.

3 Valleley S et al. (2006) *Opening doors to independence: A longitudinal study exploring the contribution of extra care housing to the care and support of older people with dementia* London: Housing 21.

4 Brooker D et al. (2009) *The Enriched Opportunities Programme: A cluster randomised controlled trial of a new approach to living with dementia and other mental health issues in extra care housing schemes and villages*. www.bradford.ac.uk/acad/health/dementia.

5 Brooker D et al. (2009) *The Enriched Opportunities Programme: A cluster randomised controlled trial of a new approach to living with dementia and other mental health issues in extra care housing schemes and villages*. www.bradford.ac.uk/acad/health/dementia.

5 Furthermore, people with dementia are less likely to move out to more intensive care settings such as nursing homes, and are more likely to use community care services instead of costly inpatient hospital care.

Objective of the model

6 In January 2010 the National Audit Office published a value-for-money report *Improving Dementia Services in England – an Interim Report*⁶, referred to hereafter as “the NAO report”. The NAO report examined the Department of Health’s National Dementia Strategy, the successful implementation of which depends on the realisation of £1.9 billion of efficiency savings.

7 This paper provides support for the potential financial savings reported as immediately achievable in the NAO report. As part of our field work for the NAO report, we analysed the potential financial savings on service provision for people with dementia if the principles of the EOP are applied to all extra care homes across England.

8 We advise that this analysis is read together with the EOP report (Brooker D *et al*, 2009), which is referred to hereafter as “the EOP study” and also the NAO report.

9 The model compares a hypothetical scenario where an EOP style service is available across all extra care homes in England, with a control group where no specific provision for people with dementia is in place in these care settings.

10 The aim of the model is to explore the extent to which there is scope for value-for-money improvements in service provision for people with dementia in an alternative care setting. The costs considered here include only costs for social care, housing and health care, which are attributable to the public sector.

6 Report by the Comptroller and Auditor General (2010) *Improving Dementia Services in England – an Interim Report* HC 82 2009-2010.

The Model

11 The model (**Figure 1** overleaf) is a Markov decision analytic model constructed using Excel XP. The evaluation period is two years and each time period in the model consists of six months. The Markov Decision Model compares the costs of service provision for people with dementia in extra-care homes where an Enriched Opportunity Programme approach is taken against a service provision without (described as Project Support Work Coach or “PSWC” in the EOP study) or the control group.

12 The model sets out to emulate the flow of residents with dementia in extra-care homes over a two-year period. Once a person is enrolled in an extra care home, we assume that he or she will either remain at the extra-care home, or move to another housing setting including:

- private (own) home;
- other extra-care home;
- residential care home; or
- nursing home.

The model tracks all people with dementia entering into extra-care homes from entry until the end of the two year evaluation period or until death occurs, whichever is sooner.

