National Audit Office

Supporting people with autism through adulthood

Model to assess the financial impacts of providing multi-disciplinary support services for adults with high-functioning autism/Asperger syndrome

TECHNICAL PAPER

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Photographs courtesy of Mystic Monkey and Ladbroke Grove Autism Centre

Introduction

1 As part of fieldwork for the National Audit Office value-for-money report *Supporting people with autism through adulthood* (available at http://www.nao.org.uk/publications/0809/autism.aspx), we developed a model to analyse the potential financial impacts of providing multi-disciplinary support services for adults with high-functioning autism/Asperger syndrome across England. The model compares the current baseline of service provision, costs and outcomes with a scenario where adults with high-functioning autism are provided with better targeted health, social care and employment support, achieving outcomes comparable with those of existing specialist services.

2 Our aim in building the model was to explore the extent to which there is scope for value-for-money improvements in service provision for adults with high-functioning autism. The model is therefore a snapshot rather than a detailed year-on-year cost-benefit appraisal based on timed and discounted cashflows. Costs such as training costs are apportioned to the multi-disciplinary team on an annuitised basis in the model, and hence are recognised as an annual expense rather than a front-loaded investment. Similarly, we have made no attempt to monetise quality-of-life improvements for adults with autism or their carers, but have concentrated solely on financial costs and benefits to the public purse and to individuals.

3 Probability and cost values for the model were obtained from our survey of Local Authorities and their NHS partners, detailed analysis of cost and caseload data from existing specialist services, published figures and expert opinion. The following is a summary of the model, the assumptions made in its construction, and the main findings.

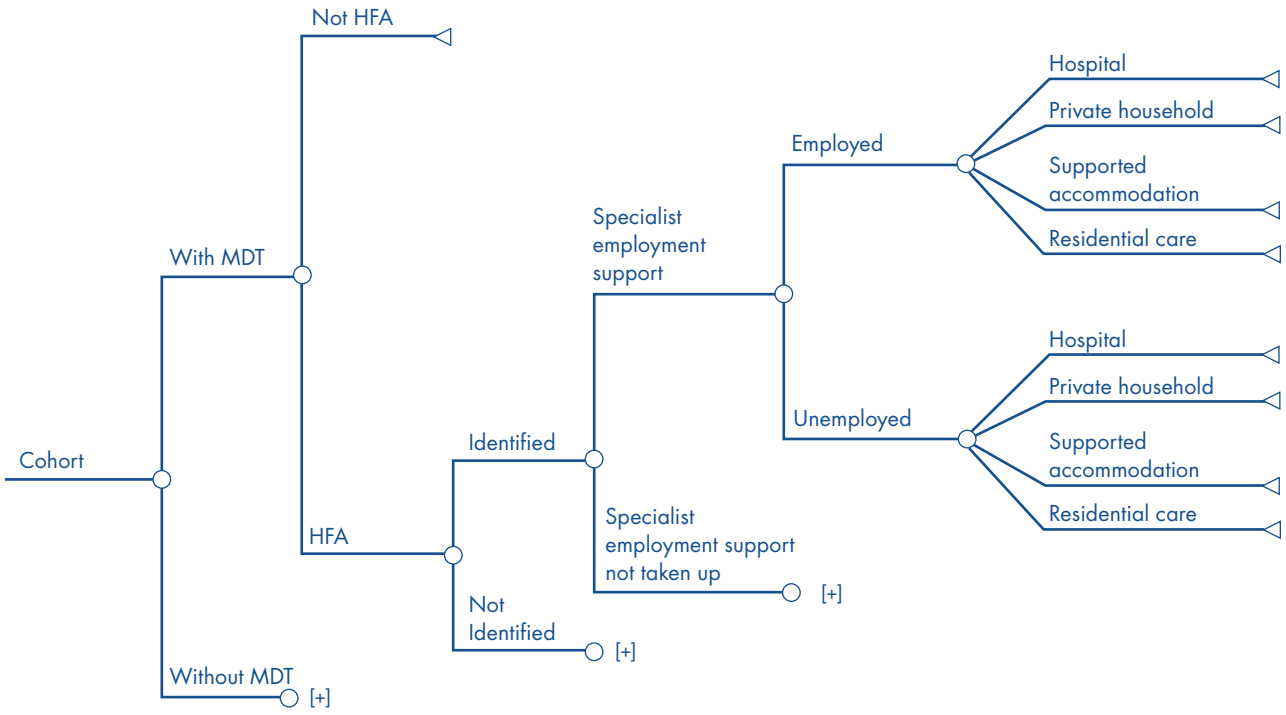
The model

4 The model is a decision analytic model constructed using the software package Treeage 2008 Professional. **Figure 1** shows the model structure.

5 The model sets out a 'snapshot' view of the annual pattern of service utilisation by adults with high-functioning autism, following the 'care pathway' of such adults, from detection, through intervention and support to outcomes in terms of employment, accommodation and healthcare. **Figure 2 overleaf and Figure 3 on page 5** illustrate the care pathways and different levels of service utilisation the model attempts to reconstruct.

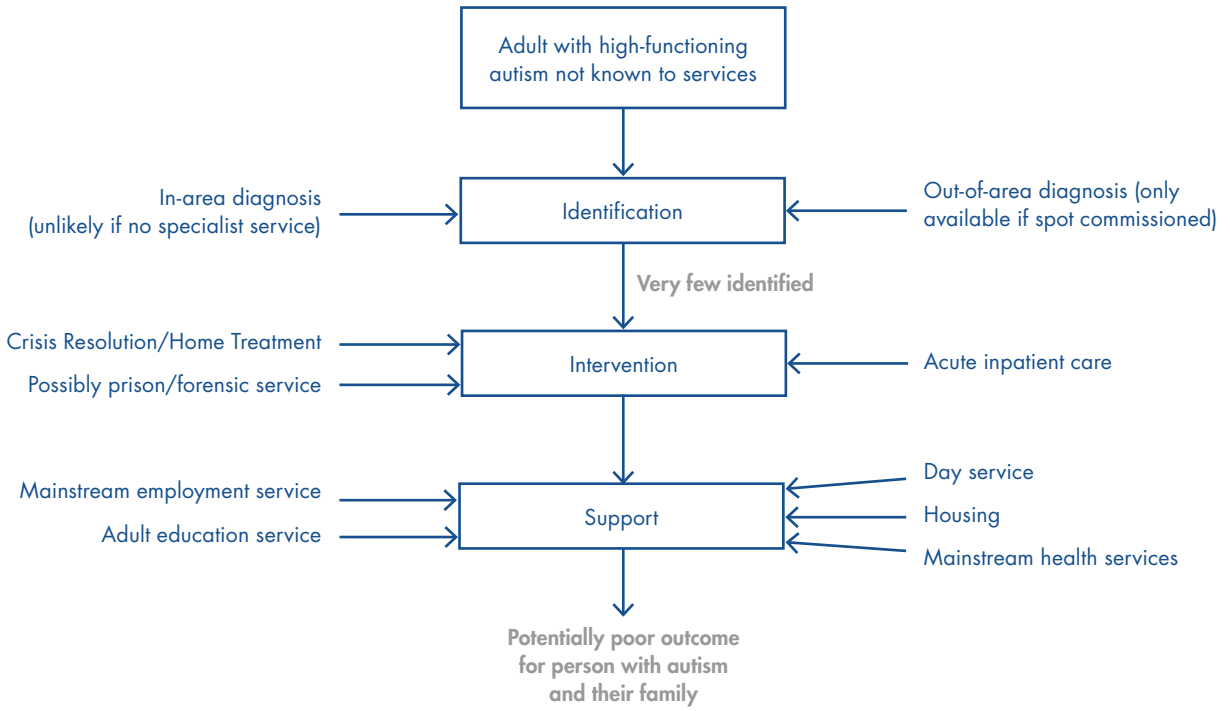
6 The model combines prevalence estimates, identification rates and probabilities of accessing services to estimate levels of service utilisation. This information is then combined with unit costs estimated for different services to obtain the total cost of service utilisation.

