The costs of an intensive home visiting programme for vulnerable families

Emma McIntosh and Jane Barlow

Introduction

Home visiting programmes are now being used extensively in countries such as the USA (Olds et al., 1997) and Australia (Brown, 2004) and this development reflects a growing recognition of the importance of the first three years of life not only in preventing a range of adverse health outcomes but in promoting optimal mental and physical health in infancy, childhood and adulthood. A recent HDA review of reviews shows that these programmes are associated with a range of benefits including better rates of breastfeeding, reduced accidents, improved detection and management of postnatal depression and improvements in parenting and the home environment (Bull et al., 2004). It is not, however, clear that their use is justified from an economic perspective. There have been few economic evaluations of health visiting services (Brooten et al., 1986; Hardy and Streett, 1989; Olds and Henderson, 1993; Archbold et al., 1995; Miller et al., 1996; Brown, 1992; Yanover et al., 1976; Morrell et al., 2000) most of which have been conducted in the US, have diverse economic objectives and many of which have been beset by methodological problems including the lack of a societal perspective. The results of these economic analyses have been variable with some studies showing that the costs of such services are offset by savings from reduced inpatient care etc. (Yanover et al., 1976; Olds and Henderson, 1993; Archbold et al., 1995; Miller et al., 1996) and some showing increased expenditure on home visiting with no savings (Brown, 1992).

Methods

A multicentre randomised controlled trial (RCT) was conducted in which women identified as being 'at risk of poor parenting' were randomly allocated to a home visiting arm (n=67) or a standard treatment control arm (n=64). Further details of the development of the home visiting service, RCT methods (Barlow et al., 2003) and full cost effectiveness analysis (McIntosh et al., 2006, submitted) are reported elsewhere. This article reports the costing methodology and cost results.

Costing

Data on resource-use were identified and measured within the RCT. The resource-use data were collected as an integral part of the trial data collection forms. A section entitled '*Your use of Services'* was included in the trial forms and women were asked to recall their use of services such as visits to the GP for the antenatal period till 2-months postnatally, 2-months to 6-months postnatally and finally from 6-months to 12-months postnatally. To aid recall the women were asked to keep a 'Diary of service use', which they used as an aid to completing the resource-use form. Where such data were not completed women were asked to return their diary so that some estimate could be obtained of service use. Unit costs (2003/4) adjusted by appropriate quantities were then attached to the items of resource-use to obtain a study cost. These study costs were summed for each individual in the study and the mean difference in costs between the two arms of the trial estimated. Private costs incurred to women such as childcare costs, over- the-counter medicines and use of private practitioners was also measured. Unit costs were attached to all resources measured to allow reporting of variances in cost arising through economic significance as well as statistical significance. The majority of unit costs were obtained from Netten and Curtis (2003), Netten and Curtis (2004) and the 'New NHS' 2004 reference costs (NHS, 2004). Where unit costs required inflating to 2004 prices, the readily available Hospital and Community Health Services (HCHS) and Personal Social Services (PSS) inflationary indices were used. Recommended discount rates of 3.5 per cent were used for both costs and benefits where applicable (HM Treasury, 2003). A societal perspective was adopted such that costs to the health service, social services, legal costs, local authority housing costs, and private costs to women were included.

Results

Thirty-three items of potential resource-use services for this group of high-risk women were originally identified and included in the resource-use proforma for women to complete. The results reveal that 29 of these resource services had been used as well as a number of 'other' services. The resources identified along with their unit costs are listed in Table 1.