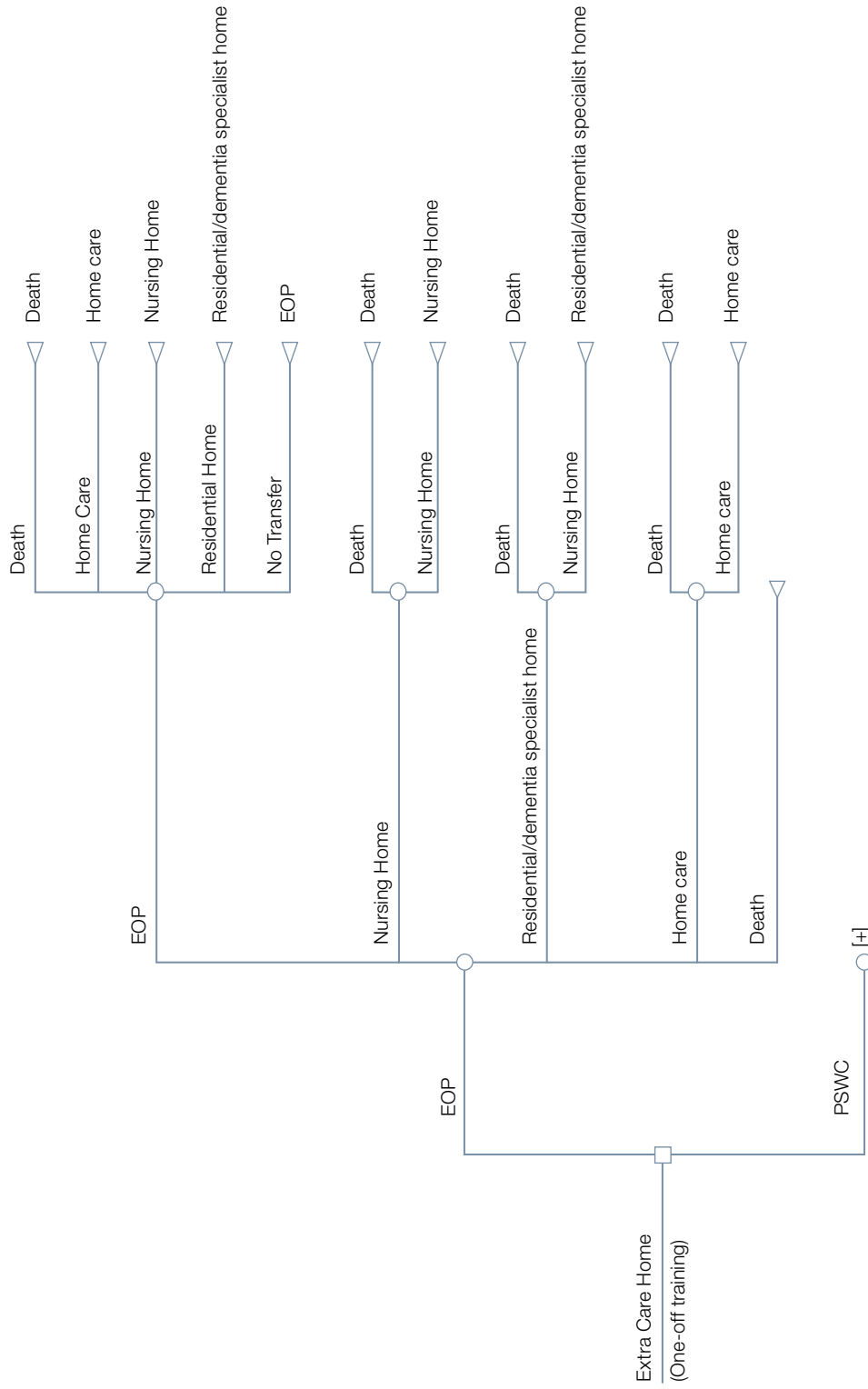
13 The model is based on the EOP study. In the EOP study, the extra-care homes in the control group⁷ were assigned a project support work coach (PSWC). The PSWC was employed as an extra senior staff member, however they were not provided with any specific training. In the extra-care homes with an EOP, extra training and team support was provided to the extra staff member employed (referred to as the “Locksmith” in the EOP report). This model evaluates the effect on service utilisation of the extra training and support provided under an EOP approach.

14 The model is a dynamic model in that once a resident leaves an extra-care home, the position available will be filled by a new resident who will then be followed until the end of the study period. The total number of people flowing through the system thus depends on the mortality rate and the transition rate to other housing settings. If people are transferred out of extra-care homes faster in one scenario, then there will be more people entering the model for evaluation in that scenario.

15 The model combines the estimates for the number of people with dementia entering extra-care homes, rate of transfer to other settings, probability of access to health care services, and mortality rate in each setting to estimate the levels of service utilisation. We then combine this information with costs estimated for different services, including housing cost, to obtain the total cost of service utilisation.

⁷ In the EOP study there is a group of five extra-care homes, which employed a Dementia Specialist (the Locksmith). A separate group of five extra-care homes employed one extra person with no extra support and training (the PSWC or Project Support Work Coach). In line with the EOP study, we refer to this second group with a PSWC as the control group.