1 Decision tree model to compare the costs of current service provision against the cost of providing specialist Multi-Disciplinary Team (MDT) support for adults with high-functioning autism (HFA)



Source: National Audit Office

2 Care pathway and service utilisation with no specialist service in place



Source: National Audit Office

Probabilities

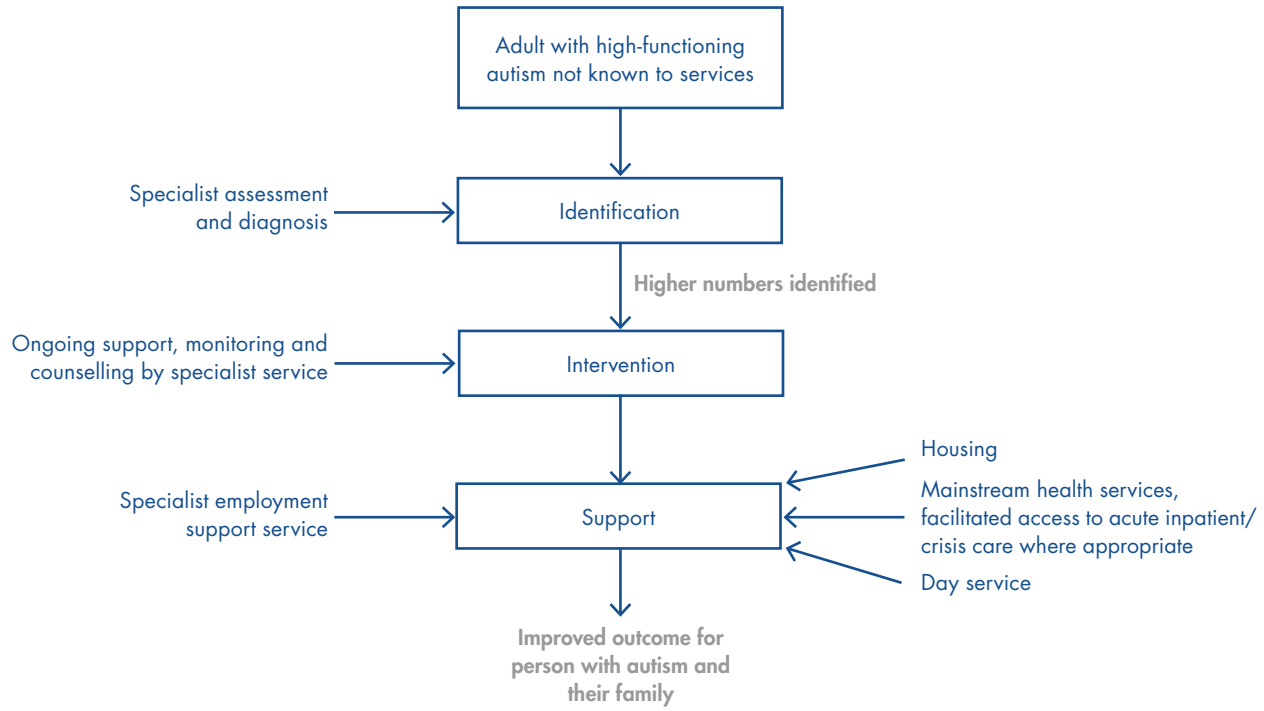
7 Probabilities were estimated using results obtained from the NAO survey of Local Authorities and their NHS partners, and from more detailed data supplied by local service providers where possible. Otherwise they were obtained from published literature. **Figure 4 on page 6** sets out the probabilities used in the model and their sources. Also shown in the table are the distributions that were fitted to study the effects of uncertainty in the probability parameters via probabilistic sensitivity analyses. These sensitivity analyses are discussed further below.

Costs

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

- Costs to the NHS: inpatient care, crisis resolution/ home treatment, NHS accommodation and treatment costs (including the NHS contribution to specialist autism services).
- Costs to local government: social services costs (including contribution to specialist autism services), employment support (LA-funded provision), housing (in or out of area), adult education, day services.
- Costs to central government: employment support (DWP-funded provision).
- Costs to private individuals: accommodation, family expenses, carers' lost earnings.

3 Care pathway and service utilisation with specialist service in place



Source: National Audit Office

9 One of the intended outcomes of the specialist service is increased employment, which is desirable in itself, as well as potentially reducing benefits payments and increasing tax revenue. However, there is only limited data available to evaluate these effects. A detailed study of the 'Prospects' supported employment service[1] showed that, on average, benefits claimed by adults with high-functioning autism in employment tend to go down, but that they could also go up if the specialist autism service identifies individuals eligible for, but not currently claiming, benefits. We have assumed, based on the Prospects study which examined total levels of benefits[2] that clients received before and after participation in the programme, that the savings to the Exchequer from decreased benefits payments due to increased employment rates would be approximately one fifth of gross income earned. This is consistent with the evidence on the benefits accruing from disability employment support schemes more generally.[3] Estimated tax flowbacks from increased employment (income tax and national insurance) are shown for reference in Figures 12 and 13. We have not, however, treated these as a benefit to the Exchequer, instead calculating increased earnings on a gross basis. Our base case employment assumption is that 18 per cent of adults with high-functioning autism are in employment, with two-thirds of these being in full-time employment,[4] although we consider alternative employment scenarios below.

1 Howlin P, Alcock J, Burkin C, 'An 8-year follow-up of a specialist support employment service for high-ability adults with autism or Asperger syndrome' in *Autism* 9(5) (2005), 533-549.
2 These comprised severe disability allowance, income support, housing benefit, job seeker's allowance, incapacity benefit, council tax and tax credit (Howlin et al., p.542).
3 National Audit Office, *Gaining and retaining a job: the Department for Work and Pensions' support for disabled people* (HC 455 2005-2006), p.49 (http://www.nao.org.uk/publications/0506/gaining_and_retaining_a_job.aspx).
4 Barnard, J et. al., *Ignored or Ineligible? The Reality for Adults with Autism Spectrum Disorders* (National Autistic Society, 2001), p.7 (http://www.nas.org.uk/content/1/c4/28/61/ignored.pdf).

