A Cost-Benefit Analysis of Early Childhood Intervention: Evidence from an Experimental Evaluation of the Incredible Years Parenting Program.[♣]

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Abstract

A number of researchers and policy makers have recently argued that the most effective way of dealing with long-run disadvantage and the intergenerational transmission of poverty is through early childhood intervention and in particular policies aimed at supporting the family. This study was part of a randomised evaluation of the Incredible Years Program, which is aimed at improving the skills and parenting strategies of parents who have children with conduct problems. The results show that the treatment significantly reduced behavioural problems in young children. Furthermore our detailed cost analysis, when combined with a consideration of the potential long-run benefits associated with the programme, suggest that the long-run rate of return to society from this program is likely to be relatively high.

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1. Introduction

It is now widely acknowledged that early childhood factors, such as behavioural problems, parental economic status, and family composition, have significant effects on subsequent economic, academic and social success (e.g. Scott et al. 2001; and Colman et al. 2009). Recently, economists have begun to give serious consideration to these issues. For example in a study of U.K. children Gregg & Machin (1999) found that indicators of childhood behavioural problems at age 7, have significant negative effects on school attendance and contact with police (measured at age 16), as well as on the probability of remaining at school after the compulsory school leaving age. This was true even after controlling for cognitive skills, family structure and a broad set of parental characteristics. In their survey of early childhood intervention programs in the U.S. Carneiro and Heckman (2003) note that early interventions can be highly effective in reducing crime, promoting social skills and integrating disadvantaged children into mainstream society, and that some of the most effective interventions target non-cognitive, social and emotional skills.[1]

Existing evidence suggests that parenting plays an important role in determining early childhood behaviour (e.g. Campbell, 1995) and parenting programs appear to offer an effective and economically efficient way of identifying and managing the risk associated with poor adjustment in childhood (Bauer & Webster-Stratton, 2006; Barlow & Parsons, 2008). More specifically research in the U.S. and more recently in the U.K., supports the efficacy of these programs in reducing the intensity of conduct problems in the short-term (e.g. Patterson et al., 2002; Gross et al., 2003; Hutchings et al., 2007) and

[1] Other surveys include Barnett (1995), Brooks-Gunn et al (2000) and Currie (2001).

in the longer-term (Scott et al., 2001; Bywater et al., 2009). Heckman (2000) emphasises the role of the family in the formation of learning skills and calls for greater government support at the family level when tackling long-run inequalities. However, relatively little is known about the cost-effectiveness of such programs or their long-term economic returns.

The analysis reported here is part of a Randomised Controlled Trial (RCT) of an early intervention program called the Incredible Years (IY) Basic Parent Training Program conducted in four urban areas in the Mid-Eastern region of Ireland. The Irish case is of particular interest because despite its unprecedented growth over the last 10-15 years Ireland still has one of the highest rates of child poverty among developed countries (UNICEF 2007). We use the primary outcome results from the RCT to evaluate the cost-effectiveness and long-term economic return of the Basic Parent component of the IY program. Our results show that the parenting programme significantly reduced behavioural problems among children throughout the sample, while the cost-benefit analysis suggest that the long-run social return from this program compares favourably to popular alternative policies.

2. Incredible Years Parenting Programme

The Incredible Years Parent, Teacher and Child Training Series was developed, over the last 30 years, at the University of Washington and is specifically designed to prevent and treat emotional and behavioural difficulties in children aged 0-12 years. This paper considers the basic BASIC Preschool/Early School Years Parent Training component of the program on children between the ages of 3-7 years. This program aims to improve the

skills and parenting strategies of parents, particularly those who find their child's behaviour difficult or challenging. Parent competences are developed in areas such as communication, limit-setting, problem-solving and anger-management. Parents are also encouraged to develop support networks. Two trained facilitators take parents in groups of approximately 12 for one 2 hour session each week over a 12-14 week period. The programme uses a collaborative approach between group leader and parents including analysis of video vignettes of family behaviour for discussion.