Figure 1
The Markov Decision Model



Source: National Audit Office

NOTE

PSWC refers to the control arm in the EOP study.

16 In line with the EOP data collection period, the two-year evaluation period is divided into four half-year periods. The costs for each period are calculated separately and then aggregated together.

Probabilities

17 We have estimated probabilities using the EOP study as well as other published literature. **Figure 2** sets out the probabilities used in the model and their sources.

Figure 2
Probabilities used in the economic model

Parameter		0-6 Months (%)	6-12 Months (%)	12-18 Months (%)	Sources and Notes
EOP	Mortality	6.9	6.7	5.6	We derived these estimates using data from the EOP study ¹ , adjusted for missing data. The EOP study is an open study in the sense that new entrants are recruited to replace those who move out or die during the study period. We accounted for this using valid person years per period to arrive at the relocation rates and mortality rates in the study.
	Relocation to nursing home	1.5	1.7	0.0	
	Relocation to residential home	1.5	1.7	2.8	
	Relocation to private housing	0.6			
PSWC	Mortality	3.1	5.9	7.7	
	Relocation to nursing home	3.9	3.4	5.7	
	Relocation to residential home	1.5	2.5	1.9	
	Relocation to private housing	0.3			
Nursing Home	Mortality (6 month)	27.3			We derived this by assuming that the difference in reported mortality between EOP and PSWC is entirely caused by the differences between the relocation rates to nursing homes. See Assumption 22b.

Source: National Audit Office analysis of EOP data

NOTE

¹ Brooker D et al. (2009) *The Enriched Opportunities Programme: A cluster randomised controlled trial of a new approach to living with dementia and other mental health issues in extracare housing schemes and villages* www.bradford.ac.uk/acad/health/dementia.

Costs

18 The following categories of costs are included in the model:

- Costs to the NHS: inpatient and outpatient acute care, GP visits, Physiotherapy, Occupation Therapy, and Chiropody services.
- Housing cost: private home, extra-care home, residential home and nursing home attributable to the taxpayer.
- Social care cost: home care, charges for care provision in various other care settings.
- Programme cost: staff wages for the EOP and PSWC programme, and one-off and ongoing training costs where applicable.

Figure 3 details the costs used for the parameters in the model and their sources.

19 The cost from the Personal Social Services Research Unit (PSSRU)⁸ for residential homes and nursing homes includes health care costs, while the cost for extra-care homes does not. The standard NHS contribution for nursing care in nursing homes is £2,626 per half year, which is much higher than the average (see Figure 3) in extra-care homes. For residential homes, we estimate the average GP and community nurse cost to be about £700 per six months; this is also higher than the primary care cost for the extra-care home reported here. However, there is no corresponding estimate for inpatient cost for residential care residents. We decided not to separate the costs attributable to the NHS out for those settings. Therefore, the housing costs for those settings in the model are not directly comparable to that for the extra care setting. This could lead to an underestimate of potential savings to the NHS, and an overestimate of the savings to the housing element.

20 We assumed that the cost for people with dementia living in a private home and extra-care home is the same on average. This is unlikely to affect the result, since the proportion of residents with dementia who move back to private homes from extra-care homes is negligible in both of the arms in the EOP study. Baumker T *et al.* (2008)⁹ also reported that the health care cost in private homes is higher than in extra-care homes.

21 In this model, we only separated out the health care cost for those residents in extra-care homes, whilst treating the cost in other settings as a single measure of housing cost. The health care cost estimated in the model will only be for the health care cost incurred whilst being an extra-care resident. This could lead to an underestimate of the savings for the NHS; however, this should not affect the total estimate.

8 Personal Social Services Research Unit (2009) *Unit Cost of Health and Social Care* Pp 37-38 www.pssru.ac.uk/pdf/uc/uc2009/uc2009.pdf.

