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Incredible Years parenting programme: cost-effectiveness and implementation

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Abstract

Purpose – There is growing interest in the economic evaluation of public health prevention initiatives and increasing government awareness of the societal costs of conduct disorder in early childhood. The purpose of this paper is to investigate the cost-effectiveness of the Incredible Years (IY) BASIC parenting programme compared with a six-month waiting list control.

Design/methodology/approach – Cost-effectiveness analysis alongside a pragmatic randomised controlled trial of a group-parenting programme. The primary outcome measure was the Strengths and Difficulties Questionnaire (SDQ), a measure of child behaviour.

Findings – The IY programme was found to have a high probability of being cost-effective, shifting an additional 23 per cent of children from above the clinical concern to below the cut-off on the SDQ compared to the control group, at a cost ranging from £1612-£2418 per child, depending on the number of children in the group.

Originality/value – The positive findings of this study have led to ongoing implementation of the IY programme and is therefore an example of commitment to evidence-based service provision and investment in prevention initiatives.

Keywords Policy, Implementation, Birmingham, Conduct disorder, Cost-effectiveness, Incredible Years parenting programme

Paper type Research paper

Introduction

The economic evaluation of public health prevention initiatives brings additional challenges for health economists and the need for a wider range of outcome measures than for clinical interventions (National Institute for Health and Care Excellence (NICE), 2013a, Vos *et al.*, 2010; Edwards *et al.*, 2013). Costs and consequences for a range of sectors need to be accounted for, along with ripple effects, externalities and equity considerations (Drummond *et al.*, 2005; Weatherly *et al.*, 2009).

Conduct disorder (CD) is a behavioural and emotional disorder which affects children and adolescents (NICE, 2013b). CD is estimated to affect approximately 6 per cent of children aged 5-16 years in the UK and boys are more likely than girls to be affected (Green *et al.*, 2004). CD is the most prevalent mental disorder in children (Green *et al.*, 2004). For children with early onset CD, problems frequently persist into adulthood (Bonin *et al.*, 2011a, b; Robins, 1978; Scott *et al.*, 2001) and, amongst other things, predict poor employment prospects, relationship breakdown and self-harming and/or anti-social criminal behaviour (Kazdin, 1989; Department of Health, 1995; Robins and McEvoy, 1990). The economic implications of severe behavioural problems in childhood are serious. It has been estimated that by age 28 the cumulative costs of publicly resourced services between the ages of ten and 28 for those with CD in childhood are 10 times

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higher (£91,854 in 2009/2010 prices) than for those with no childhood behavioural problems (£9,737 in 2009/2010 prices) (Scott *et al.*, 2001). Parenting is a key determinant of child behaviour (Gardner, 1987).

In the UK there is growing recognition by Government of the need to ensure early intervention to prevent the long term negative consequences of CD in young children (Allen, 2011). The Children Act 2004 (UK Parliament, 2004) introduced a set of reforms and policy in the UK which aim to ensure that every child, irrespective of circumstances or background, has the support needed to be healthy and safe; and has the opportunity to make a positive contribution. Local governments are investing significant resources into prevention initiatives (Buck and Gregory, 2013). Birmingham City Council (BCC), through its Brighter Futures programme, has been at the forefront in introducing and trialling evidence-based, prevention and early intervention initiatives for children (Little *et al.*, 2012).

One of the interventions implemented and evaluated was the Incredible Years (IY) BASIC parenting programme, suitable for parents of children aged three-six years, which is described in more detail elsewhere (Webster-Stratton and Hancock, 1998). As an overview, the programme aims to strengthen parent-child interactions and promote children's emotional regulation and social skills. There is growing evidence of its shorter and longer term clinical effectiveness and cost-effectiveness (Bywater *et al.*, 2009; Hutchings *et al.*, 2007; Furlong *et al.*, 2012; O'Neill *et al.*, 2013); however, research findings have not always resulted in the programme becoming established in regular service.

The present study was conducted to evaluate the cost-effectiveness of the IY BASIC parenting programme in Birmingham, UK, delivered as part of the Brighter Futures initiative. From the outset the BCC funding for the research trial was undertaken with a view to adopting the IY programme if it were found to be effective and cost-effective. With this in mind the programme was delivered by regular BCC early years staff who would then be in a position to continue to deliver the programme. Training and support for delivery was provided through the Children's Early Intervention Trust (www.childrearlyinterventiontrust.org/).

Methods

The purpose of economic evaluation

The purpose of economic evaluation is to draw up a balance sheet of the costs and benefits associated with implementing a new or existing programme, as compared with a relevant comparator; because of the need for a comparator economic evaluations are often undertaken alongside, or as part of, a randomised controlled trial (RCT) of the programme.

Study population and recruitment

This economic evaluation took place alongside a pragmatic RCT, details of which, including sample size calculation, are given in Little *et al.* (2012). The Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997) was administered to parents of children aged three-four years as a screening tool. Parents who rated their child as above the cut-off for clinical concern on the SDQ (total difficulties) were invited to discuss the trial, and their potential participation, with a researcher. The researcher obtained consent from willing, and eligible, parents. A waiting list control design was adopted and control families had access to the programme after the six-month (post-baseline) follow-up.

Data collection

Service utilisation and effectiveness (outcome) measures were collected during home visits by researchers blind to condition at baseline and six-month follow-up. The sample for the economic evaluation consisted of those for whom complete cost and outcome data were available at both time-points.

Measurement of IY programme costs

We undertook our micro-costing (a method of calculating unit costs) from a payer perspective, i.e. from BCC as they were the ones implementing the programme. Our micro-costing of the

set up and delivery of the IY programme used both bottom-up and top-down approaches (Drummond *et al.*, 2005; Curtis, 2010; Netten and Knight, 1999). Bottom-up approaches involve collecting data from individuals to calculate certain costs. Top-down approaches use total cost data to produce an average cost of the intervention per person. The top-down approach was used to collect project management, recruitment and administration costs from local government service providers. While a top-down approach requires less intensive data collection, a disadvantage is that it does not consider variation; therefore a bottom-up approach was used to collect data from group leaders using diaries to record all activities in connection with preparing for, delivering and following up the IY programme. All costs reported relate to the year 2009/2010. The costs for training IY group leaders were supplied by the Children's Early Intervention Trust. Initial group leader training costs have been annuitised over five years at 3.5 per cent because they represent a one off cost with benefits accrued into the future (Netten and Knight, 1999). Costs included materials, incentives, trainer fees, supervision, administration, delivery, venue costs, travel and consumables. Costs for the group leaders to attend the training courses were based on average salaries. Group running costs included group leader salaries, materials, venue hire and travel costs. Employment overheads of 25 per cent were added to reported salary costs to reflect national insurance and superannuation. A further 25 per cent was added to reflect capital and managerial overheads.