3. Study Design

To carry out our analysis sample members were randomly allocated, on a 2:1 basis, to either the parent training intervention group (T) (n=103) or a control group (C) (n=46). Details of the RCT design are given in McGilloway et al (2010). Participants were assessed at baseline in early 2008 (i.e. before they received the intervention) and again 6 months later during which time all members of the treatment group had particiapted in the program. Valid follow-up data for the purpose of the economic analysis were obatined for 112 parents, of which 74 were members of the treatment group and 38 were members of the control group. Each parent completed a Profile Questionnaire which collected detailed information on family background, employment status and income levels. Summary statistics for the sample used in this study are given in table 1. Crucially, we find no statistically significant pre-intervention differences in the behavioural test scores of the children.

For purposes of conducting the cost-benefit analysis, an adapted version pf the Client Service Receipt Inventory (CSRI) (Beecham & Knapp, 1992) was used to record the

frequency with which health, educational and social services were used by parents and their children during the previous six months. This Service Utilisation Questionnaire (SUQ) was administered by means of a face-to-face interview with the main caregiver who was asked to provide information on the child's use of a wide range of health and social services and special educational services (e.g. GP, social worker, educational psychologist, hospital visits). The SUQ was administered at two time points: at baseline, before parent/caregivers began the parenting course and again 6 months later.

The *Eyberg Child Behaviour Inventory (ECBI*; Eyberg & Ross, 1978; Eyberg, 1980) was the primary outcome measure of child problem behaviour. This elicits parental reports of the frequency and intensity of problem behaviour in children. The test has been developed as a screening instrument for the differentiation of normal and conduct problem children and studies have indicated that the test has good reliability and validity (Eyberg and Ross (1978) and Eyberg and Robinson (1983)). The test is used to assess 36 individual problems, including difficulty following orders, difficulty interacting with other children, problems with attention seeking and problems with concentration and attention span. Many of these characteristics have been identified by teachers as important determinants of readiness to learn, with teachers placing much less weight on more traditional intellectual achievements (Lewit and Baker 1995, Kiernan et al 2008). Children are then assigned a score between one and seven depending on the frequency of the problem (1 if the problem never occurs and 7 if the problem always occurs). The final test score, which ranges from 36-252, is an aggregate of the individual scores over the 36 problems. The clinical cut-off for serious behavioural problems with the Eyberg Test is 127.

4. **Estimating the Program Effects**

In order to estimate the cost effectiveness of the Incredible Years program we need to obtain the estimated effect of the program with the additional cost of providing this program.

4a. Impact of Program on Child Behaviour.

McGilloway et al (2010) provide a detailed analysis of the effect on the IY program on a range of children's and parents' outcome. They report a statistically significant reduction in problem child behaviours and improvements in pro-social behaviour. In particular a mean difference 21.45 was found between the treatment and control groups on the ECBI intensity scale.[2] The gains are further illustrated in Figure 1, which shows the distribution of pre and post intervention ECBI scores for both the treatment and control group, pre and post intervention. The left hand panel of this figure supports the validity of the random assignment process, with no significant difference in the distribution of test scores. It is also clear from the post treatment distributions in the left hand panel that the mean effects identified in McGilloway et al (2010) are not driven by outliers and instead reflect a genuine improvement in test scores throughout the distribution. Using the median change in test scores we find that the median drop in test scores was 15 points higher in the treatment than in the control group. Furthermore, while over 20% of the control group experienced a rise in the ECBI scores, indicating greater behavioural problems in the follow-up, this was true for less than 10% of the treatment group. Further evidence of sustained effects throughout the distribution is found in the fact that following treatment 65% of the treatment group had obtained

[2] The point estimate for our smaller sample was 21.53

Eyberg intensity scores below the clinical cut-off (127), when compared to only 36% of the control group.

4.b Service Usage

As noted earlier a SUQ was used to assess the frequency of health, social and educational services used by children in our sample. Data on service utilisation were obtained for the previous six months. The details on service use are given in Table 2. Looking at the results we see that, in terms of primary care, the most commonly used services were General Practitioners (GPs), Nurses and Speech Therapists.[3] The remaining primary care services such as social workers, paediatricians, and physiotherapists tended to be used by less than 10% of either group. In terms of special resources during schooling only one-to-one help, which is likely to mean accessing Special Needs Assistants, was identified as a commonly reported service.

Of additional interest is the comparison of service use before and after the intervention. While there is some evidence of a decline in service use by the control group, particularly with regard to speech therapy, the reduction in service use over time is more evident in the intervention group. In particular, there was a substantial decline in the use of many primary care services, as well as less contact with social workers. At follow-up, only 1% of the intervention group had seen a social worker during the previous six months. This decline in service use is consistent with improvements in child behaviour and serves to enhance the overall cost-effectiveness of the program.