Table 1 Summary of main resources and unit costs

Resource Item	Unit cost[1]	Study cost (2004)[2]	Resource item	Unit cost[1]	Study cost (2004) [2]
Family doctor (GP)	£26.00[3]	£26.66[14]	Family centre	£27.69[3]	£2.77[33]
Home visitor (home)	£76.00[3]	£77.94[15]	Sure Start	£27.69[3]	£27.69[34]
Home visitor (clinic)	£53.00[3]	£27.18[16]	Home Start	£76.00[3]	£77.94[35]
Home visitor (phone)	£22.00[3]	£3.76[17]	Housing department	£12.50[5]	£12.50[5]
Social worker (home)	£76.00[3]	£79.50[18]	Women's aid	£93.00[6]	£46.50[36]
Social worker (clinic)	£30.00[3]	£31.38[19]	Legal aid	£93.00[6]	£46.50[37]
Social worker (phone)	£30.00[3]	£5.23[20]	CAB	£12.50	£12.50[38]
Midwife (home)	£44.00[4]	£44.00[21]	Psychologist	£66.00[3]	£67.68[39]
Midwife (hospital)	£62.00[4]	£62.00[22]	Psychiatrist	£210.00[3]	£215.36[40]
Antenatal class	£37.00[3]	£3.70[23]	Foster care	£593.00[3]	£620.28[41]
Alcohol/drug support	£87.00[4]	£91.00[24]	Adoption services	See[7]	See[7]
Paediatrician	£105.00[4]	£105.00[25]	Local advice centre	£12.50	£12.50[42]
Obstetrician	£84.00[4]	£84.00[26]	Parent-toddler group	£2.00[8]	£2.00[8]
Audiology	£59.00[4]	£59.00[27]	Court hearing	£945.00[9]	£945.00[43]
Opthalmology	£49.00[4]	£49.00[28]	Social services case conference	£258.00[10]	£450.58[10]
CPN	£62.00[3]	£63.58[29]	Crèche	£4.50[11]	£4.50[11]
Child and family team	£27.69[3]	£27.69[30]	Playgroup	£2.00[11]	£2.00[11]
Hospital A&E department	£65.67[4]	£67.34[31]	Private child care	£35.00[11]	£35.00[11]
Psychologist	£66.00[3]	£67.68[32]	Police attendance	£12.00[12]	£12.00[13]

*[1] Published unit cost: [2] Unit cost multiplied by quantity of resource-used in study and inflated to 2004 prices using HCHS or PSS Inflationary indices where relevant: [3] Netten and Curtis (2003/4): [4] NHS Reference Cost (2004) (Online spreadsheets: http://www.doh.gov.uk) : [5] 2004 costs personal communication, Business Manager, Housing Customer Services, Oxford City Council: [6] Legal aid costs http://www.gov.uk: [7] 'Costs of Adoption', Selwyn et al (2004) in Netten and Curtis (2004). Costs include: post placement unit costs per year of £6,070 (2003); Post-adoption unit cost per year £2,334 (2003); Carer and legal costs of the adoption process of £252 (2003): [8] Average for Oxfordshire (2004): [9] http://www.courtservice.gov.uk: [10] Assumption: 2 hours social worker time[3] plus 2 hours social worker assistant[3] plus 2 hours home visitor[3] plus 2 hours legal aid time[6]: [11] Average for Oxfordshire (2004): [12] http://www.homeoffice.gov.uk: [13] £12 per hour according to ready reckoner: Assume 1 hour contact time: [14] Per clinic consultation lasting 12.6 minutes: [15] Per 1 hour client contact for home visit: Assume 1 hour for study cost: [16] Assume 30 minutes contact time for study cost: [17] Unit cost of £22 per hour non-contact: Assume 10 minute phone call: [18] Per 1 hour client contact for home visit: Assume 1 hour for study cost: [19] £30 per hour of client related work in clinic: [20] £30 per hour of client related work in clinic: Assume 10 minute phone call: [21] Midwifery postnatal visit cost: [22] Midwifery outpatient appointment cost: [23] NHS Reference costs Antenatal Support: Assume 10 women attend each class – individual cost of £3.70: [24] NHS Reference costs (2004) Mental health Services: booked appointments data for alcohol and drug counselling: [25] Paediatric outpatient appointment: [26] Obstetric outpatient appointment: [27] Audiology outpatient appointment: [28] Ophthalmology outpatient appointment: [29] Community Psychiatric Nurse (CPN): [30]Netten & Curtis (2003); Per hour of client contact: Assume 1 hour for study cost: [31]NHS Reference cost (2003): Assumption: Average cost of referred/discharged/transferred: [32] Per 1 hour client contact with a clinical psychologist: [33] Session at a local authority nursery as proxy (£27.00; Netten & Curtis (2003)): Assume 10 women attend each session: [34] Session at a local authority nursery as proxy (£27.00; Netten & Curtis (2003)): [35] Home Start is a home visiting service, run by a charity: Assumption – resources are the same as home visiting. [36] Assume same cost as legal aid (see[37]): [37] Based on the cost of a legal aid solicitor, Legal aid costs £93 per hour, assume a 30 minute appointment: [38] Assume average local authority service unit cost: [39] £66 per hour of client contact with a clinical psychologist: [40] £21-per hour patient contact with a consultant psychiatrist: [41] Netten & Curtis (2003) Local Authority foster care costs per week (individual cases varied according to no. of weeks in foster care, emergency removal or standard, social worker time, case conference costs and court hearing costs: [42] Assume average local authority service unit cost: [43] Assume court hearing for emergency child protection order, Assume Band 2 Grade B summary assessment fees (Oxfordshire Solicitors Court Fees)*2 = £145*2, plus Counsels fees of 0.5 day hearing on Queens bench (£655), total = £945.*