4 Probability parameters used in the decision tree model

Parameter (Probability)	Value	Distribution	Reference
Prevalence	0.005	Beta (n=1,000, r=5)	CDC Morbidity and Mortality Weekly Report (9 Feb 2007) estimate (44.6 per cent of people with autism have 'cognitive impairment', i.e. are 'low functioning'.). Baird et al., (2006)[1] estimate 55 per cent of total as low-functioning.
Identification rate			NAO survey/data from specialist services. Identification rate calculated as number of adults with high-functioning autism known to services divided by estimated total adults with high-functioning autism in population. Total adults with high-functioning autism estimated as 0.5 per cent of ONS mid-2007 estimate of working-age (16-59/64) adult population).[2]
with MDT	0.04		
without MDT	0.01		
Probability of crisis management			Data from specialist Asperger services, comparing proportion of time spent by their clients in crisis treatment before and after being diagnosed and supported by the specialist service.
before identification	0.0007	Triangular (0,0.0007,0.04)	
post identification	0.0029		
Probability of acute inpatient care			Data from specialist Asperger services, comparing proportion of time spent by their clients in inpatient care before and after being diagnosed and supported by the specialist service.
ratio of hospitalisation rate post-identification vs pre-identification	2.0		
Probability of employment			
without employment service	0.18		Knapp et al. (2007)[3]
ratio of employment rate with service vs no service	1.9		Barnard et al. (2001)[4] Howlin et al. (2005)[5]
Probability of employment service take up after identification	0.8		Estimate
Location of residence before identification			
Private accommodation	0.78		NAO survey of Local Authorities and NHS organisations.[6]
Supported Accommodation	0.14		
Residential care	0.07		
Hospital	0.01		
Location of residence after identification			
Private accommodation	0.915	Beta (203,190)	Data from specialist services
Supported Accommodation	0.06	Beta (203,12)	
Residential care	0.005	Beta (203,1)	
Hospital	0.02		

Source: National Audit Office

NOTES

1 Baird, G, Simonoff, E, Pickles, A, et al. 'Prevalence of disorders of the autism spectrum in a population cohort of children in South Thames: the Special Needs and Autism Project (SNAP)' in *The Lancet* 368 (2006), 210 -215.

2 http://www.statistics.gov.uk/statbase/Product.asp?vlnk=15106. Note that the working-age population has been used as a denominator throughout the calculations to ensure comparability rather than as an assumption that only working-age adults would be served by specialist Asperger teams. Whilst employment support services will clearly be most relevant for working-age adults, a number of existing specialist Asperger health and social care services also cater for older adults (aged 65 and over). Owing to low diagnosis rates in the past, however, such clients are likely to make up only a small percentage of teams' caseload (approximately six percent where data on dates of birth was available for our analysis).

3 Knapp et al., *The Economic Consequences of Autism in the UK* (Foundation for People with Learning Disabilities, 2007).

4 Barnard, J et. al., *Ignored or Ineligible? The Reality for Adults with Autism Spectrum Disorders* (National Autistic Society: London, 2001), p.7 (http://www.nas.org.uk/content/1/c4/28/61/ignored.pdf).

5 Howlin P, Alcock J, Burkin C, 'An 8-year follow-up of a specialist support employment service for high-ability adults with autism or Asperger syndrome' in *Autism* 9(5) (2005), 533-549.

6 We obtained figures for the numbers of adults with high-functioning autism known to services and living in supported accommodation or residential care, or in hospital, from our survey and from reviewing data from specialist services. We assume that the remaining expected number of adults with high-functioning autism are living in private accommodation.

10 The cost of providing specialist autism services via a multi-disciplinary team is applied to the cohort of general population as a fixed cost, regardless of the level of identification, and at what stage on the patient pathway it is utilised. Such specialist services can be commissioned and provided by the NHS or Local Authorities, or indeed a combination of the two. For the purposes of the model, we have assumed that the costs of specialist service provision are split equally between the NHS and Local Authorities.

11 The model uses 2007-2008 prices where available. Cost estimates from different time periods are adjusted to 2007-2008 using the Consumer Price Index for Health **(Figure 5)**.[5] 2005 is the base price level.

12 **Figure 6 on pages 8, 9 and 10** shows the costs used in the model, as well as the distributions fitted when modelling uncertainty in the estimates (as with the probability parameters reported in Figure 4).

5 Consumer Price Index used to adjust costs in the model to 2007-08 prices

Year	2003	2004	2005	2006	2007	2008
Index	95.5	97.2	100.0	102.7	106.2	109.5

Source: Office for National Statistics

13 The model assumes that:

- People in employment and receiving supported employment services do not use any day services or adult education services.
- People identified and supported by the specialist service and not in employment continue to use day services.
- People who do not access the specialist supported employment service have the same pattern of utilisation of non-autism-specific employment support as the rest of the population.
- As in the case of specialist multi-disciplinary team costs, other health, social care and treatment costs are split equally between the NHS and Local Authorities.
- Costs of day service provision, adult education, crisis management, and other health, social care and treatment costs are applied as per capita costs for the individuals using those services.
- People living in private accommodation may be living independently, or may be living with carers. In the case of people living independently, we have assumed living expenses of £11,176 per annum **(Figure 7 on page 12)**; in the case of people living with carers, we have assumed costs of £6,000 per annum, consisting of £3,912 in lost carer earnings, and £2,008 in family expenses. As we have no information on what proportion of people with high-functioning autism live in each of these types of private settings, we have run the model twice: once assuming that all are living with carers, and once assuming that all are living independently. We have then used the mid-point between these two extremes to estimate the financial impact on private individuals, i.e. treating half of those in 'private accommodation' as living in their parental home and half independently.
- Based on Information Centre data on user charges paid by working-age adults in residential placements, ten per cent of such costs have been attributed to private individuals rather than Local Authorities.[6]

5 http://www.statistics.gov.uk/statbase/TSDtimezone.asp.
6 Source PSS EX1 data return 2007-08 (http://www.ic.nhs.uk/statistics-and-data-collections/social-care/adult-social-care-information/personal-social-services-expenditure-and-unit-costs:-england-2007-08).