[3] Comparisons to the general population are difficult given the time span involved though Madden, Nolan and Nolan (2005) report that the proportion of the total adult population in Ireland who had visited a GP at least once in the previous 12 months rose from 70.9% in 1987 to 85.6 in 2000 for medical card holders and from 52.9 to 66.9 for non-medical card holders. Harmon and Nolan (2001) report that 16.7% of the adult population had an outpatient visit to a hospital during 2000. The comparative figures for in-patient and A&E visits were 12.9% and 11.8% respectively.

5. Cost Data.

5.1 Unit–Service cost

The next step in our analysis involved obtaining the costs of the individual services. In previous studies, much of the unit cost data were publicly available; for example, Edwards et al (2007), in their UK-based study, used the Unit Costs of Health and Social Care annual publication. There is no comparable publication for Ireland. Table 3 lists the key services as identified in the data provided by the SUQ and the unit costs data collected for these services. For some categories (e.g GP visits), the costs are well-established. For some of the others (e.g. A&E, Outpatient and Overnight stay in paediatric hospital) costs were obtained from the Casemix/HIPE unit of the Health Service Executive, the organisation charged with running the public health system in Ireland.[4] These costs are derived from the annual accounts of the hosptials under headings such as salaries, radiology, labs, drugs and then allocated to a range of hospital treatments in order to faciliate the construction of an average cost per case.

5.2 Cost-Diaries

The final cost component concerns the direct recurrent costs per parent of running the program. These costs were obtained from 'cost diaries' completed by each of the group facilitators during each week of the program. These costs covered the full range of recurrent costs involved in implementing the program. These included (i) pre-group

[4] We are grateful to Fiachra Bane, CASEMIX/HIPE analyst at the HSE for providing these figures. More information on the Irish Casemix system can be found at http://www.casemix.ie/.

costs of the facilitator; (ii) costs of recruiting the parents; for instance, time and mileage for each family visited and telephone call; (iii) costs directly related to ongoing group (e.g. session preparation time, home visits to parents and supervision time); and (iv) costs incurred through facilities provided, such as the provision of crèche facilities or payment for childcare, taxis, food and catering, and other administrative costs directly related to the program. Non-recurrent initial training and group set-up costs were not included for purposes of this analysis.

A total of 18 cost diaries were completed and for simplicity we summarise these costs in three categories, direct *wage costs* covering the costs of the facilitators time, *travel costs*, and *other costs and expenses*. Table 4 provides a summary of total recurrent costs under each of these three headings. As expected, direct wage costs constituted the largest component of total cost, accounting for almost 90% of total costs. Additional expenses accounted for the majority of the remaining costs, with travel expenses amounting to only a minor component of overall costs. Since the average group size observed in this study was 11 parents per group, these data imply an average recurrent cost per parent of €1463. Table 5 combines this data with the service utilisation costs in order to estimate the incremental costs associated with the program. The final row indicates that the additional net cost of the program was approximately €1520. This figure was used to construct an estimate of the overall cost-effectiveness of the program.

6. Cost-Effectiveness of Incredible Years Parenting Program

In health economics, cost-effectiveness is defined as the incremental cost effectiveness ratio (ICER) of the new treatment or intervention relative to a specified alternative (typically a waiting list control or placebo condition). [1] Stinnett and Mullahy (1998) have identified a number of problems with the use of ICER for this type of sensitivity analysis and have turned to the related concept of the Incremental Net Health Benefit Statistic (INHBS). However both the ICER and INHB statistics will lead to the same results in the event that both the incremental costs and incremental benefits are positive, which, as we will see, turns out to be the case for our application (see also Briggs and Fenn (1998)).