Measurement of frequency and cost of health, social care and special educational service use by children and parents

In this economic evaluation costs were examined from a public sector multi-agency perspective including health, special educational services, e.g. speech and language therapists and social services (Edwards *et al.*, 2008). Data were collected on children's and parents' use of health, social and special educational services by means of an adapted Client Service Receipt Inventory (Beecham and Knapp, 1992; Ridyard and Hughes, 2010) administered to parents at baseline and six-month follow-up. National costs were applied to these services (Curtis, 2010; Department of Health, 2010), supplemented by direct approaches to local authorities and programme designers. All costs are in UK £ sterling for the year 2009-2010 (see Table A1). Costs fell within a one-year time horizon, therefore it was not necessary to discount costs. Children's service use costs were used in the cost-effectiveness analyses using the SDQ and Eyberg Child Behaviour Inventory (ECBI), while parents' service use costs were used in the cost-effectiveness analysis using the Arnold-O'Leary Parenting Scale (APS).

Measurement of effectiveness

Effectiveness was measured using the SDQ total difficulties (Goodman, 1997), ECBI (Eyberg and Pincus, 1999), and the total score on the APS (Arnold *et al.*, 1993).

The SDQ (Goodman, 1997) is a 25-item behaviour screening measure, covering both positive and negative attributes, for children aged between three and 16 years, using a three-point scale. It has five subscales: emotional problems, conduct problems, hyperactivity, peer problems and pro-social behaviour. A total difficulties score between 0 and 13 is considered normal, 14-16 is considered borderline and 17-40 is considered abnormal. An additional impact supplement scale measures the extent to which the parent or caregiver perceives the child's difficulties as affecting their daily life.

The ECBI (Eyberg and Pincus, 1999) is a 36-item inventory measuring problem behaviour in children aged between two and 16 years old as reported by the parent or caregiver. Each behaviour is rated on two scales: a seven-point intensity scale that measures how often the behaviour is perceived to occur, ranging in response intensity from 1 (never) to 7 (always); and a Yes-No problem scale that identifies whether the behaviour is seen as a problem for the parent. The clinical cut-off for the ECBI is suggested as 127 or more for the intensity scale (ECBI-I) and 11 or more for the problem scale (ECBI-P).

The APS (Arnold *et al.*, 1993) is a 30-item inventory of parenting competencies each measured on a seven-point scale. The scale comprises an overall score and three subscales; laxness refers to insufficient monitoring of the child and their behaviour, over-reactivity refers to displays of anger,

meanness or irritability and verbosity refers to lengthy verbal responses to inappropriate child behaviours. Arnold *et al.* (1993) report a total mean clinic sample score of 3.1 (SD = 0.7) and a population norm total mean score of 2.6 (SD = 0.6).

Imputation of missing data were based on the last observation carried forward method.

Presentation of results

As well as presenting conventional incremental cost-effectiveness ratio (ICER) estimates, we adopted an approach we have used in previous studies (Edwards *et al.*, 2011). In this paper we show for the intervention and control groups the proportion of children who moved from being above the clinical concern cut-off to below the SDQ clinical concern cut-off and related this to the cost per child of the IY programme, depending on the number of children per group.

Analysis strategy

The cost-effectiveness analysis involved calculating an ICER point estimate with a 1,000-replication bootstrap to provide a confidence interval (CI) (Briggs and Gray, 1999). In other words, we divided the additional costs associated with the IY programme as compared to the control condition by the additional benefits to child behaviour observed for the children of participants in the IY arm over and above the control condition to achieve an average cost per unit of benefit- our ICER point estimate. We used a statistical method called bootstrapping to resample 1,000 times from our trial data to generate a CI around our average estimate of cost-effectiveness.

It would not be appropriate to try to measure utility in these young children to facilitate a cost-utility analysis (Noyes and Edwards, 2011). Cost-effectiveness planes and cost-effectiveness acceptability curves (CEACs) for SDQ are presented. Cost-effectiveness planes are a graphical representation showing where the 1,000 ICER estimates generated by the bootstrapping fall on a graph with axes showing costs and outcomes. Points falling in the North-East indicate that an intervention is both more costly and more effective than the control condition. Points falling in the North West indicate that an intervention is more costly but less effective than the control condition. CEACs indicate the probability that an intervention is cost-effective at a range of willingness to pay thresholds. For example, if society were willing to pay a maximum of £20,000 per unit improvement on a particular outcome measure, the reader can read across the CEAC to see the corresponding probability that the intervention would be cost-effective at that willingness to pay threshold.

Shifts in the distribution of child behaviour as measured by the SDQ are presented. Data were analysed using SPSS v20.0 and EXCEL 2013.

Sensitivity analysis and sub-group analysis

Sensitivity analysis was conducted based on 12 children per each IY group delivered in addition to the base case scenario of eight, as was presented in Edwards *et al.* (2007). This being the range of size of IY groups typically. We also explored the effect of dose, i.e. number of sessions attended by parents, on cost-effectiveness.

Results

Characteristics of the study families

Of the 161 consenting families in the clinical effectiveness sample, 110 were allocated to the intervention and 51 to the control. 147 families were followed-up at six months (ten were lost from the intervention and four from the control, seven of these 14 formally withdrew and seven were uncontactable). Economic data were available for our analysis for 144 participants (97 intervention and 47 control) which is 98 per cent of the clinical effectiveness sample at six months.

Mann-Whitney tests showed no significant differences in baseline SDQ total difficulties scores, ECBI-I (Eyberg and Pincus, 1999) or total scores on the APS (Arnold *et al.*, 1993) scores between

the economic analysis sample and clinical effectiveness sample, indicating that our economic sample was representative of the larger one.

Table I presents the characteristics of participating families. Independent *t*-tests showed no significant differences between the intervention and control groups at baseline (child age $t = -0.26$, $p = 0.80$; child gender $\chi^2 = 0.46$, $p = 0.50$; parent age $t = -0.53$, $p = 0.96$; parent gender $\chi^2 = 0.06$, $p = 0.81$). Mann-Whitney tests showed no significant difference in service use costs between intervention and control group at baseline for children ($Z = -0.38$, $p = 0.71$) or parents ($Z = -0.05$, $p = 0.96$). Adjustment of follow-up values is necessary when there is an imbalance between groups at baseline on variables that are related to the outcomes of interest in order to ensure that any difference detected between groups at follow-up is the result of an intervention effect rather than imbalanced baseline data. However, as there were no significant differences between groups on key variables, the follow-up data in this analysis were not adjusted for baseline values.