6 Cost parameters used in the decision tree model

Parameter (cost annual)	Value in literature/ assumed	Adjusted value (using CPI index above)	Attributed to	Distribution	Reference
Supported accommodation	£59,022 (2005-2006 price)	£62,681	Local Authority	Lognormal (11.02782, 0.035996)	Knapp et al. (2007)[1]
Residential care home	£61,734 (2005-2006 price)	£65,562	Local Authority	Lognormal (11.07428, 0.032952)	Knapp et al. (2007)
Private household	£1,488 (2005-2006 price)	£1,580	Local Authority[2]	Lognormal (7.317459, 0.095441)	Knapp et al. (2007)
Hospitalisation	£75,480 (2005-2006 price)	£80,160	NHS	Lognormal (11.27457, 0.034417)	Knapp et al. (2007)
Day service	£2,226 (2005-2006 price)	£2,364	Local Authority		Knapp et al. (2007)
Crisis management	£11,712 (2006 price)	£12,487	NHS		Previous NAO work on Crisis Resolution/Home Treatment services estimated the average cost per month of CRHT input per patient as £976 (based on 2006 prices).[3] Multiplying this by 12 produces an estimated annual cost of £11,712.
Cost of multidisciplinary team per 1,000 working-age adult population	£1,420	£1,420	NHS/ Local Authority		Staff mix and headcount from existing specialist services, costs from Curtis L, *Unit Costs of Health and Social Care* (2008) and discussions with teams and training providers, population figures from ONS Mid-2007 estimates of working-age (16-59/64) adult population).[4] (Figures 8 and 9).
Cost of autism-specific employment support per successful job placement	£4,281 (2003-03 price)	£4,760	DWP/Local Authority		Howlin et al. (2005). Costs are attributed to DWP/LA in the same proportions as for mainstream support (below).[5]
Mainstream disabled employment support services (per 1,000 population aged 16-64 (male) and 16-59 (female))	£13,440	£13,440	DWP/Local Authority		Total DWP GB specialist employment programme costs (£444.8m, Source: DWP) Non-DWP funding of specialist employment services estimated at £50m p.a.[6] GB-wide total (£444.8m + £50m) divided by 2007 GB population aged 16-59/64 (36,815) x 1,000.

6 Cost parameters used in the decision tree model *continued*

Parameter (cost annual)	Value in literature/ assumed	Adjusted value (using CPI index above)	Attributed to	Distribution	Reference
Average earnings per person with autism in employment	£20,756	£20,756	Private individual		Estimate based on Office of National Statistics data on average earnings of £24,908 for a 35 hour week; number of hours worked per person with autism supported ranging from 5-35,[7] but with approximately twice as many adults with high-functioning autism being in full-time than part-time work (as per Barnard et al., 2001).[8]
Adult education service per person	£2,886	£3,065	Local Authority		Knapp et al. (2007)
Other health, social care and treatment costs per person	£634	£673	NHS/ Local Authority		Knapp et al. (2007)
Lost employment for informal carer	£3,684	£3,912	Private individual		Knapp et al. (2007)
Family expenses per person	£1,891	£2,008	Private individual		Knapp et al. (2007)
Living expenses for adults living independently	£10,785	£11,176	Private individual		ONS Family Expenditure Survey for 2007 (expenditure for single non-retired adult houesholds), uprated using all-items consumer price index (Figure 7)
Cost of diagnostic assessment in area per person	£521	£521	NHS		Discussion with specialist services on direct staff time and resources used for diagnosis, costed using Curtis L, *Unit Costs of Health and Social Care* (2008)
Cost of diagnostic assessment out of area per person	£2,500		NHS		Discussion with specialist services

6 Cost parameters used in the decision tree model *continued*

Parameter (cost annual)	Value in literature/ assumed	Adjusted value (using CPI index above)	Attributed to	Distribution	Reference
Cost of diagnosis with no specialist service in place per 1000 adult population	£40	£40	NHS		Discussion with specialist services (see below, paragraph 15). Average cost= ((0.25 x £521)+(0.75 x £2,500)) = £130 + £1,875 = £2,005 per diagnostic assessment Every two referrals are assumed to result in one diagnosis, therefore cost per diagnosis = 2 x £2,005 = £4,010 NAO survey/data from specialist services shows identification rate in areas without specialist service of 1% of estimated total with high-functioning autism. Therefore average number of people identified in such areas = 1,000 x 0.5% x 1%, at a diagnostic cost of 0.05 x £4,010 = £200. Assuming all such people have been identified in the last 5 years, annual cost = £200/5 = £40.

Source: National Audit Office

NOTES

1 Knapp, M, Romeo, R and Beecham, J, *The Economic Consequences of Autism in the UK* (Foundation for People with Learning Disabilities, 2007). The average annual estimates of costs for adults in supported housing and residential care accommodation in the Knapp study were obtained by pooling data from five datasets on the costs for people by types of accommodation and averaging across the total sample. These figures are in line with the estimates provided in the standard reference on unit costs of health and social care (Curtis, *Unit Costs of Health and Social Care*, published annually) for the costs of this type of accommodation more generally. For example, 2006 *Unit Costs* identify the establishment cost per week of supported living schemes as £1,177. An annual estimate would be £1,177 x 52 = £61,204, close to the Knapp et al. 2006 estimate of £59,022.

2 Knapp et al. base this cost estimate for private household on data obtained from Jarbrink K, Knapp M, 'The economic impact on autism in Britain' in *Autism* 5 (1): 7-22 (2001), where the authors cost the amount of supervision required for adults with autism living at home (in addition to both 'family expenses' and 'lost employment for informal carer'). This expense could in theory fall to either the public or the private purse, but to reflect that it might be covered by LA-funded self-directed support, and to avoid overstating potential savings to the public purse of people living in more independent settings, we have attributed this cost to Local Authorities.

3 National Audit Office, *Helping People through Mental Health Crisis: The Role of Crisis Resolution and Home Treatment Services* (HC 5, 7 December 2007), n.48, p.37 (http://www.nao.org.uk/publications/nao_reports/07-08/07085.pdf).

4 http://www.statistics.gov.uk/statbase/Product.asp?vlnk=15106.

5 Howlin P, Alcock J, Burkin C, 'An 8-year follow-up of a specialist support employment service for high-ability adults with autism or Asperger syndrome' in *Autism* 9(5) (2005), 533-549.

6 A previous NAO report found that there were some 2,500 voluntary and Local Authority projects providing more than 6,700 employment-related services to disabled people across the country. See National Audit Office, *Gaining and retaining a job: the Department for Work and Pensions' support for disabled people* (HC 455 2005-2006, 13 October 2005), p.40 (http://www.nao.org.uk/publications/0506/gaining_and_retaining_a_job.aspx). In the absence of precise figures for non-DWP funded supported employment, discussions with the British Association for Supported Employment produced a GB-wide estimate of approximately £50 million p.a.

7 Howlin P, Alcock J, Burkin C, 'An 8-year follow-up of a specialist support employment service for high-ability adults with autism or Asperger syndrome' in *Autism* 9(5) (2005), 533-549.

8 Barnard, J et. al., *Ignored or Ineligible? The Reality for Adults with Autism Spectrum Disorders*, NAS: London, 2001, p.7 (http://www.nas.org.uk/content/1/c4/28/61/ignored.pdf).