9 Baumker T *et al.* (2008) *Costs and Outcomes of an Extra-Care Housing Scheme in Bradford* Joseph Rowntree Foundation www.jrf.co.uk.

Figure 3

Cost parameters used in the economic model

Parameters		Cost (£)	Source	
EOP (Locksmith) and PSWC staff cost (per annum)		31,800	EOP study ¹	
Training cost for EOP staff (per annum)		4,020	EOP study	
One-off training cost for EOP Programme		2,000	EOP study	
Housing and care cost (per week)	Nursing home for elderly	718	PSSRU (2009) ² The cost include housing, social care and health services charges.	
	Residential care home for elderly	502		
	Private home	470	Assumed to be the same as in extra-care home (See Paragraph 18).	
	Extra-care home	420	Baumker T <i>et al.</i> (2009) ³ This does include health care cost.	
Health care costs for EOP residents with dementia		EOP	PSWC	EOP Study
Acute care cost at baseline (First six month period)	First half-year	621	621	In the EOP study, the average acute health care cost for the first six months is £740 for the EOP arm and £502 for the control arm. We used a weighted average of £621 for both arms. For the following periods, we used the rate of change inferred from the EOP study to estimate the cost for each period. We assumed that the rate of change was the same as the third period.
	Second half-year	742	961	
	Third half-year	630	1,540	
	Fourth half-year	536	2,464	
Primary care cost at baseline (First six month period)	First half-year	266	266	In the EOP study, the average primary care cost for the first six months is £300 for the EOP arm and £234 for the control arm; we used a weighted average of £266 for both arms. For the following periods, we used the rate of change inferred from the EOP study to estimate the cost for each period. We assumed that the rate of change was the same as the third period.
	Second half-year	234	264	
	Third half-year	298	270	
	Fourth half-year	380	276	

Source: National Audit Office analysis

NOTES

- 1 Brooker D *et al.* (2009) *The Enriched Opportunities Programme: A cluster randomised controlled trial of a new approach to living with dementia and other mental health issues in extra care housing schemes and villages.* www.bradford.ac.uk/acad/health/dementia.
- 2 PSSRU (2009) *Unit Cost of Health and Social Care* p37-38 www.pssru.ac.uk/pdf/uc/uc2009/uc2009.pdf.
- 3 Baumker T *et al.* (2008) *Costs and Outcomes of an Extra-Care Housing Scheme in Bradford* Joseph Rowntree Foundation www.jrf.co.uk.

Assumptions

22 To address the gap in the data, we have made various assumptions in the model. In general, the assumptions we made are conservative.

a Assumptions on housing service utilisation:

- The occupation rate is 90 per cent for all extra-care homes; this is based on the Laing and Buisson Report on extra-care home markets¹⁰.
- The EOP programme could be replicated in other extra-care settings; we are aware that not all extra-care homes are the same as Extra-care Charitable Trust housing, which supported the EOP programme.
- Residents who move out of extra-care homes, for instance those who move to nursing homes, will stay until the end of the two year evaluation period unless they die during the evaluation period.
- Of all the housing provisions, including those receiving care in private homes, about three-quarters of the housing costs are paid for by the taxpayer. The Bradford study¹¹ on extra-care home costs reported that on average, about one quarter of the housing costs can be attributed to private individuals. *The Impact Assessment for Intermediate Care*, published by the Department of Health (2009), assumed that about 33 per cent of the cost of residential care for people with dementia is borne by private individuals, based on a PSSRU estimate¹².
- We assumed that for those living in private homes, the total housing cost and care provision is the same as for those in extra-care homes.

b Assumptions specifically relating to the EOP data analysis:

- For those who moved out or died during a six- month time period, the events happened at the midpoint of the corresponding period.
- The differences in relocation rate and health care utilisation are attributable to the EOP programme.
- For those residents who refused to participate or those whose data are incomplete, the service utilisation is assumed to be the same as for those who remained on the study; i.e. those data are missing randomly.
- For the 18-24 months time-period, we assumed that the relocation rate will be the same as for the period between 12-18 months. However, for the transfer rate to nursing homes for the EOP arm, we used an average of the first three periods; since no one was transferred to nursing homes in the third period in the EOP study (see Figure 2).