The extent to which the resource-use quantity and cost for the entire period differs between the two arms is shown in Table 2. The total cost variable is produced from a societal level whereby all costs to all parties are included. Home visiting training costs were also included pro-rata in the costs of each woman allocated to the intervention arm. In addition to this, where infants were placed in foster care or for adoption additional resource-use information

for such events were individually identified from the relevant home visitor records including type of removal (i.e. emergency or routine), foster care duration, adoption expenses, court cases, child protection resources, legal costs and social care involvement.

Table 2 Mean cost & quantity differences arising between arms of the trial

Resource	Control	Home visiting	Mean cost difference (SE)	P
Mean no. of clinic visits to a health visitor Mean cost (£)	14.24 £383	8.82 £237	-£146 (£57)	0.01
Mean no. of phone calls to a health visitor Mean cost (£)	6.94 £26	10.34 £38	£13 (£5)	0.019
Mean no. of home visitor home visits Mean cost (£)	10.30 £797	40.63 £3,128	£2,330 (£136)	0.000
Mean no. of social worker office visits Mean cost (£)	0.5 £16	1.55 £48	£32 (£27)	0.23
Mean no. of midwife hospital visits Mean cost (£)	2.8 £178	3.9 £245	£68 (£49)	0.16
Mean no. of alcohol/drug counselor visits Mean cost (£)	1.2 £107	0.78 £70	-£38 (£95)	0.69
Mean no. of A&E visits (mother) Mean cost (£)	0.65 £43	0.41 £27	-£16 (£15)	0.27
Mean no. of A&E visits (infant) Mean cost (£)	0.83 £55	0.43 £28	-£26 (£16)	0.10
Mean no. of psychologist appointments Mean cost (£)	0.08 £6	0.98 £65	£60 (£27)	0.028
Mean no. of psychiatrist appointments Mean cost (£)	0.50 £107	0.95 £203	£96 (£85)	0.259
Mean no. of visits to an obstetrician Mean cost (£)	2.20 £184	1.36 £114	-£70 (£103)	0.49
Mean no. of family centre visits Mean cost (£)	6.13 £167	7.67 £210	£43 (£89)	0.63
Mean no. of Home Start visits Mean cost (£)	0.53 £41	1.7 £129	£88 (£76)	0.25
Mean no. of visits to the housing department Mean cost (£)	6.17 £76	4.75 £59	-£18 (£20)	0.37
Children entering foster care/adoption Mean cost (£)	0 £0	4 £776	£776 (£536)	0.15
Home visiting training cost apportionment per woman (£)[1]	(n/a) £0.00	(n/a) £29.63	£30 (£1)	0.000
Total cost (all resource-use data)[2]	£3,874	£7,120	£3,246 95% CI[3]: £1,645 - £4,803	0.000

[1] This cost was an apportioned cost to account for the beneficial effect of the home visiting training on all the other women home visited by the home visitors who were not in the trial.

[2] The total cost variable includes all costs and not only those which were statistically significantly different. This allows cost differences to be economically significant although not statistically so.

[3] The 95 per cent confidence interval for the cost difference was obtained using non-parametric bootstrapping to account for the skewed nature of the cost data in each arm of the trial.

A mean cost estimate per woman per arm of the trial was computed. The cost data distributions for both arms were not normally distributed hence the 95 per cent confidence interval for the difference was therefore obtained using non-parametric bootstrapping methods. The mean costs in the control and intervention arms were: £7,120 compared with £3,874, a difference of £3,246 (95 per cent confidence interval for the cost difference: £1,645 – £4,803). The total costs of the intervention arm as shown in Table 2 above are statistically significantly greater due to increased home visits, phone calls to a home visitor, home visitor training costs and appointments with a psychologist. Costs incurred, though not reaching statistical significant include: foster care and adoption costs; social worker office visits; hospital visits to a midwife; appointments with a psychiatrist; visits to family centres; and Home Start visits. However, Table 2 also reveals significant cost savings arising due to the home visiting intervention in the form of reduced costs of *clinic* health visiting costs. Further cost savings arising in the intervention arm, although not statistically significant arose in the following categories: alcohol and drug counseling costs; obstetric costs; A & E costs for both mother and baby; obstetrician appointment costs; and local authority housing department costs. Although many of the additional costs did not reach formal levels of statistical significance when all resources were combined within a 'total cost' variable, the mean incremental cost in the home visiting arm of £3,246 was statistically significant ($p<0.001$) with 72 per cent of this incremental cost being due to the extra costs of the home visiting intervention, and 24 per cent due to the costs of the infants being removed from parental care and entering foster care and/or the adoption process (resources involved with infants being removed from parental care involved social workers, police, solicitor and court costs, foster care and adoption placement costs).