9 Where local Primary Care Trusts have not commissioned diagnostic services, these costs may fall to private individuals. In the absence of data on numbers of privately funded diagnoses, however, we have attributed all diagnostic costs to the NHS.

10 Curtis L, *Unit Costs of Health and Social Care*. (Canterbury: Personal Social Services Research Unit, 2008).

7 Living expenses for adults living independently

Items	Weekly cost (£) (2006-07 prices)	Annual cost (£) (2006-07 prices)	Uplifted annual cost (£) (2007-08 prices)
Food and drinks	24	1,253	1,299
Clothing and footwear	10	520	539
Housing fuel and power	47	2,434	2,522
House goods and services	21	1,071	1,110
Health	3	151	156
Transport	41	2,127	2,204
Communication	8	437	453
Miscellaneous goods and services	22	1,128	1,169
Recreation and Culture	32	1,664	1,724
Total	**207**	**10,785**	**11,176**

Source: ONS Family Expenditure Survey 2007 (http://www.statistics.gov.uk/downloads/theme_social/Family_Spending_2007/FamilySpending2008_web.pdf)

14 In costing the health and social care multi-disciplinary team, we reviewed the staff mix of a number of specialist Asperger services currently in operation **(Figure 8)**. The make-up of such services varies between localities, although all include multi-disciplinary autism specialist input and offer both diagnostic assessment and support services. **Figure 9** shows the unit costs assumed for individual team members. Adjusting for differences in local population size, two of the three (Liverpool and Kingston) cost approximately the same (around £1,400 per 1,000 of population served). Although equivalent costs for the third team (Northamptonshire) are much lower, the team report that they currently have difficulty meeting demand, particularly for diagnostic assessments. For the purposes of our modelling, therefore, we have assumed costs equivalent to Liverpool and Kingston.

15 Diagnostic assessment costs are derived from discussions with specialist services who carry out diagnoses both for their 'home' Local Authority/Primary Care Trust under service level agreements and for other commissioners (i.e. spot-purchasing/out of area) on an ad hoc basis. Discussions with one Asperger specialist suggest that, prior to implementation of a full specialist service in there area (but with the specialist carrying out some assessments and diagnoses locally), approximately half of diagnoses took place out of area. Reducing this proportion to reflect areas where there is no specialist Asperger clinician and no specialist Asperger service, it is assumed that on average a quarter of all referrals are dealt with in area, and three quarters are dealt with out of area. Based on data from the Liverpool service, who have made approximately 250 diagnoses from around 540 referrals, it is assumed that about every two referrals results in one diagnosis of high-functioning autism. It is further assumed that those who were identified in areas without specialist service provision were all identified in the last five years.

8 Staff mix and costs of existing specialist Asperger services

		Liverpool	Kingston	Northamptonshire[1]
2007 working-age (16-59/64) adult population (000)		284.6	106.6	425.9
Team Staffing (Whole-Time Equivalent)	Consultant Psychiatrist	0.00	0.00	0.00
	Clinical psychologist	0.80	0.50	2.00
	Occupational Therapist	0.00	0.20	1.00
	Community Psychiatric Nurse/Social Worker	3.00	1.00	1.00
	Support Worker	3.00	1.20	0.00
	Admin/Secretary	1.00	0.20	0.30
	Team Manager	0.50	0.40	0.00
	Speech and Language Therapist	0.50	0.20	0.00
Estimated Cost (£)		369,421	163,713	240,073
Estimated cost per 1,000 of working-age (16-59/64) adult population (£)		1,298	1,536	564

Source: National Audit Office analysis of ONS population estimates, individual service specifications and discussion with service providers. Costs are taken from Curtis L, Unit Costs of Health and Social Care (Canterbury: Personal Social Services Research Unit, 2008), and where relevant include costs of qualification and autism-specific further training annuitised over the individual's working life.

NOTE

1 The Northamptonshire service also cover other developmental disorders such as Attention Deficit Hyperactivity Disorder, but estimate that approximately half of their resources are dedicated to high-functioning autism/Asperger Syndrome. The figures used here are therefore half of the whole-time equivalent team specification.

9 Unit costs assumed for individual team members in specialist Asperger services

£	Consultant Psychiatrist	Clinical psychologist	Occupational Therapist	CPN / Social Worker	Speech and Lang Therapist	Support Worker	Team Manager
Salary	117,450	34,300	22,900	28,494	22,900	21,296	35,410
On costs	29,686	7,422	4,788	7,135	4,788	5,211	9,010
Qualifications	31,475	22,000	4,171	5,862	4,379		
Additional training	2,227	113	90	90	115	90	
Overheads	7,904	5,047	4,345	5,344	4,345	3,134	6,663
Capital Overheads	4,944	2,573	2,972	2,568	2,972		2,568
Total	**193,686**	**71,455**	**39,266**	**49,493**	**39,499**	**29,731**	**53,651**

Source: National Audit Office analysis of unit cost data

NOTES

1 Salaries, on-costs and qualification costs are taken from Curtis L, *Unit Costs of Health and Social Care* (Canterbury: Personal Social Services Research Unit, 2008).

2 No qualification costs are available for clinical psychologists (see Curtis, p.97). Therefore for the purposes of analysis we have assumed an approximate cost of £22,000 (70 per cent of the equivalent cost for a Consultant Psychiatrist). We have explored the possible impact of variations in costs through sensitivity analyses (see paragraph 17, below).

3 Additional autism-specific training for individual team members has been costed from discussions with team members and specialist training providers, assuming full DISCO diagnostic training (approximately £1,380) for psychologists, training in TEACCH (approximately £1,000) and PECS (approximately £400) for speech and language therapists and a two-module specialist university qualification for other team members (approximately £1,100). These one-off autism-specific training costs have been annuitised over the individual's working life using the same method as Curtis.

4 The full breakdown of salary, on-costs and overheads for secretarial/administrative support is not listed in Curtis, but an overall cost of £28,011 is attributed as an overhead when costing senior clinical staff (e.g. p.161). We have therefore assumed this unit cost for such support in calculating the total cost of teams.