¹⁰ Laing and Buisson (2009) *Extra Care Housing Market Report 2009*.

¹¹ Baumker T *et al.* (2008) *Costs and Outcomes of an Extra-Care Housing Scheme in Bradford* Joseph Rowntree Foundation www.jrf.co.uk.

¹² Department of Health (2009) *Impact Assessment of Updated Guidance on Intermediate Care* www.dh.gov.uk.

- For resource utilisation in health care, we assumed that either the trend in the change in utilisation continues into the 18-24 months period or it remains the same as that for the 12-18 months period (see Figure 3).
- We assumed that those who were relocated to residential care homes and private housing have the same mortality rate (calculated as the average for the first three periods) as those who remained in the EOP or PSWC arms respectively.
- Finally, we assumed that residents in extra-care homes have the same underlying mortality rate whether in an EOP or in the control PSWC group. The difference in reported mortality for the two types of extra-care homes are caused by different rates of transfer to nursing homes. This is based on our understanding that those who were relocated to nursing homes are usually frailer and thus have a higher mortality rate.

Results

23 We have assumed that there are currently 40,000 bed places for extra-care homes (see Paragraph 1) in England, with an occupation rate of 90 per cent. We have also assumed that if all extra-care homes have an inclusive policy, about 25 per cent of residents in extra-care homes could be older people with dementia¹³. On this basis, some 9,000 elderly people with dementia could be accommodated in the available extra-care homes.

24 **Figure 4** shows the baseline costs for housing, medical costs and the EOP programme costs if an EOP style service is implemented across all extra-care homes in England for the first 6 month, 6-12 month, 12-18 month and 18-24 month periods.

Figure 4

Costs for a scenario with EOP style service in place for all extra-care homes in England

	0-6 months (£m)	6-12 months (£m)	12-18 months (£m)	18-24 months (£m)	Total (£m)
Housing	74.6	77.9	80.1	82.6	314.8
Medical cost in extra-care	8.0	8.8	8.4	8.3	33.4
Programme cost	7.5	6.8	6.8	6.8	27.8
Total	90.1	93.5	94.7	97.7	376.0

Source: National Audit Office

NOTE

Discrepancies in the totals are due to rounding

¹³ Brooker D et al (2009) *The Enriched Opportunities Programme: A Cluster Randomised Controlled Trial of a New Approach to Living with Dementia and Other Mental Health Issues in Extra Care Housing Schemes and Villages* www.bradford.ac.uk/acad/health/dementia.

25 **Figure 5** shows the baseline costs for housing, medical cost and the PSWC style programme costs if a PSWC style service is available for all extra-care homes across England for the first 6 month, 6-12 month, 12-18 month and 18-24 month periods. Due to the dynamic nature of the resident flow, and the fact that more people under the PSWC scheme would be transferred out of extra-care homes and still be followed until the end of the two year period, more people would be cared for and costed under a PSWC scenario than under an EOP scenario in the model. We therefore adjusted the estimate for a PSWC scenario to the number of people cared for under an EOP scenario to make the results more comparable.

26 **Figure 6** shows the incremental cost based on Figure 4 and Figure 5.

27 **Figure 7** shows the incremental cost for up to 18 months and up to 24 months respectively. The adjusted results are for those adjusted to the number of people cared for under the two scenarios (see Paragraph 25). To be conservative, these figures assume that the service utilisation rate remains the same for the 12-18 month period as for the 18-24 month period.

Sensitivity Analysis

28 Although the EOP study is large and has a robust design for a study of its kind, the parameters derived are inevitably subject to various degrees of uncertainty or bias. These could arise from either the limitations of the EOP study or the assumptions we have made in constructing the model.