Clinical effectiveness

The Birmingham Brighter Futures Initiative included evaluations of three interventions, Triple P, PATHS and IY. Full details of the effectiveness of these three programmes and RCT conditions are published as Little *et al.*, 2012. To provide context to this paper, in the PATHS trial, modest improvements in emotional health and behavioural development after one year disappeared by the end of year 2. There were no effects for Triple P. In contrast, Little *et al.* (2012) report significant benefits for the intervention group compared to the control group in the IY trial on the SDQ, ECBI and APS, upon which this economic evaluation is based.

Table II shows mean scores at baseline and six-month follow-up for participants in the economic analysis sample ($n = 144$). Independent samples *t*-tests showed no significant differences between groups (ECBI-I $t = 0.51$, $p = 0.61$; APS total $t = 1.10$, $p = 0.27$). Mann-Whitney tests showed no significant differences between groups for the ECBI-P and SDQ at baseline (ECBI-I-P $Z = -0.832$, $p = 0.406$; SDQ total $Z = -0.737$, $p = 0.46$).

Table I Demographics of participants at baseline

	Intervention mean (SD), $n = 97$	Control mean (SD), $n = 47$
Child age	3.34 (0.57)	3.36 (0.49)
Child: female	36 (37.1%)	14 (29.8%)
Parent age	30.37 (6.10) ^a	30.43 (5.94)
Parent: female	94 (98%) ^b	47 (100%)

Notes: ^a $n = 95$; ^bpercentage based on sample $n = 96$

Table II Effectiveness scores at baseline, six months and differences for child and parent measures (economic sample)

Child measure (cut-off)	Baseline score mean (SD)			6 month score mean (SD)		
	Intervention, $n = 97$	Control, $n = 47$	Difference in mean score	Intervention, $n = 97$	Control, $n = 47$	Difference in mean score
SDQ total difficulties baseline score (17)	23.13 (4.48)	23.68 (4.49)	-0.55	14.67 (5.81)	17.28 (7.39)	-2.61*
SDQ impact	0.66 (1.13) ^a	0.93 (1.42) ^b	-0.27	0.13 (0.54)	0.57 (1.20) ^c	-0.44**
ECBI-I (127)	143.23 (34.34)	146.49 (38.87)	-3.26	121.60 (32.58)	136.17 (43.46)	-14.57*
ECBI-P (11)	16.72 (8.86)	17.94 (9.20)	1.22	10.67 (8.80)	14.70 (9.94)	-4.03*
APS total	3.49 (0.63)	3.62 (0.78)	-0.13	2.94 (0.73)	3.34 (0.84)	-0.4**

Notes: ^a $n = 95$; ^b $n = 44$; ^c $n = 46$. *,**Significant at $p < 0.05$; $p < 0.01$, respectively

At six months there were statistically significant improvements across all three outcome measures. Child behaviour and self-reported parenting skills also improved in the control condition, but not as much as in the intervention condition.

1Y group costs

Table III summarises the setting up and running costs of the Brighter Futures 1Y programme in this study. Costs are divided into non-recurrent initial training, project management costs associated

Table III Programme costs and cost per child of running 11 1Y parenting groups over 12 session programme for 2009-2010, inclusive of employers on costs of 25 per cent

		Cost (£) ^a	
		Total	Group
Non-recurrent group set-up costs to train group leaders in pre-school BASIC and BASIC ($n = 60$) (based on costs from IY Centre Wales)			
Inclusive of training and accreditation, supervision, materials, programme kit, venue and accommodation		20,000	
3 day training for 60 group leaders (based on average salary cited below)		46,616	
Non-recurrent cost total		66,616	
Non-recurrent cost per group (2 leaders)			2,221
Non-recurrent cost per group (2 leaders) annuitised over 5 years at 3.5%/yr			492
Recurrent group running costs across 11 groups			
<i>Project management and recruitment of parents (based on costs supplied by BCC)</i>			
	Gross salary	Time employed	
Pilot project manager	54,325/year	1 WTE for 3 months	13,581
Pilot project manager (interim consultant)	£68,821/year	1 WTE for 4 months	22,940
Engagement and recruitment project officer (mid-point grade 4)	16,584/year	0.5 WTE for 6 months	4,146
Engagement and recruitment project officer (mid-point grade 5)	14,640/year	0.2 WTE for 12 months	2,928
Administrative support for TP (benefits registration role)	13,287/year	0.33 WTE for 1 yr	4,429
Wrap round coordination ^b (£4,000 per group)			44,000
Project management subtotal			92,024
Project management for 1 parenting group (total/11 groups)			8,366
<i>Ongoing supervision cost for 1Y group leaders (based on costs from BCC)</i>			
Trainer costs	£600/day	39 days	23,400
Venue (accommodation and food)			8,789
Accreditation			600
Course administration			1,754
Supervision subtotal			34,543
Supervision for 1 parenting group (total/11 groups)			3,140
<i>Parenting programme delivery cost (based on mean from 11 groups, except item 1)</i>			
Group material cost (includes basic parenting pack, parent handouts and IY book). Based on costs from IY Office			1,221
	Mean (SD), unit time	Mean (SD), unit	
Preparation time for 2 leaders, including room preparation	23.87 (12.06)/hr	78.99 (52.16) hr	1,885
Session time for 2 leaders	23.87 (12.06)/hr	46.11 (33.02) hr	1,101
Follow-up time including travel, home visits, phone, admin	23.87 (12.06)/hr	14.04 (14.63) hr	335
Mileage ^c	40p/mile ^d	75.75 miles (145.03)	30
Parents transport, taxi, refreshment and DVD ^c		£850.8 (£1,249.30)	851
Supervision including travel time	23.87 (12.06)/hr	80.58 hr (55.09 hr)	1,923
Group subtotal			7,346
<i>Cost of establishing and running 1 parenting group over 12 week programme, inclusive of training for 2 leaders annuitized over 5 yrs at 3.5%/yr</i>			
Total (project management, supervision and delivery)			19,344
Cost per child based on 8 per group			2,418
Cost per child based on 12 per group			1,612
<i>Cost of running 1 parenting group over 12 week programme, includes project management and supervision</i>			
Total			18,852
Cost per child based on 8 per group			2,357
Cost per child based on 12 per group			1,571

Notes: ^aRounded to the nearest whole pound and all salaries include employers on-costs; ^bincluding salaries for facilitators, travel and subsistence for parents, room hire, materials, interpreter; ^cbased on info from three respondents incurred before WAC in post; ^dHM customs statutory mileage rate 2010

with the establishment of the project and recruitment, group set-up costs and recurrent costs. Where possible, means and standard deviations are presented. The mean cost per child (based on eight children per group) was £2,418.