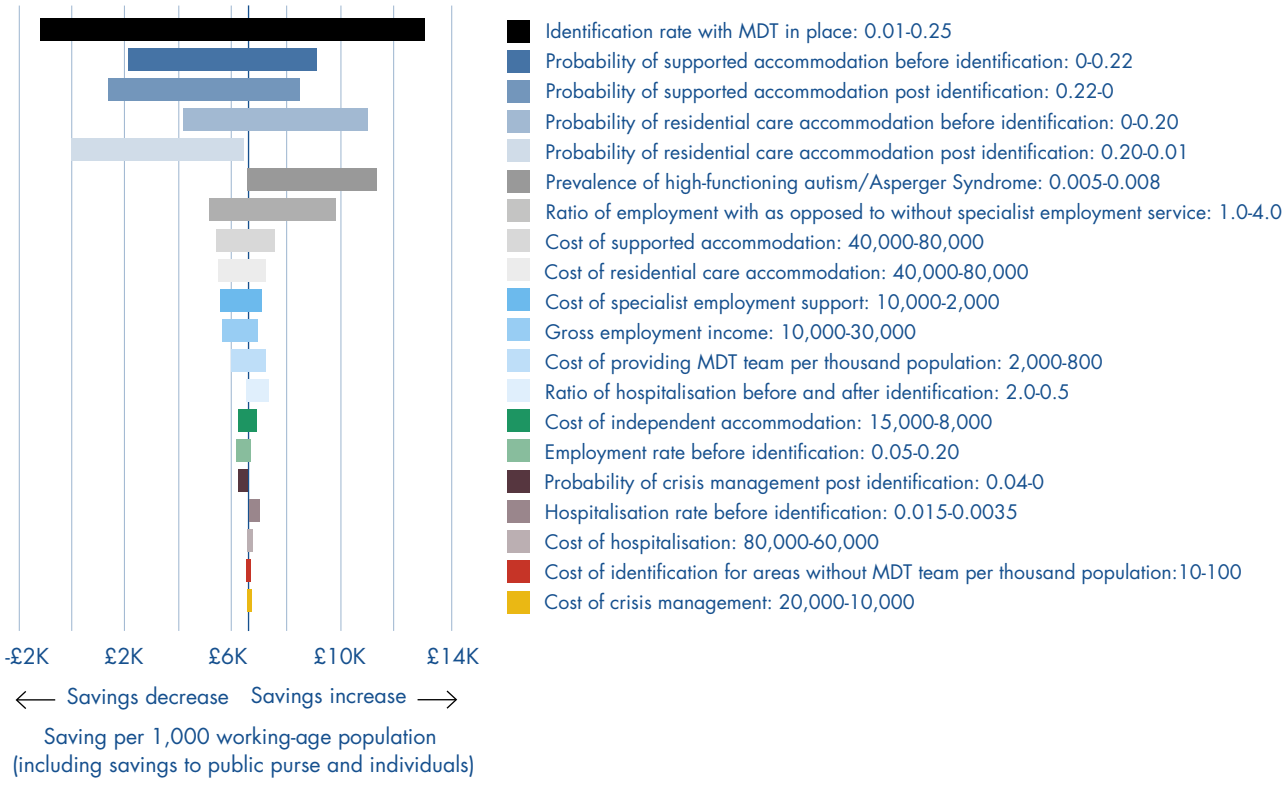
5 We have applied general overheads to support workers at a comparable rate to other team members, but because they will be largely community-based, have not included capital overheads for these staff.

Sensitivity analyses

16 The inputs to the model are subject to various degrees of uncertainty. To explore the effects of this, parameters were varied around their base case values. The results of these 'one-way sensitivity analyses' are shown in **Figure 10**.

17 Figure 10 shows how varying the model parameter values affects the incremental cost of service utilisation (i.e. the difference between the total cost of service utilisation if a specialist service is in place, and the total cost if there is no specialist service in place). Positive values on the horizontal axis represent a net saving, and negative values represent a net cost. The horizontal bars show how the total incremental cost/saving varies as each parameter is varied over the range of values shown.

10 Variations in total incremental cost of service utilisation by adults with high-functioning autism when a specialist support service is available



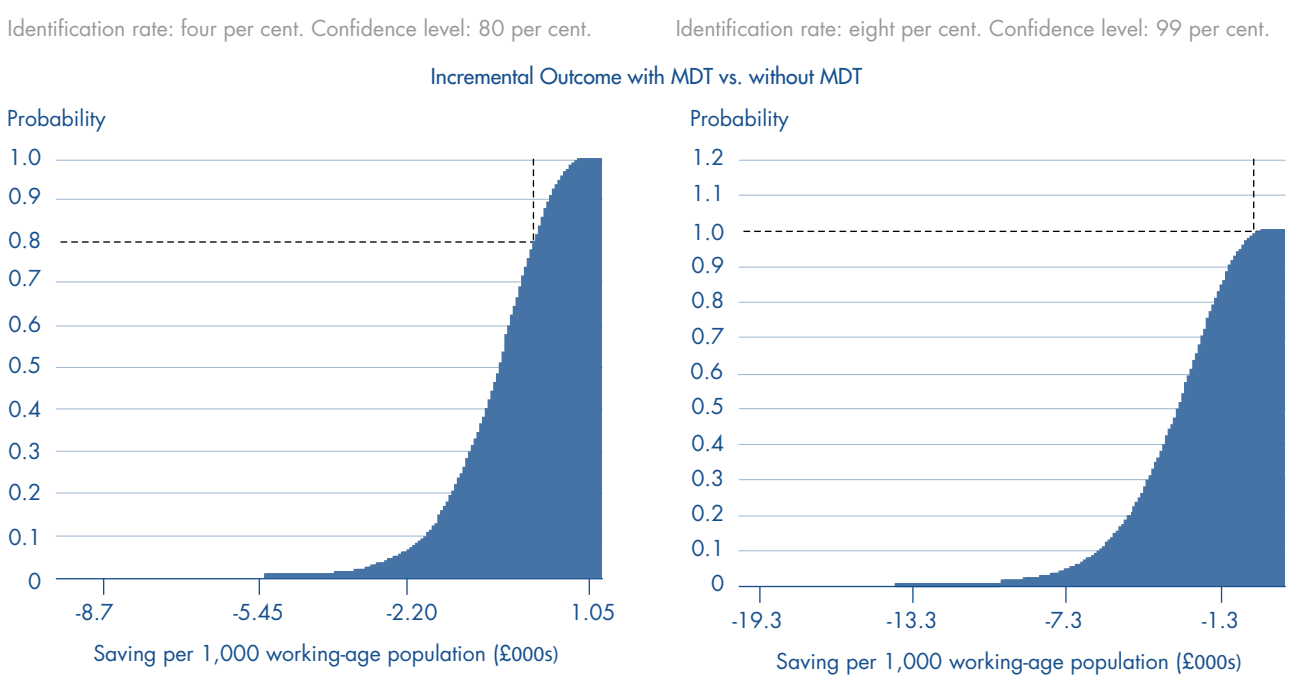
Source: National Audit Office analysis

18 Figure 10 indicates that the modelled incremental cost is particularly sensitive to: the proportion of the local population with high-functioning autism/ Asperger Syndrome which the service could identify, the proportion of clients in supported housing or residential care who could more cost-effectively be cared for in private households, and the proportion of its clients finding employment.