29 We carried out extensive one way sensitivity analyses on various parameters to test the effects of varying their values on the base line results. The parameters tested included the costs for the EOP locksmith, costs of training, inpatients and primary resource utilisation with EOP, the costs of housing (including extra-care and nursing homes), mortality rate in nursing homes and the proportion of housing cost paid by private individuals.

Figure 5

Costs for a scenario where a PSWC style service is in place for all extra-care homes in England

	0-6 months (£m)	6-12 months (£m)	12-18 months (£m)	18-24 months (£m)	Total (£m)
Housing	76.8	82.3	89.3	94.7	343.2
Medical cost in extra-care	8.0	11.0	16.3	24.7	60.0
Programme cost	6.0	6.0	6.0	6.0	24.1
Total	90.9	99.4	115.6	125.4	427.2
Adjusted by person cared for	89.7	96.3	104.2	115.5	405.7

Source: National Audit Office

NOTE

Discrepancies in the totals are due to rounding

Figure 6

Incremental cost between a scenario where there is EOP style service and a scenario where there is PSWC style service

	0-6 months (£m)	6-12 months (£m)	12-18 months (£m)	18-24 months (£m)	Total (£m)
Housing	-2.2	-4.4	-9.7	-12.1	-28.4
Medical cost in extra-care	0.0	-2.2	-7.9	-16.4	-26.6
Programme cost	1.4	0.8	0.8	0.8	3.7
Total	-0.8	-5.9	-16.9	-27.8	-51.3
Adjusted by person cared for	0.4	-2.8	-9.5	-17.8	-29.7

Source: National Audit Office

NOTE

Discrepancies in the totals are due to rounding

Figure 7

Incremental cost between a scenario where there is EOP style service and a scenario where there is PSWC style service for up to 18 months and up to 24 months respectively (assuming the same service utilisation pattern for the 12-18 month period and 18-24 month period)

		Total Incremental Cost (£m)	Housing Service Cost (£m)	Health Care Cost (£m)
Up to 18 Months	Adjusted	-11.9	-8.3	-5.2
	Unadjusted	-23.5	-16.3	-10.2
Up to 24 Months	Adjusted	-21.4	-13.8	-9.6
	Unadjusted	-40.4	-26.0	-18.1

Source: National Audit Office

NOTE

'Adjusted' refers to the number of people cared for adjusted according to the number of people going through the EOP scenario (see Paragraph 25).

30 Figure 8 below shows the effect of varying those parameters in the model upon the incremental costs. The base-line result in the diagram is for the incremental cost up to 18 months, adjusted for the number of people cared for (see Paragraph 22). The horizontal bars show how the total incremental cost varies as each parameter is varied over the range of values shown.

31 The Tornado Diagram (Figure 8) indicates that the most significant drivers in the model for the incremental costs are:

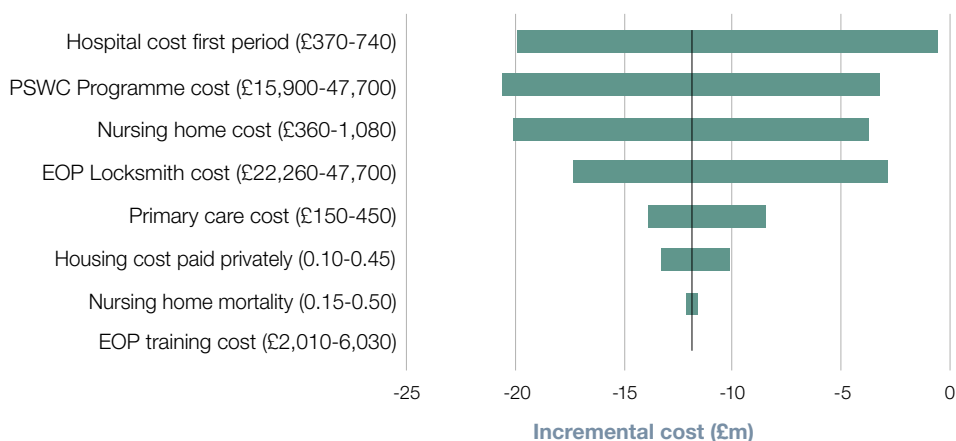
- Inpatient costs incurred by dementia residents (hospital cost first period);
- Costs for the PSWC and EOP programmes including staff cost (PSWC programme cost, EOP Locksmith cost);
- Costs of nursing home care; and
- Primary care costs.