Service use

A summary of service use between baseline and sixth-month follow-up is provided in Table IV. Primary care service use was similar in both groups, although mean contact with speech therapists was higher in the control group, whilst children in the intervention group had on average more contacts with social workers, respite foster care and other social services. Children in the control group had more additional contacts with class teachers and head teachers, whilst there was a higher rate of 1-1 help and special needs teaching for those in the intervention group.

Cost-effectiveness

ICERs are presented in Table V. A one-point improvement in the SDQ over and above that provided by the waiting list control would cost £1,295 on a 40-point scale. A one-point improvement in the ECBI-I would cost £237 on a 216 point scale. A one-point improvement in the APS would cost £9,477 on a seven-point scale.

Distributional shifts

Distributional shifts of outcome measure scores are shown in Figure 1(a) and (b). All children at baseline were within the cause for concern range on the SDQ total difficulties scale. On the SDQ, 21/47 (45 per cent) of children in the control group moved from above to below the cause for concern cut-off. By contrast, 66/97 (68 per cent) children in the intervention group moved from above to below the cause for concern cut-off, resulting in an incremental difference of 23 per cent between groups. The cost of running the IY programme for all 97 participants was £212,784 (excluding health and social service use), making the average cost to move a child below the SDQ cut-off £9,672 per child in the intervention group over and above the proportion who would have moved without intervention.

Bootstrapping and CEACs

Figure 2(a) shows the cost-effectiveness planes for the SDQ. The majority of point estimates fell in the NE quadrant of the cost-effectiveness planes, indicating that the intervention is both more costly and more effective than the waiting list control. The CEAC in Figure 2(b) shows the probability that the intervention is cost-effective for a range of willingness to pay thresholds. For example, if society is willing to pay £2,500 for a point improvement on the SDQ, there is an 82 per cent probability of the IY programme being cost-effective.

Sensitivity analysis

Sensitivity analysis was conducted to see the effects of running the IY programme with 12 participants (the suggested maximum) per group compared with the base case scenario of eight (including full set-up and running costs). As the group running costs are mostly fixed (i.e. preparation and delivery time is unchanged regardless of the number of participants), we divided the running costs per group by 12 to calculate the mean cost per child for a group of 12. The ICER reduced from £1,295 to £905 per one-point improvement on the SDQ (95 per cent lower bootstrapped CI £388, upper is dominant as 2.6 per cent of replications were more costly and less effective). The ICER reduced from £237 to £166 per one-point improvement on the ECBI-I score (95 per cent CI £73, upper is dominant as 3.3 per cent of replications were more costly and less effective) and from £9,477 to £6,413 per one-point improvement on the APS (95 per cent CI £3,313-£54,047) (Table VI).

Sub-group analysis

We repeated our analysis for a sub-group of parents who attended seven or more of the 12 sessions (55/97 in the intervention group). In this case, the ICER fell from £1,295 to £689 per one-point improvement on the SDQ (95 per cent CI £414-£1,964); the ICER fell from £237 to £177 per one-point improvement on the ECBI-I (95 per cent CI £91-£1,684) and the ICER fell

Table IV Mean NHS and Local Authority costs for children and parent (£) over six months follow-up by group (economic analysis sample)

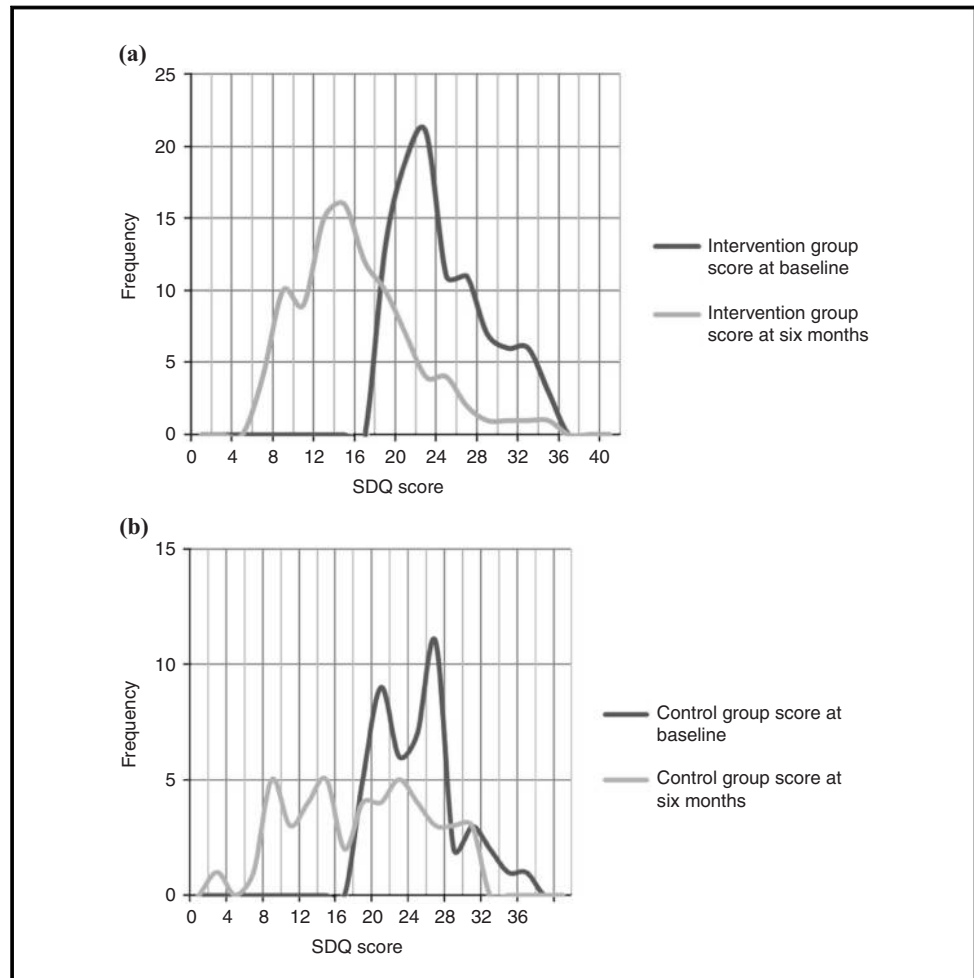
Type of cost	Control ^a		Intervention ^a		Mean difference (bootstrapped 95% CI)
	Mean £	SD £	Mean £	SD £	
	n = 47		n = 97		
<i>(a) Children</i>					
NHS primary, community and local authority care sector ^b					
GP consultations	69	76	82	93.3	14
Practice nurse	5	16	5	9	0
Health visitor	5	21	8	28	3
Speech therapist	31	166	5	21	-26
Physiotherapist	1	7	4	33	3
Social worker	4	29	54	231	50
CAMS	18	77	1	7	-18
Community paediatrician	19	74	12	60	-7
Home-start volunteer	0		1	9	1
Other contacts	16	59	44	245	29
Respite foster care	0		49	480	49
Total primary care and social services cost	169	259	266	739	97 (-56, 283)
Additional educational cost					
Extra parental consultation with head teacher	92	345	9	38	-83
Extra parental consultation with class teacher	77	212	30	119	-47
School nurse	2	12	4	14	2
One-to-one help	12	41	149	672	137
Small group work	6	23	4	29	-1
Special teaching in main stream school	13	92	18	177	5
Special Educational Needs Statement	5	32	7	38	2
Psychological assessment	5	32	9	44	4
Special needs school	7	49	101	766	94
All other educational costs	16	59	22	126	7
Total additional education cost	226	614	353	1,170	127 (-33, 301)
NHS secondary sector					
A&E	26	63	13	40	-14
Ambulance	21	69	0	0	-21
Out patients	65	115	64	196	-1
In patients stays			73	721	73
Other contacts			0	3	0
Total secondary care cost	113	165	150	852	38 (-87, 237)
Total NHS and social care cost	508	825	769	1,625	261 (-149, 662)
IY parenting programme cost	0	-	2,465	0	2,465
Total NHS, social care and parenting programme cost	508	825	3,234	1,625	2,726 (2,334, 3,158)
<i>(b) Parent</i>					
NHS primary, community and local authority care sector ^b					
GP	87	95	104	129	17
Practice nurse	6	11	7	15	1
Health visitor	0	0	9	40	9
CPN	30	196	14	96	-16
Social worker	8	58	41	210	33
Counselling	62	268	51	251	-11
Parent primary care and social services subtotal	193	397	226	511	33 (-131, 168)
NHS secondary sector					
OP	73	203	91	271	17
A&E	13	51	13	47	0
In patient stays	106	420	163	550	57
Other contacts	46	228	13	57	-33
Parent secondary care subtotal	239	520	280	729	41 (-172, 256)
All parent primary, secondary and social services subtotal	432	722	506	972	75 (-218, 337)