Monte Carlo Simulation

19 To examine the joint effects of uncertainty in the values of the parameters to which the outputs of the model are most sensitive, these parameters were assigned probability distributions, as shown in Figure 4 and Figure 6. A 'Monte Carlo' simulation was then run, whereby each of these parameters is assigned a value sampled from its distribution and the results for incremental costs given by the model are calculated. After each sampling, the model is re-run, and the process is repeated 10,000 times to produce a distribution of possible results. Two such distributions are shown in **Figure 11**. These indicate that, with the base case values and distributions for model parameters given in Figure 4 and Figure 6, there is a greater than 80 per cent chance that providing a specialist service for adults with high-functioning autism will be cost-saving. If the rate of identification of adults with high-functioning autism (as a proportion of the estimated prevalence within each Local Authority) is increased to eight per cent, the probability that the service will be cost-saving is greater than 99 per cent.

11 Distributions of possible cost savings resulting from provision of specialist services for high-functioning autism (results of probabilistic sensitivity analyses)



Source: National Audit Office analysis

The impact of identifying more adults with high-functioning autism

20 In order to test the likely impact of different rates of identification of adults with high-functioning autism (as a proportion of the estimated prevalence within each Local Authority), we held the identification rate constant at various levels, and ran the above simulations again. The results are summarised in **Figure 12 below and Figure 13**.

21 Currently, the longest-running specialist Asperger service in England, the Liverpool Asperger team, is achieving an identification rate of about 14 per cent. Figure 13 shows that if a similar identification rate could be achieved across the country, the estimated total benefit to the public purse could be £159 million (the total working-age population of England is 31.8 million). At a more conservative estimate of a realistically achievable identification rate of eight per cent, the model suggests the benefit could be £67 million per annum.

12 Probabilistic Sensitivity Analysis with identification rate held constant at various levels, showing costs and benefits to both public services and private individuals, per 1,000 working-age population

	Annual incremental costs / (benefits) per 1,000 working-age population, specialist service vs no specialist service						
Identification rate	**2%**	**4%**	**6%**	**8%**	**10%**	**12%**	**14%**
Estimated cost/ (benefit) to Department for Work and Pensions	0.0	0.1	0.2	0.3	0.3	0.4	0.5
(£000)	0.0-0.1	0.0-0.3	0.0-0.4	0.0-0.5	0.0-0.7	0.1-0.8	0.1-0.9
Estimated cost/(benefit) to Local Authorities	0.0	(1.1)	(2.2)	(3.3)	(4.4)	(5.5)	(6.6)
(£000)	(0.7)-0.5	(3.0)-0.1	(5.2)-(0.2)	(7.6)-(0.6)	(9.8)-(0.9)	(12.0)-(1.3)	(14.1)-(1.6)
Estimated cost/(benefit) to NHS	0.7	0.8	0.8	0.9	1.0	1.0	1.1
(£000)	0.7-0.7	0.7-0.9	0.7-1.0	0.7-1.2	0.8-1.3	0.8-1.5	0.8-1.6
Estimated total cost/ (benefit) to public purse	**0.7**	**(0.2)**	**(1.2)**	**(2.1)**	**(3.1)**	**(4.1)**	**(5.0)**
(£000)	**0.2-1.2**	**(1.8)-0.9**	**(4.0)-0.6**	**(6.0)-0.2**	**(7.9)-(0.1)**	**(9.9)-(0.3)**	**(12.0)-(0.6)**
Estimated total cost/ (benefit) to private individuals (including gross earnings)	**(0.2)**	**(0.2)**	**(0.3)**	**(0.4)**	**(0.5)**	**(0.6)**	**(0.7)**
(£000)	**(0.3)-0.0**	**(0.5)-(0.1)**	**(0.7)-(0.1)**	**(0.9)-(0.1)**	**(1.1)-(0.2)**	**(1.3)-(0.2)**	**(1.5)-(0.2)**
Estimated Income Tax and National Insurance contributions recovered from benefits to private individuals but not counted as benefits to public purse, above	(0.05)	(0.10)	(0.15)	(0.20)	(0.25)	(0.30)	(0.35)
(£000)	(0.1)-0.0	(0.2)-0.0	(0.3)-(0.1)	(0.4)-(0.1)	(0.5)-(0.1)	(0.6)-(0.1)	(0.7)-(0.1)

Source: National Audit Office analysis

NOTE

Figures may not sum exactly due to rounding. Figures in grey are 95 per cent confidence intervals for the estimated results.

13 Probabilistic Sensitivity Analysis with identification rate held constant at various levels, showing England-wide costs and benefits to both public services and private individuals

	Annual England-wide incremental costs/(benefits), specialist service vs no specialist service						
Identification rate	**2%**	**4%**	**6%**	**8%**	**10%**	**12%**	**14%**
Estimated cost/ (benefit) to Department for Work and Pensions (£ million)	0.0	3.2	6.4	9.5	9.5	12.7	15.9
	0.0-3.2	0.0-9.5	0.0-12.7	0.0-15.9	0.0-22.3	3.2-25.4	3.2-28.6
Estimated cost/(benefit) to Local Authorities (£ million)	0.0	(35.0)	(70.0)	(104.9)	(139.9)	(174.9)	(209.9)
	(22.3)-15.9	(95.4)-3.2	(165.4)-(6.4)	(241.7)-(19.1)	(311.6)-(28.6)	(381.6)-(41.3)	(448.4)-50.9
Estimated cost/(benefit) to NHS (£ million)	22.3	25.4	25.4	28.6	31.8	31.8	35.0
	22.3-22.3	22.3-28.6	22.3-31.8	22.3-38.2	25.4-41.3	25.4-47.7	25.4-50.9
Estimated total cost/ (benefit) to public purse (£ million)	**22.3**	**(6.4)**	**(38.2)**	**(66.8)**	**(98.6)**	**(130.4)**	**(159.0)**
	6.4-38.2	**(57.2)-28.6**	**(127.2)-19.1**	**(190.8)-6.4**	**(251.2)-(3.2)**	**(314.8)-(9.5)**	**(381.6)-(19.1)**
Estimated total cost/ (benefit) to private individuals (including gross earnings) (£ million)	**(6.4)**	**(6.4)**	**(9.5)**	**(12.7)**	**(15.9)**	**(19.1)**	**(22.3)**
	(9.5)-0.0	**(15.9)-(3.2)**	**(22.3)-(3.2)**	**(28.6)-(3.2)**	**(35.0)-(6.4)**	**(41.3)-(6.4)**	**(47.7)-(6.4)**
Estimated Income Tax and National Insurance contributions recovered from benefits to private individuals but not counted as benefits to public purse, above (£ million)	(1.59)	(3.18)	(4.77)	(6.36)	(7.95)	(9.54)	(11.13)
	(3.2)-0.0	(6.4)-0.0	(9.5)-(1.6)	(12.7)-(3.2)	(15.9)-(3.2)	(19.1)-(3.2)	(22.3)-(3.2)

Source: National Audit Office analysis

NOTE

Figures may not sum exactly due to rounding. Figures in grey are 95 per cent confidence intervals for the estimated results.