Formally the ICER is defined as:

$$R = \frac{\left(C_T - C_C\right)}{\left(E_T - E_C\right)} \tag{1}$$

where C_T and C_C are the population mean cost of the treatment (T) and the control (respectively) and E_T and Ec measure the population mean health effect associated with the treatment and control groups. The ratio of the incremental cost to the incremental benefit provides the additional investment of resources required for each additional unit of health improvement expected from investing in treatment T rather than in treatment C. To estimate this we replace the unknown parameters with sample means giving:

$$\hat{R} = \frac{\left(\overline{C_T} - \overline{C_C}\right)}{\left(\overline{E_T} - \overline{E_C}\right)} \tag{2}$$

where $\overline{C_j}$ is the sample average cost incurred by members of group j (j=treatment (T), control (C)) and $\overline{E_j}$ is the sample average of the outcome variable for group j (in our case the Eyberg Intensity Score). As defined, the ICER simply measures the cost of

obtaining a one unit decrease in the Eyberg score when using treatment T when compared to treatment C. The extent to which the program can be viewed as cost-effective will depend on society's preferences and this will be discussed in more detail later.

When the outcomes from this study are combined with the cost results, we estimate a cost-effectiveness ratio of €72 per 1 point change in the Eyberg intensity score (1520/21; where the numerator is the difference in difference estimate of the cost change and the denominator is the difference in difference estimate of the change in test score brought about by the treatment). This estimate compares to the point estimate of £73 (€83) obtained by Edwards et al (2007) in their study of the IY program in Wales. Our estimate implies that it would cost €7848 ((235-126)*72) to bring the child with the highest intensity score to below the clinical cut-off point and €2232 ((157-126)*72) to bring the average child in the study below this limit. We will discuss these estimates in the context of a full cost-benefit analysis in Section 7. The ICER may be complemented using Probabilistic Sensitivity Analysis (PSA) (e.g van Hout et al (1994)). Confidence intervals for our estimator can be constructed either parametrically, if one is willing to make distributional assumptions, or non-parametrically (e.g using bootstrap) if a closed form expression for the distribution of the estimator is difficult to obtain. In our evaluation a 1000 replication bootstrap procedure 90% Confidence Interval of [€33-€147].

To gain additional insight into our estimates we consider a family of tests of the following form:

$$H_o : \frac{(C_T - C_C)}{(E_T - E_C)} \geq k \quad \text{versus} \quad H_A : \frac{(C_T - C_C)}{(E_T - E_C)} < k \qquad (3)$$

As posed, the hypothesis asks us to consider the conjecture that our program can be deemed cost effective relative to a benchmark value €k. Rejecting the null-hypothesis in favour of the alternative is strong-evidence that our program is cost-effective for the given k. In this sense 'k' can thought of as measuring the maximum price society is willing to pay for an incremental gain in health. As usual in econometrics we might considering reporting the p-value associated with this hypothesis. Let us call this p-value, p_k, where the p-value is indexed by k to remind us that the hypothesis is specified for a given value of k. It is typical in classical econometrics to require p-values smaller than at least .1 before considering rejecting a null-hypothesis. That is, if $p_k<=.1$ we can `confidently', with at most a 10% chance of being wrong, reject the null-hypothesis and thus deem our program to be cost-effective against a willingness to pay of €k.

One problem with the approach as outlined above, is that it is conditional on a given k. However, we are unlikely to know society's willingness to pay. In addition it may vary over time and place and indeed across governments entrusted with funding potential programs. One solution to this is to repeat the above analysis for a range of k, thereby allowing individuals/policy-makers to assess how support for cost-effectiveness varies across these prices. Graphically, one might consider plotting p_k against k, for a range of k. In the literature it is more common to plot $(1-p_k)$ against k.[5] The resulting curve is known as the *Cost-Effectiveness Acceptability Curve (CEA)*. Clearly an increase in k raises the possibility of our program being deemed cost-effective and hence our

[5] Given the relationship between hypothesis testing and confidence levels (1-p) is the smallest CI that contains k (see Lothgren and Zethraeus (2000)).

confidence level should increase (p-value decline).[6] However, the exact shape of the curve is unknown without considering the data in detail.

The CEA curve for our application is given in Figure 2. Given uncertainty about the parametric distribution of the ICER, we use a 1000 replication bootstrap to estimate the associated p-values for each level of k.[7] Following our earlier discussion, we distinguish between k-values for which $p_k>.1$ and those for which $p_k<.1$. From our graph we can then infer that we are 90% confident that the Incredible Years program would be cost-effective, provided society was willing to pay at least €120 for a one-point reduction in the ECBI test-score. Alternatively with 90% confidence we propose that a 1 unit improvement in Eyberg score can be obtained for *at most* €120.