32 The sensitivity analyses demonstrate that under a wide range of scenarios, savings could be realised with an EOP style programme in place as opposed to a PSWC style programme.

33 In the EOP study, the real differences between the two scenarios are training and support provided to the Locksmith, rather the number of staff itself (i.e. staff cost). Therefore, the staff costs for the PSWC and EOP programmes, although appearing to be sensitive here, are of little real significance to our analysis for incremental cost. The EOP training accounts for the difference between the two scenarios; however, this has little influence on the incremental cost.

Figure 8
Variations in total incremental cost (adjusted by the number of people cared for up to 18 months) of service utilisation for elderly people with dementia in extra-care homes

Tornado Diagram



Source: National Audit Office

Discussion

34 Based on evidence from the recent study in the Bradford area, our economic model suggests that providing an EOP style service in extra-care homes for people with dementia could lead to cost savings. This is in addition to the improved quality of life reported from the EOP report¹⁴.

35 If the first 18 month period is included as demonstrated in the EOP study, then the savings could be as much as £23 million. The savings for the NHS could be some £10 million, and for the housing service about £16 million. However, residents flow faster when no EOP programme is in place, and so the total number of residents evaluated in the model for the PSWC programme will be higher. After adjusting for this, the total savings would be around £11 million as compared to the counterfactual of no EOP provision.

36 If the trend in service utilisation between 18 and 24 months is the same as between 12 and 18 months, over a two year period the savings could be as much as £40 million in total, with £18 million for the NHS. Adjusted for the number of people cared for, the net savings could be about £21 million. The savings for the NHS could be about £9 million.

37 In the EOP study, an extra staff member was employed for both arms of the study, so the beneficial effects are due solely to the training, mentoring and management involvement and support. So the net effect of the EOP programme could be larger if it is compared to a setting where there are no extra staff at all; however, this could not be evaluated here.

38 The EOP programme was trialled over a two-year period. As indicated in Figure 6 the savings only start to be realised after one year, due to the initial set-up cost and the time lag before the intervention takes effect. So, in the longer term, the savings per annum could be higher.

39 There is notably more variation in the utilisation of health services in the EOP programme than those in the PSWC programme (according to the data provided to us by the EOP study team). This indicates that greater uncertainty is associated with the current EOP programme than with the control. We do not know the cause of this; however this does indicate that the consistency of the EOP programme needs to be improved. Parameters for resource utilisation for the model are based on the data generated from one trial study. Although the trial is the largest of its kind and of robust design, it was not envisaged in the first place as an economic study and the data were not collected systematically for economic evaluation. Therefore, more robust trials designed specifically to evaluate the economic impact of EOP would be desirable.

¹⁴ Brooker D et al (2009) *The Enriched Opportunities Programme: A Cluster Randomised Controlled Trial of a New Approach to Living with Dementia and Other Mental Health Issues in Extra Care Housing Schemes and Villages* www.bradford.ac.uk/acad/health/dementia.

Conclusion

40 This EOP initiative has demonstrated that by providing a proactive and integrated service between health, social care and housing services, people with dementia could be effectively cared for in extra-care housing. Furthermore our analysis, based on findings from the EOP study, indicate that if the EOP programme is rolled out to all extra-care homes in England, over a two year period the savings to the public through reduced inpatient care and less utilisation of more intensive housing care provision could be around £21 million, shared between local government (for housing) and NHS (health care).

41 With an ageing population and growing number of people with dementia, and more importantly with changing expectations from service users and growing constraints on public finance, extra care could prove to be a cost-effective alternative to residential care for elderly people with dementia.