Discussion

This work has provided detailed cost estimates of resources used by this 'high risk' population. The main challenges arising with the economic evaluation of home visiting interventions, as documented by researchers such as Olds and colleagues (1997) and Byrd (1997) are firstly that whilst the costs of such services can be easily identified and measured the resulting benefits and cost savings are more complex to identify and measure since they may occur in sectors of government beyond health care including social services, education, crime and housing. Indeed, 24 per cent of the incremental costs of the home visiting intervention in this study were due to non-health service costs. Secondly, the benefits and cost savings may accrue over a longer time period than is often accommodated for in trials, and this combined with the multi-sectors affected by this intervention makes for a complex economic evaluation process. A three-year follow-up of the current study is now underway and the economic analysis will use modeling techniques to extrapolate both the costs and benefits beyond the end of the trial.

References

Archbold, P.G., Steward, B.J., Miller, L.L., Harvath, T.A., Greenlick, M.R. and Van Buren, L. (1995) The PREP system of nursing interventions: a pilot test with families caring for older members, *Research in Nursing and Health*, 18, 3-16.

Barlow, J., Stewart-Brown, S., Callaghan, H., Tucker, J., Brocklehurst, N. and Davis, H. et al. (2003) Working in partnership: The development of a home visiting service for vulnerable families, *Child Abuse Review*, 12, 172-189.

Brooten, D., Kumar, S., Brown, L.P., Butts, P., Finkler, S.A. and Bakewell-Sachs, S. (1986) A randomized clinical trial of early hospital discharge and home follow up of very low birth weight infants, *New England Journal of Medicine*, 315, 934-939.

Brown, J. (1992) Screening infants for hearing loss, *Journal of Epidemiology and Community Health*, 46,:350-356.

Brown, K. (2004) *Evaluation of Family Home Visiting Program*, Government of South Australia, Australia.
Bull, J., McCormick, G., Swann, C. and Mulvihill, C. (2004) *Ante and Post-Natal Home-Visiting Programmes: A Review of Reviews*, HDA, London.
Byrd, M.E. (1997) A typology of the potential outcomes of maternal child home visits: A literature analysis, *Public Health Nursing*, 14, 3-11.
Curtis, L. and Netten, A. (2004) *Unit Costs of Health and Social Care*, Personal Social Services Research Unit, University of Kent, Canterbury.
Hardy, J.B. and Streett, R.R (1989) Family support and parenting education in the home: an effective extension of clinic-based preventive health care services for poor children, *Journal of Pediatrics*, 115, 927-931.
HM Treasury (2003) *The Green Book*, The Stationery Office, HMSO, London.
McIntosh, E., Barlow, J. and Stewart-Brown, S. (2006) Economic evaluation of an intensive home visiting programme: A cost-effectiveness analysis from a societal perspective, *British Medical Journal* (submitted).
Miller, L.L., Hornbrook, M.C., Archbold, P.G. and Stewart, B.J. (1986) Development of use and cost measures in a nursing intervention for family caregivers and frail elderly patients, *Research in Nursing and Health* 19, 273-285.
Morrell, C.J., Siby, H., Stewart, P., Walters, S. and Morgan, A. (2000) Costs and effectiveness of community postnatal support workers: randomised controlled trial, *British Medical Journal*, 321, 593-598.
Netten, A. and Curtis, L. (2003) *Unit Costs of Health and Social Care*, Personal Social Services Research Unit, University of Kent, Canterbury.
New NHS 2004 reference costs, http://www.dh.gov.uk, 2004.
Olds, D.L., Eckenrode, J., Henderson, C.R., Kitzman, H., Powers, J. and Cole, R. et al (1997) Long term effects of home visitation on maternal life course and child abuse and neglect: Fifteen-year follow up of a randomized trial, *Journal of the American Medical Association*, 278, 637-643.
Olds, D.L. and Henderson, C.R.P.C.K.H. (1993) Effect of pre-natal and infancy nurse home visitation on government spending, *Medical Care*, 31, 155-174.
Yanover, M.J., Jones, D. and Miller, M.D. (1976) Perinatal care of low risk mothers and infants: early discharge with home care, *New England Journal of Medicine*, 294, 702-705.