Notes: ^aCosts rounded to the nearest £; ^bconsultations costs include face to face, telephone and/or home visits

Table V Incremental cost-effectiveness for the three measures (economic analysis sample)

Measure	Incremental difference in cost	Incremental difference in effect	ICER (Bootstrapped 95% CI)
SDQ total	£2,679.62	2.07	£1,295 (£593 ^a)
ECBI-I	£2,679.62	11.31	£237 (£113 ^b)
APS total	£2,492.49	0.263	£9,477 (£4,869 to £92,822)

Notes: ^a3.6 per cent of replications are more costly and less effective giving a dominant upper CI of -£9,150; ^b4.1 per cent of replications are more costly and less effective giving a dominant upper CI of -£2.289

Figure 1 Change in (a) intervention group mean and (b) control group mean SDQ score between baseline and six months

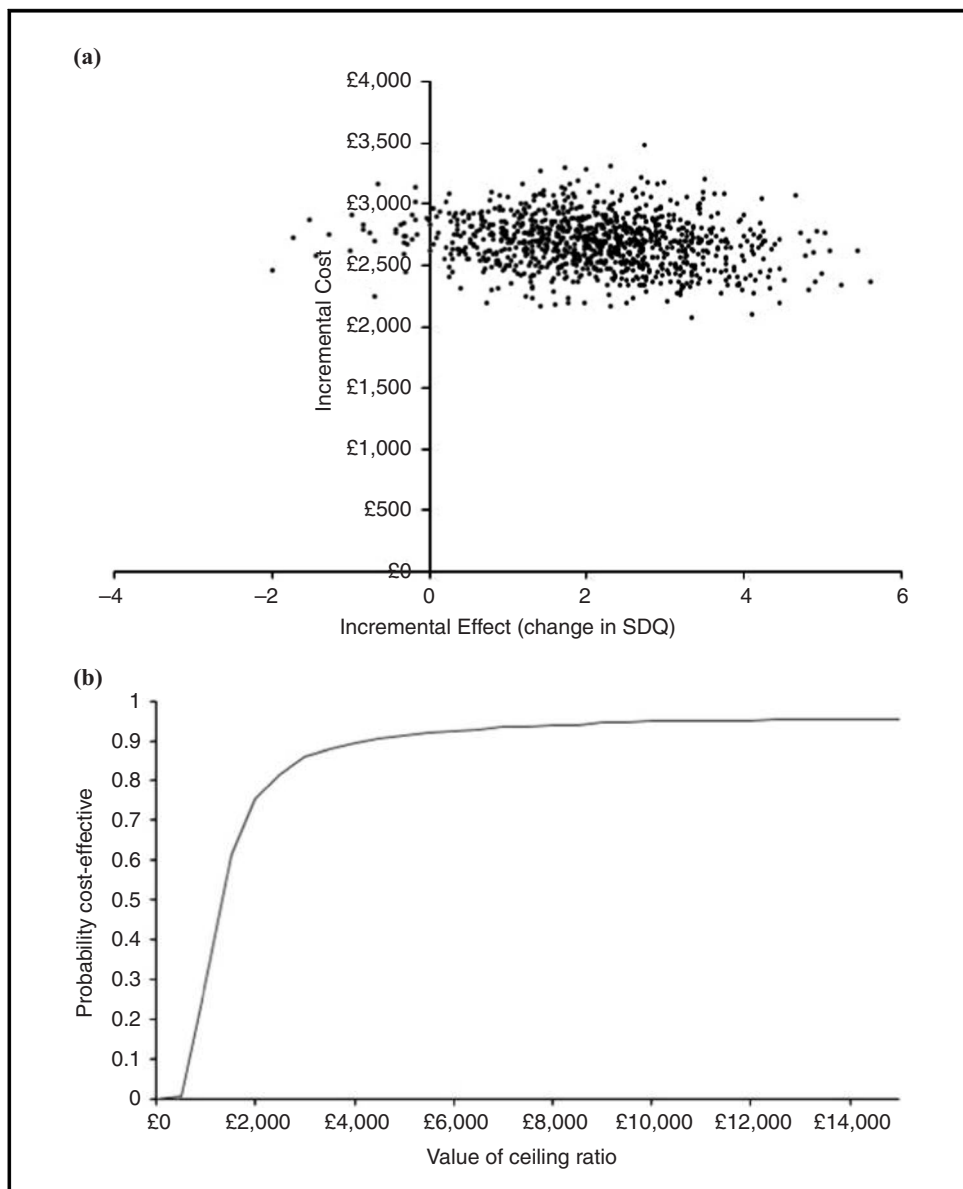
from £9,477 to £7,240 per one-point improvement on the APS (95 per cent CI £4,167 to £27,012). The sub-group analysis should be considered indicative as the analysis loses power with the reduction in participant numbers.