7. Cost-Benefit Implications

To date there have been relatively few cost-benefit analysis of early intervention programs of the type considered in this paper. Aos et al (2004) undertook a series of cost-benefit analysis for a range of early intervention programmes. Their results for Pre-Kindergarten Education Programmes and Home-Visitation Programmes, indicate that while some programs (such as early child education for low income families, Nurse-Family Partnership for Low income Women, and Home Visitation Programs for at Risk Mothers and children) achieve significantly higher benefits than costs, others

[6] However, see Fenwick et al (200) for examples of data generating processes that do not exhibit this behaviour. However, their examples require that a non-negligible proportion of the joint density of incremental costs and effects straddle multiple quadrants in the incremental cost-benefit plane. However Figure 1A in the Appendix shows that this is not the case with our application.

[7] The cost-effectiveness plane generated in this way is given in Figure 1A of the Appendix and illustrates the almost complete dominance of the north-east quadrant (positive benefits and positive incremental costs) in our application. This pattern negates the earlier concerns of Stinnett and Mullahy (1998) concerning the use of ICER's and also rules out the "odd-shaped" CEA curves discussed in Fenwick et al (2004).

(e.g. Early Head Start, Comprehensive Child Development programme and Infant Health and Development Program) were less successful in this respect, yielding net losses of between $16,203 and $49,000 per youth. The unsuccessful programmes were all characterised by extremely high costs (ranging from $20,000 to $49,000 per youth), reflecting in some cases, such as Early Head Start, the much more intensive nature of the intervention[8] As noted earlier, the estimated cost of the IY program is a much more modest €1463 per parent. While many of the programs discussed by Aos et al (2004) have features in common with the Incredible Years program, this program itself was not included on the grounds that the outcomes associated with the program (i.e. reductions in child conduct disorder) are difficult to value. While we accept that this is the case we nevertheless believe that there is some merit in trying to put the cost-effectiveness analysis provided in the previous section in context. To do this we look at studies that have tried to relate improvements in conduct disorder to outcomes which are relatively easy to value.

7.1 Conduct Disorder and Crime

Scott et al (2001) carried out a longitudinal study of children and young people (aged 10-28 years) from Inner City London. The children were screened in the initial wave and, on the basis of this clinical screening, were categorised into the following three groupings: those with no behavioural problems, those with mild behavioural problems and those with severe conduct disorder. Detailed life-history data, including educational

[8] In addition the low return to Early Head start reported by Aos et al (2004) reflects a very restrictive view of the likely benefits of the program. In particular the only benefit attributed to Early Head Start is its effect on cognitive test scores. This seems to be a rather pessimistic reading of the evidence presented in Love et al (2004).

history, psychological functioning, work and marital status, educational provision and criminal records, were obtained during follow-up surveys. The authors estimated that those with conduct disorder were 3 times more likely to have been convicted of a crime than those without such problems and 12 times more likely to have spent time in prison, though the latter finding was based on relatively small numbers. In another 25-year longitudinal study of a birth cohort in New Zealand, Fergusson et al. (2005) reported that children diagnosed with severe conduct problems at age 7-9, were 5 times more likely to be arrested at ages 21-25 than those with less severe problems and almost 20 times more likely to have been imprisoned, even after controlling for a wide range of early family and child characteristics. Likewise, in an Irish context, Cleary et al (2004) conducted a 10-year longitudinal study of young children and found that 47% of those with behavioural problems in childhood were subsequently in trouble with the police when compared to only 14% of the non-deviant group.

7.2 Conduct Disorder and Unemployment

With regard to unemployment, Caspi et al (1998) found that adolescents with conduct disorder are likely to have been unemployed for 5 months longer when aged 21-26 years, than those without such problems. In addition, Scott et al (2001) reported that welfare payments until the age of 28 were 1.65 times higher for children with problems than for those with none. While Colman et al (2009) reported no significant differences in unemployment across behavioural groups, their definition of unemployment was relatively weak. In particular, they only considered whether an individual had ever experienced a spell of unemployment and did not adjust, therefore, for differences in

duration or multiple spells of unemployment. However, they did report that individuals with severe behavioural problems were almost twice as likely to experience financial difficulties in adulthood.