22 As noted above, the financial impacts summarised in Figure 12 and Figure 13 are sensitive to the probabilities of adults with autism being in residential and supported housing settings before and after specialist services are in place, and also to the overall rate of employment of adults with high-functioning autism, and to the efficacy of specialist employment support services in increasing the probability of being in employment. We therefore ran further sensitivity analyses on these parameters, reducing in stages the 'effect sizes' of the specialist service provision from the baseline values (based on the performance of specialist services currently in place, and reported in Figure 4) down to a scenario of 'no effect'. We took more conservative values in each of these sensitivity analyses than we used in the base case to inform our estimate of reasonably achievable savings for an identification rate of eight per cent. **Figure 14** shows the effects of varying the proportions of adults with high-functioning autism in residential care or supported housing.

23 Under a scenario of a 12 per cent supported housing rate and a five per cent residential care rate before identification, we then ran sensitivity analyses on the proportion of adults with high-functioning autism in employment, and the effectiveness of autism-specific employment support (measured by the ratio of the proportion of such adults in employment when specialist services are in place compared to when they are not in place). The results are shown in Figure 15. They indicate, for example, that, at an employment rate of 15 per cent, and an effectiveness ratio of 1.5 (both more conservative than the figures reported in the literature and given in Figure 4), the total incremental benefit would be £2,100 per 1,000 working age population, or £67 million across the whole of England. £60 million of this figure would be savings to the public purse, and £7 million savings to private individuals.

14 Probabilistic sensitivity analysis of total incremental costs/(benefits) per 1,000 working-age population, with probabilities of being in residential care or supported accommodation before identification held constant at different values

Supported housing rate	14%	12%	10%	8%
Residential care rate	7%	5%	3%	1%
Total cost/(benefit) per 1,000 working-age population (£000)	(3) (7.7)-0	(2.3) (6.2)-0.2	(1.6) (5.8)-0.4	(0.9) (3.4)-0.7

Source: National Audit Office analysis

NOTE

Identification rate held at eight per cent. Figures in grey are 95 per cent confidence intervals for the estimated results.

15 Probabilistic sensitivity analysis of total incremental costs/(benefits) per 1,000 working-age population, with employment rate before identification and effect of employment support held constant at different values

Employment rate before identification	12%	14%	15%	16%	18%	20%
Ratio of employment rate with specialist support to rate without specialist support	1.2	1.4	1.5	1.6	1.8	2.0
Total cost/(benefit) per 1,000 working-age population (£000)	(1.9) (5.3)-0.3	(2.0) (5.5)-0.3	(2.1) (6.0)-0.3	(2.1) (6.0)-0.3	(2.2) (6.1)-0.2	(2.5) (6.7)-0.2

Source: National Audit Office analysis

NOTE

Identification rate held at eight per cent, residential care rate before identification held at five per cent, and supported housing rate before identification held at 12 per cent. Figures in grey are 95 per cent confidence intervals for the estimated results.

Conclusion

24 Clearly, the financial impacts of providing specialist services for adults with high-functioning autism/Asperger syndrome depend on many factors. Our modelling work was designed to examine the impacts that would be likely to occur under a range of plausible scenarios, using the best available information from a wide range of sources to inform the costs and probabilities on which such estimates depend. Figure 13 shows that providing a specialist service for adults with high-functioning autism/Asperger syndrome is unlikely to be cost-increasing.

25 One important driver of the overall financial impact of providing such specialist services more widely is the proportion of adults with high-functioning autism/Asperger syndrome that they can identify and support. If the identification rate is very low there would be a net cost to the public purse; but as the identification rate approaches four per cent, the model suggests that specialist services would become cost-neutral for the public purse over time, as well as resulting in additional earnings and reduced expenses for individuals. If specialist services can identify four per cent or more of the likely total number of adults with high-functioning autism in their local areas, they are likely to lead to a net benefit for the public purse. The level of this benefit rises if higher identification rates can be achieved. Since specialist services also improve outcomes for people with high-functioning autism and their carers, we conclude that there is potential for value-for-money improvements through more widespread availability of such services.

Discussion

26 Based on existing data, this model suggests that providing specialist multi-disciplinary support to adults with high-functioning autism could be marginally cost saving, and that these savings would increase considerably if the identification rates achieved by existing services of this type could be replicated across the country. However, a number of assumptions in the model are deliberately conservative to acknowledge that the evidence underpinning them is currently limited, and that further research is needed to produce more robust estimates.

27 For example, as well as the uncertainties around parameter estimates outlined above, the model does not currently take into account potential savings from avoiding inappropriate interactions with the criminal justice system. Although the research base to date is very limited, expert opinion suggests that high-functioning autism and Asperger Syndrome may be disproportionately represented among the prison population, and that a proportion of these detentions could potentially have been avoided through appropriate early intervention and case management.

28 Similarly, although the best available data were used to model the probability of clients accessing inpatient and crisis resolution treatment before and after coming under the care of the specialist service, it is possible that interactions with these services prior to diagnosis were not recorded as consistently in that period as in the period after diagnosis, where local services were aware of the service user owing to contact with the team. One possible result of this is an understatement of NHS acute care costs incurred by adults with high-functioning autism prior to diagnosis. This is in turn could lead to a potential overstatement of incremental costs to the NHS once such people come under the care of the specialist service, and their interactions with acute services (and hence the associated costs) are more accurately recorded.

29 Another limitation is that, although the model uses the best available information about the relative costs of different types of housing setting, this evidence base remains limited, particularly as very few Local Authorities were able to give us figures for how much they spent on accommodation for adults with autism. Linked to this, it is difficult to estimate the implications for housing benefit payments resulting from more adults with high-functioning autism living independently. Whilst estimated reductions in housing benefit are included in the estimate of benefits avoided as a result of increased employment in the model, there may be increases in housing benefit for people not receiving significant employment income but nonetheless living more independently. This might have some effect on the attribution of total costs and benefits to private individuals and public organisations, and more research would be useful to explore in more detail the implications of this for both Local Authority and DWP budgets.

30 The model does not explore whether care is provided in or out of area. While a small number of people with particularly complex needs may need specialist resources that cannot be provided in-area (for example forensic mental health services), with sufficient investment in specialised settings and staff, some services could potentially be provided locally at lower cost. Although national data on out-of-area placements are limited, a systematic review of existing research on placements for people with learning difficulties (including people with autism) concluded that the financial cost to authorities funding out-of-area placements can be high.[7] Where comparative data are available, out-of-area placements are on average more expensive than locally based services. It is possible that the availability of specialist multi-disciplinary support locally would reduce the need for out-of-area placements. Implementing our recommendation that all Local Authorities and NHS partners review their out-of-area placements for people with autism would provide further evidence on this topic, and allow a more robust estimate of the savings that might be realised through a specialist local support service.

7 Emerson E and Robertson J, *Commissioning person-centred, cost-effective, local support for people with learning difficulties* (Social Care Institute for Excellence, July 2008) (http://www.scie.org.uk/publications/knowledgereviews/kr20.pdf).