Discussion

Main findings

This paper reports an evaluation of the IY parent programme, delivered as part of BCC's Brighter Futures initiative. Inflating costs to 2009/2010, previous cost-effectiveness analyses of the IY

Figure 2 (a) Cost-effectiveness plane as measured by the SDQ and (b) cost-effectiveness acceptability curve as measured by the SDQ



BASIC parenting programme showed an ICER of £84 per one-point improvement in ECBI-I scores (95 per cent CI of £57-£191) (Edwards *et al.*, 2007) and £63 per one-point improvement in ECBI-I scores (90 per cent CI £34-£113) (O'Neill *et al.*, 2013). Our findings were considerably higher, with an ICER of £237 per point improvement on the ECBI-I; however, the cost of running IY with existing staff trained to deliver the programme, has been shown to be lower in the long run. Programmes that may seem expensive at the time of set up are vital for generating evidence on effectiveness and cost-effectiveness for policymakers to be able to develop evidence-based longer term investment plans.

Interpretation and commissioning implications

The findings led BCC to reconfigure services, train additional staff and roll-out the IY parent programme across the city for parents of identified high risk three and four year olds (using the SDQ as a screener). In 2015, BCC were using a 16 area locality model, with 20 IY BASIC parent

Table VI Sensitivity analysis (economic analysis sample)

Measure	Incremental difference in cost	Incremental difference in effect	ICER (bootstrapped 95% CI)
<i>Group size of 12</i>			
SDQ total	£1,873.62	2.07	£905 (£388 ^a)
ECBI-I	£1,873.62	11.31	£166 (£73 ^b)
APS total	£1,686.49	0.263	£6,413 (£3,313-£54,047)
<i>Participants attending 7 or more sessions</i>			
SDQ total	£2,528.79	3.67	£689 (£414-£1,964)
ECBI-I	£2,528.79	14.32	£177 (£91-£1,684)
APS total	£2,533.95	0.35	£7,240 (£4,167-£27,012)

Notes: ^a2.6 per cent of replications are more costly and less effective giving a dominant upper CI of -£306,223; ^b3.3 per cent of replications are more costly and less effective giving a dominant upper CI of -£2,331

groups currently running. Two or three groups are run per locality per year, dependent upon level of need, with a minimum of 32 groups per annum. During the course of the research trial, 12 BCC group leaders became certified leaders in the programme. This involves passing a rigorous quality control mechanism involving videotape review, self-reflection and parent feedback. Five certified leaders have undertaken peer coach training that enables them to provide in-house supervision to newer group leaders and two leaders have been identified to train as in-house trainers or mentors, which will further reduce costs by bringing the whole process in-house. An IY administrator has been employed to oversee this strategy and a further 15 staff were trained as group leaders in 2013 and 20 in 2014. Based on this reconfiguration, and given the benefits of scale and the earlier infrastructure support in terms of training and materials, the cost of the ongoing service is considerably lower than that reported for the research trial (see Table AII). Lower costs after programme roll-out have also been found in previous studies of IY (Charles *et al.*, 2013). This is likely to be because the supervision led to leader certification and bought leader support in house.

From a policy perspective, we need to ask how much BCC is prepared to pay for a one-point improvement on the SDQ, ECBI or APS. Difficulty interpreting the clinical significance of one-point improvements on these scales leads us to explore how resources invested lead to shifts in the distribution of scores of children's behaviour and parenting skills. In order to assess the probability of cost-effectiveness for each of the measures we need to set payer thresholds which are by nature arbitrary. It appears that for the IY BASIC parent programme, roll-out after a research study is costing less due to the prior investment in training, resources and supervision.

While research findings do not always lead to wider implementation and roll-out, this study confirmed to BCC and policymakers that the Brighter Futures' IY parenting programme provides benefits on a range of child behaviour and parental competence measures at a modest additional cost and by using regular children's centre staff this left the BCC with a cadre of trained and experienced staff. This was the only one of the three programmes trialled under the Brighter Futures initiative that showed effectiveness (Little *et al.*, 2012) and as a consequence the only programme that has continued to receive ring-fenced Brighter Futures funding. BCC's work in implementing evidence-based service provision and investment in early prevention initiatives has been recognised in the Children's and Adolescents' Mental Health and CAMHS report (House of Commons, 2015).

Approximately 57 per cent of parents in the intervention arm attended at least seven out of 12 sessions. This was lower than in previous studies; Hutchings *et al.* (2007) had an 83 per cent rate of attendance of 7+ sessions and Webster-Stratton (1998) had an 88 per cent rate of attendance for 6+ sessions. The benefits of attending 7+ sessions compared to the waiting list control are clear; parents who attended six or less sessions performed comparably to parents in the waiting list condition, whereas parents attending 7+ sessions had an incremental improvement of 3.67 SDQ points over the control condition. A practical implication of this result is the need to encourage parents to attend the sessions to reduce drop-out rates.

Strengths of the study

Economic evaluation of public health initiatives, including prevention and early intervention services, requires a broader set of costs and outcomes than economic evaluations of clinical interventions to be considered. This paper does this by including outcomes for both children and parents, and presents results not only as conventional ICERs but also in terms of the proportion of children who move from clinical concern to below clinical concern cut-off on the SDQ. Also we undertake sub-group analysis to further explore the impact of dose, i.e. the number of sessions attended by parents, on the ICER estimate.