7.3 Conduct Disorder and Education

Miech et al. (1999), in a study in New Zealand, showed that children with conduct disorder were five times less likely to obtain a School Certificate (i.e. state exam at age 16) than those without behavioural problems. Of the young people who did receive a certificate, those with a conduct disorder were 3.3 times less likely to complete high school, and conditional on doing so, were 2.5 times less likely to go to university. In another UK-based study, Colman et al (2009) found that children with severe behavioural problems were more than twice as likely to leave school without a recognised educational qualification than those with no behavioural problems, and that this effect remained significant even after controlling for family socioeconomic background and other child characteristics. In addition, Scott et al (2001) reported that children with conduct problems were much more likely to require: remedial help at primary and secondary school; the intervention of a social worker for truancy cases; and extra school assistance to tackle literacy problems when older. Fergusson et al. (2005) also found that children with severe behavioural problems were 10 times more likely to leave school with no educational or vocational qualifications than those with no such difficulties. However, unlike the work by Colman et al (2009), this difference was not statistically significant after controlling for a range of family and child characteristics. In their Irish study, Cleary et al (2004) showed that two-thirds of the

'behaviourally deviant' group left secondary school before completing the Leaving Certificate (universal state school exam in Ireland taken in the final year of second level education) when compared with only about one in five (19%) of the the non-deviant group. Furthermore, participation at third level varied considerably. Approximately half (51%) of the non-deviant group went to third level education when compared to only 16% of the group who were classified as 'behaviourally deviant'.

7.4 Cost-Benefit Analysis of Incredible Years Program

In this section, we combine the results from these studies with our evaluation of the IY parenting program to estimate the potential long-run returns of the program. We consider potential benefits under each of the three categories discussed above.

The latest figures for Ireland suggest that the average cost of keeping a prisoner for the year 2007 was €97,700 (Irish Prison Service Annual Report, 2007). Fergusson et al (2005) estimated that the gap in the probability of imprisonment between those with behavioural problems and those without was 7 percentage points. This figure gives an approximate measure of the additional cost of prison arising from conduct disorder, to be in the order of €6839 per person. In our calculations, we assume that the savings from reduced criminal activity occur only once and at the age of 30, which is the average age of the prison population in Ireland in 2007 (Irish Prison Service Annual Report 2007).

We might also consider including, as an additional source of societal benefit, a reduction in unemployment duration of the order of 5 months, as suggested by Caspi et al (1998). It is estimated that the annual cost of unemployment in Ireland, in terms of

welfare payments and losses in taxes, is approximately €15000 which, when combined with Caspi et al's estimate, leads to an expected savings of €6250. Again, we are assuming for simplicity, that this is a once-off saving, occurring again at the age of 30.

Finally, as noted above, a number of authors have highlighted the potential educational benefits arising from reduced behavioural problems, including less reliance on remedial education (Scott et al 2001) and increased graduation rates at both second and third level (Colman et al 2009)). In an attempt to capture some of the societal benefits to the state, we consider one hour a week less contact with Special Needs Assistants (SNA) for each of the first 4 years of primary school. Given a school year of 37 weeks and an hourly pay rate of €15.20 for SNA, this translates into an annual savings of €562.40 for each of the 4 years of schooling.

From our earlier analysis we know that the mean pre-intervention Eyberg score was 157. Thus a 31-point decrease is required to reduce this score below the critical level. Costing each point reduction using our estimate of €72 gives a mean cost of €2232 to bring the average problem child below the clinical cut-off value.

Given all these assumptions we can estimate the internal rate of return of the programme as the interest rate that solves the following problem:

$$\left(\sum_{t=1}^{4}\frac{562}{(1+r)^{t}}\right)+\frac{6839+6250}{(1+r)^{25}}-2232=0$$

This leads us to an internal rate of return of 13.3%.[9]

As a robustness check, we take a rather extreme assumption and assume that the reduction in crime is the only benefit arising from treatment of conduct disorder.[10]

[9] Sometimes investments are summarized using Net Present Values rather than internal rate of returns. Assuming an opportunity cost of capital of 5% the NPV of the IY program given our assumptions is €4599 per child.

In this case the internal rate of return is given as the solution to

$$\frac{6839}{(1+r)^{25}} - 2232 = 0$$

resulting in an estimated return of 4.6%.

These estimates are intended to illustrate the potential return associated with the parenting program under evaluation. Other benefits such as improvements in second and third level educational attainment and the associated increases in productivity and earnings capacity, reductions in substance abuse, benefits to victims of reduced crime and benefits accruing to the parents as a result of the programme are likely to push these returns higher. On the other hand the short-run nature of our evaluation leaves open the question as to whether additional programme costs may be needed in the future in order to maintain the short-run benefits identified in our evaluation.

While we know of no long-run evaluation of the Incredible Years program, the evidence available does suggest that the initial gains reported by McGilloway et al (2010) may have a significant long-run component. Hutchings et al (2004) report on a four-year follow up evaluation of a structured parenting program which is similar in many ways to the Incredible Years program. They found that the substantial improvements in child behaviour observed after the 6 month follow-up were still evident four years after the intervention had stopped. By contrast, the control group received a less intensive program but exhibited no evidence of long-run gains. Furthermore, Bywater et al (2009) show that

[10] The savings in criminal costs are by far the largest components of the estimated additional costs associated with conduct disorder in the UK as reported by Scott et al (2001) and also the largest component of the estimated benefits associated with the pre-school intervention as estimated by Barnett (1996).

significant improvements in primary measures of child behaviour resulting form an evaluation of the IY parenting program conducted in Wales were maintained 18 months after baseline. In addition, Webster-Stratton, Rinaldi and Reid (2009) carried out assessments of participants 8-12 years after contact with the program. Although no control group was available in this case, the results suggest that the treated children showed less severe conduct problems at adolescence (e.g. limited contact with the criminal justice system) than might have been expected given their earlier clinical levels of conduct disorder.

Therefore on the basis of the evidence available it would seem plausible that the estimated rates of returns presented above may, if anything, underestimate the true rate of return. In spite of this, these estimates compare favourably with previous evaluations of policies aimed at tacking disadvantage. For example the estimated internal rate of return of the Perry Preschool Project, perhaps the most heralded early childhood intervention program in the United States, was 8% (Barnett 1992)), while many of the adult training programmes studied surveyed by Heckman et al (1999) yielded negative returns. Our cost-benefit analysis therefore suggests that parenting programs such as the Incredible Years program may be a cost-effective policy in reducing long-term inequality.

8. Conclusion

The call for an increased policy focus on early childhood interventions and in particular policies that tackle the role of the family in early childhood development has been growing in recent years. This call is based on the dual premise that `skill begets skill',

so that early childhood intervention can result in cumulative gains over the life-cycle, and that the family environment plays a significant source of early childhood disadvantage. This paper uses the findings from a randomised controlled experiment to examine one such early childhood intervention programme. The findings reported here suggest that the program offers a cost-effective policy option to reduce long-term inequalities, with a long-run rate of return that compares favourably to more intensive and costly alternatives.

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Table 1: Summary Statistics

	Treatment Group	Control Group	p-value for Equality across Treatment groups
Male Child	.58	.68	.288
Parent's Age	34	35	.59
Married	.31	.50	.07
Seperated/Divorced	.11	.03	.13
Single	.24	.24	.94
Social Housing	.40	.37	.81
Employed	.23	.24	.93
Weekly Income <€300	.47	.32	.11
White	.93	.84	.13
Eyberg Intensity Score	157	161	.54

Table 2: Proportion using Medical Services at Baseline and Follow-up survey

Service	**Control Baseline**	**Treatment Baseline**	**Control Follow-up**	**Treatment Follow-up**
GP	53%	64%	55%	42%
NURSE	13%	10%	5%	5%
Health Visitor	8%	12%	5%	3%
Speech Therapist	21%	21%	8%	5%
Physiotherapist	3%	8%	5%	3%
Social Worker	5%	9%	10%	1%
Community Paediatrician	3%	5%	0%	1%
Special Needs Assistant	18%	12%	13%	12%
A&E Department	8%	12%	10%	12%
Outpatient stay in hospital	10%	20%	11%	10%
Overnight Stay in hospital	2%	5%	3%	7%

Table 3: Unit Costs Data obtained to date, for the Incredible Years Ireland Study