Limitations of the study

There are two main limitations to the design of the Birmingham Brighter Futures IY Trial. First, this trial was fairly small, with an economic analysis based on 144 participants, representing 98.0 per cent of the clinical sample of 147 participants. However, a sample size and power calculation was conducted and we recruited to that target so we can have confidence in our findings. Second, participating index children and families were only followed-up for six months so that the control families could be offered the intervention as soon as possible.

Implications for future research

There is a growing evidence base for the effectiveness of the IY BASIC parent programme and this paper adds to an increasing number of published papers on the cost-effectiveness of IY. Commissioners are interested in the longer term benefit-cost ratio or return on investment in children's services. Our study provides further data for the construction of future economic models to forecast such longer term benefit-cost ratios. Future trials with accompanying economic evaluation studies would benefit from longer follow-up, greater attention to context and potential effects of other programmes running simultaneously; and greater attention to the impact of dose of intervention on cost-effectiveness.

Comparison of findings with published literature

There are a small but growing number of cost-effectiveness analyses of parenting interventions (O'Neill *et al.*, 2013; Edwards *et al.*, 2007; Charles *et al.*, 2011; Simkiss *et al.*, 2013) with some attempt to look at the longer-term effectiveness of these programmes (O'Neill *et al.*, 2013; Bywater *et al.*, 2009; Muntz *et al.*, 2004). This trial would have benefited from a longer follow-up period, although ethically it is considered inappropriate to withhold intervention from control families for a programme with an increasingly strong evidence base for its effectiveness. Previous authors have estimated the longer-term return on investment of parenting programmes (O'Neill *et al.*, 2013; Muntz *et al.*, 2004). Recently two reports have been published by the Social Research Unit focusing on youth justice and early years and education (The Social Research Unit, 2012a, b). These reports highlight interventions that provide the best value for money in terms of benefit-cost ratios and return on investment and, as the Birmingham Brighter Futures initiative demonstrates, costs fall significantly when the appropriate infrastructure is developed to build on research findings and roll the programme out in a widespread way. The cost of £9,672 to move a child in the intervention group from above to below the SDQ cut-off over and above the proportion who would have moved without intervention is considerably higher than the average cost per family of parenting programmes of £1,507 reported in Furlong *et al.* (2012) and £700-£4,273 reported in Dretzke *et al.* (2005), largely due to the higher intervention cost in this study.

Conclusions

The costs of CD in childhood and associated costs in later life are potentially great to the family, the National Health Service, social care services and the judicial system. Despite funding cuts BCC is making a major financial commitment to public health prevention and early intervention. Based on cost-effectiveness findings from the Birmingham Brighter Futures IY RCT, which showed an additional 23 per cent of children moved from above the cause for

concern cut-off to below on the SDQ in the IY intervention group at a cost of £2,418 per child (eight per group) or £1,612 per child (12 per group), BCC has rolled-out the IY parenting programme across the city; demonstrating the effect of evidence-based policy making in action.

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Declaration of Interest: J.H. is paid by the IY programme developer for running occasional training courses in the delivery of the parent programme. All other authors declare no conflict of interest. Funding: This study was funded by Birmingham City Council in collaboration with the Social Research Unit, Dartington. Ethical Approval: North West Wales Ethics Committee.

Trial No. ISRCTN48762440. Note: As two authors of this paper were employees of the Dartington Social Research Unit (DSRU) at the time of the research (albeit not when the paper was submitted), and the research formed part of wider study by the DSRU, it was inappropriate for the Editors of the *Journal of Children's Services* at the time (Nick Axford and Michael Little, both employees of the DSRU) to oversee the review process. Accordingly, a member of the Editorial Board, Professor Jeni Beecham, kindly oversaw the review process and made all decisions concerning the paper, including reviewer selection, recommended revisions and ultimately acceptance for publication.

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Appendix

Table A1 Unit cost of health, social care and education costs in UK pounds for 2009-10 with source of costs^a

	Unit	Unit cost	Details
<i>Healthcare resource</i>			
GP (surgery)	Visit	36	Per consultation (11.7 mins) (10.8b) ^c
GP (home visit)	Visit	120	Per consultation includes travel (23.4 mins) ^c
GP (phone)	Phone	22	Per telephone consultation lasting 7.1 minutes ^c
GP (clinic)	Visit	53	Per consultation (17.2 mins) ^c
Practice nurse (surgery/clinic)	Visit	12	Per consultation (15.5 mins) (10.6) ^c
Practice nurse (home)	Visit	20	Per consultation (27 mins) (10.6) ^c
Specialist nurse (clinic or surgery)	Visit	17	Per consultation (15 mins) (10.7) ^c
Health visitor, specialist or LAC nurse (home visit)	Visit	42	Per consultation (20min) (10.3) ^c
Community speech therapist, occupational or physiotherapist	Visit	17	Per clinic consultation (30min) (9.3) ^c
Community speech therapist, occupational or physiotherapist (home)	Visit	47	Per home visit (9.3) ^c
Play therapist	Visit	47	Based on above
CPN	Visit	56	Per face-to face session (1hr) (10.2) ^c
Dietitian	Clinic	32	Per hr consultation (13.4) ^c
<i>Social care resource</i>			
Social worker (children)	Office	72	Per client related hour (11.3) ^c
Social worker (children)	Home	199	Per face-to face session (1hr) (11.3) ^c
Assistant social worker, sessional worker or link worker	Office	33	Per client related hour ^c
Assistant social worker, sessional worker or link worker	Home	103	Per face-to face session (1hr) (11.4) ^c
Community paediatrician	Clinic	300	NHS Reference Costs 2009-10, CP60FCPH TCSCMO
Generic multidisciplinary CAMHS team	/hospital	72	Per team member per contact hour (12.7) ^c
Home Start	/hospital	29	Per hour visit (p. 27 Curtis and Netten ^d inflated using Inflation Indices, p. 189 and Curtis p. 225) ^c
Sure Start	Home	6	Per hour Toddler Group or Stay and Play (p. 26 Curtis and Netten ^d inflated using Inflation Indices Curtis, p. 225) ^c
Sure Start	Centre	71	Per hour visit (p. 27 Curtis and Netten ^d inflated using Inflation Indices Curtis, p. 225) ^c
Flying Start	Home	71	Based on above
Family support (parenting skills intervention)	Home	38	Per hour visit (p. 31 Curtis and Netten ^d inflated using Inflation Indices, p. 189 and Curtis p. 225) ^c
Counsellor	Outreach	71	Per consultation (2.14) ^c
Fostering respite care		676	Per week ^c
<i>Education care resource</i>			
Head teacher	School	56	Per hour consultation (based on mid Pt L14-27 qualified teacher salary scale 2009-10 £61,302)
Classroom teacher	School	27	Per hour consultation (based on mid Pt. M4-6 qualified teacher salary scale 2009-10 £29,328)
School nurse	School	37	Per consultation (30mins) ^c

(continued)

Table A1

	Unit	Unit cost	Details
Educational social worker	School	199	Costed as social worker child fact to face contact per hour (11.3) ^c
School doctor	School	283	Per face-to-face contact (CP60FO, NHS Reference Costs 2009-2010)
Educational psychologist	School	81	Per hour per patient contact (9.5) ^c
One-to-one classroom assistant	School	16	Per hour (Gwynedd Council Education Dept) ^{b,e}
Small group assistance	School	5	Per hour/child (based on 3 children/group) (Gwynedd Council Education Dept) ^{b,e}
Special teaching	School	35	Per hour (Gwynedd Council Education Dept) ^e
Educational needs statement	School	219	Per statement ((Assumes 4hr: 1hr face-to-face + 3hr related activity) ^e and 9.5) ^c
Psychological assessment	School	219	Per statement ((Assumes 4hr: 1hr face-to-face+3hr related activity) ^e and 9.5) ^c
Special education cost (special communication with headmaster, 23rd June 2009 cost year 2008-2009, inflated to 2009/2010 as Curtis, 2010, p. 227)			Unit cost
Cost per child per school year attending LEA funded school on day basis = £14,000			
Cost per child per week (= £14,000/42 school weeks in a year)			£337
Cost per child per school year attending LEA funded residential school = £28,000			
Cost per child per week (= £28,000/42 school weeks in a year)			£674
Secondary care costs (DH NHS reference costs 2009-2010)			
Costed on an individual level by consultation, day cases and in-patients. Further details on request			Various

Notes: ^aAll rounded to the nearest £; ^bcost extracted from Edwards *et al.* (2007) inflated from cost year 2003/2004 to 2009/2010 using Hospital & Community Health Service (HCHS) inflation indices Curtis (2010, p. 225)

Source: ^cCurtis (2010); ^aCurtis and Netten (2004); ^eEdwards *et al.* (2007)

Table All Programme costs and cost per child of running IY parenting groups over a 14 session programme since the research trial, exclusive of non-recurrent (training costs) inclusive of employers on costs of 21 and 10 per cent management costs for 2012-2013

<i>Total cost (£)^a per group</i>			
<i>Recurrent group costs to deliver the IY pre-school BASIC and BASIC (n = 300, 30 groups) (based on costs from BCC)</i>			<i>Per group</i>
<i>Project management and recruitment of parents (based on costs supplied by BCC)</i>			
	Gross salary	Time employed	
Project manager	24,000 / year	0.7 FTE	24,000
Administrative support	14,000 / year	0.5 FTE.	14,000
Project management subtotal			38,000
Project management for 1 parenting group (total/30 groups)			1,267
<i>Parenting programme delivery cost (based costs supplied by BCC for 30 groups)</i>			
	Mean (SD)	Mean (SD) unit	
	Unit time		
Group delivery consisting of preparation time for 2 leaders (including room preparation),	23.87	15 hr	5,013
Session time for 2 leaders and follow-up time (including travel, home visits, phone and admin)	(12.06)/hr		
Supervision including travel time	£2,000/ supervision	3 supervisions per year	6,000 200
Group subtotal			5,213
<i>Cost of running 1 parenting group over 14 week programme, including project management and supervision</i>			
Total			6,480

Note: ^aRounded to the nearest whole pound and all salaries include employers on-costs

About the authors

Professor Rhiannon Tudor Edwards is Professor of Health Economics and Co-Director of the Centre for Health Economics and Medicines evaluation (CHEME), Bangor University. Rhiannon is also the Director of the Welsh Health Economics Support Service. Rhiannon works closely with a number of UKCRC registered Trials Units and is a Health Economist on a range of HTA and NIHR funded UK trials. She has a particular interest in the methodology of economic evaluation alongside trials of public health and psychosocial interventions. Professor Rhiannon Tudor Edwards is the corresponding author and can be contacted at: r.t.edwards@bangor.ac.uk

Dr Carys Jones joined the Centre for Health Economics and Medicines Evaluation (CHEME), Bangor University in 2009 to undertake a PhD in quality of life measurement for carers of people with dementia. In 2012, Carys became a Research Officer at the CHEME. She has worked on several projects closely aligned to her primary research interests of carers, dementia and aging.

Dr Vashti Berry joined the NIHR CLAHRC South West Peninsula (PenCLAHRC) in 2014 as a Senior Research Fellow to undertake and lead research in the area of complex intervention design/development and evaluation. Her research is particularly focused on the promotion of children's mental health and family functioning, although her remit within PenCLAHRC also extends to physical health conditions.

Dr Joanna Charles read Psychology with Clinical and Health Psychology at the Bangor University and graduated in 2007. She completed her Masters Degree in the Foundations of Clinical Psychology at the Bangor in 2008. Having a keen interest in health and specifically health related interventions; Joanna began a PhD in 2009 with the Centre for Health Economics and Medicines Evaluation (CHEME), conducting an economic evaluation of the Incredible Years Toddler Parenting Programme. Following her PhD, Joanna is a Research Officer in Health Economics within CHEME, providing economics support to various projects.

Pat Linck holds a BA and an MSc from the University of Wales, Bangor. She first joined IMSCaR in 1999. Now retired, Pat previously provided health economic advice for the NIHR Research Design Service for the North West and had provided economic support to the National

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Dr Tracey Bywater is a Reader in the IEE, focusing on the theme of enhancing parental input in supporting children's success. Her area of interest and expertise lies in the design and implementation of randomised controlled trials of complex interventions, namely, parent, child, and school programmes, to assess behavioural and health outcomes for children and their carers/families. In addition to outcomes or clinical effectiveness of these interventions, she is interested in process, and cost, evaluations of intervention delivery. Tracey is also the IEE's Director of Post-graduate Studies.

Professor Judy Hutchings established and leads the Centre for Evidence Based Early Intervention. For 25 years she has held a joint post as a Consultant Clinical Psychologist in the NHS (now Honorary) and as a University Based Researcher. In 2011 she was awarded an OBE for her work with children and families. Her interests are conduct disorders, parenting, child social skills, anger management and problem solving, teacher classroom management, real world interventions and fidelity. Whilst most of her work has been within Wales she has also trained internationally and is also working in South Africa in collaboration with Oxford and Cape Town universities.

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