GP	€45
Nurse	€24 an hour (Estimate based on Dept. of Health & Children Payscales for Public Health Nurse)
Speech Therapist	€22.11 an hour (Estimate based on Dept. of Health & Children Payscales)
Physiotherapist	€22.11 an hour (Estimate based on Dept. of Health & Children Payscales)
Social Worker	€19.23 an hour (Estimate based on Dept. of Health & Children Payscales for Social Care worker)
Community Paediatrician	€24
In-School Assistance Special Teaching	€15.20 an hour (Estimate based on Dept. of Education Payscales for SNA)
Hospital	
Casualty Department (A&E)	€273 (Dept. of Health Casemix/HIPE Unit – direct correspondence)
Travel by ambulance	€83 (Gannon et al)
Outpatient Consultant appointment	€160 (Dept. of Health Casemix/HIPE Unit – direct correspondence)
Overnight	€1562 (Dept. of Health Casemix/HIPE Unit – direct correspondence)

Table 4: Recurrent Costs of Program Provision using Leader Cost Diaries

	Total Cost of Programme	Average Cost per Group	Average Cost per client
Direct Wage Costs	€128321	€14257	€1296
Other Costs	€15219	€1691	€153
Travel Costs	€1389.5	€154	€14
Total	€144929.5	€16102	€1463

Table 5: Health Social Care and Special Education Services used by Children. Figures are mean total cost per child (€)

Type of Service	**At Baseline**		**At 6 month follow up**	
	Control	**Treatment**	**Control**	**Treatment**
Primary Care	112.43	150.93	107.6	98.7
Hospital Services	152.02	405.58	195.57	196.97
Special Education	826.8	556.75	450	560.5
Social Services	3.03	4.93	21.25	0
Parenting Programme	None	None	None	1463
Total	1094.28	1118.09	774.42	2319
Change in cost over 6 months			-319.86	1201
Net Change in Cost				1201+319.86=1520

Figure 1: Distribution of Eyberg Scores at Baseline and 6-month Follow-Up

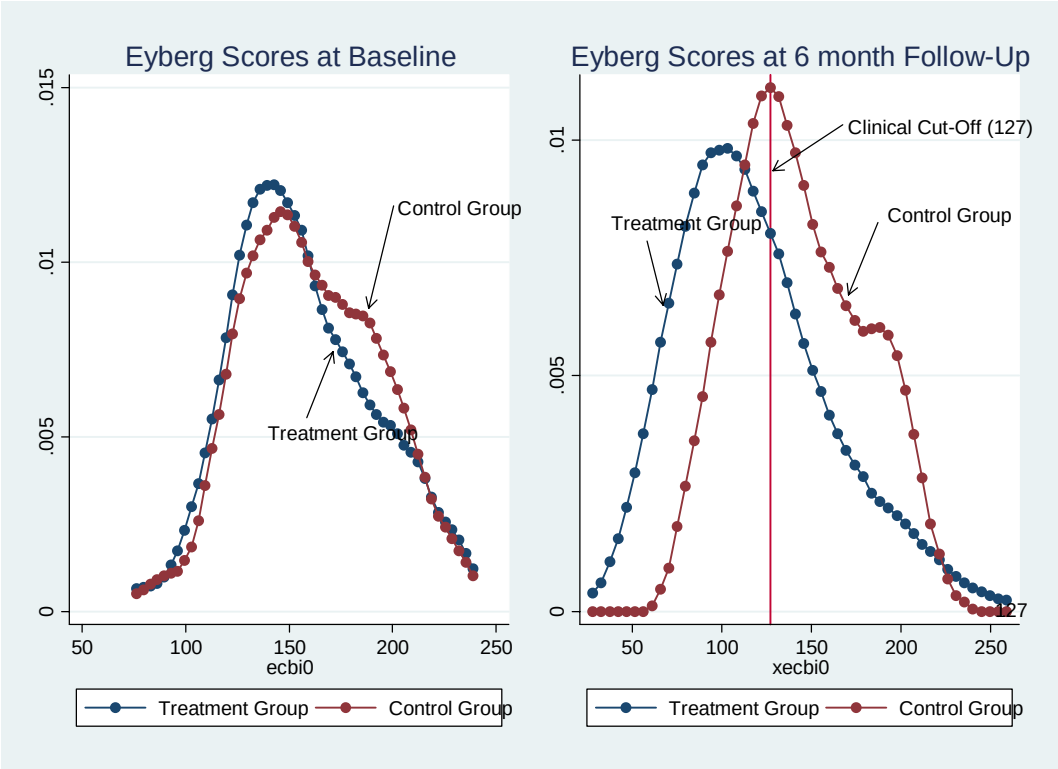
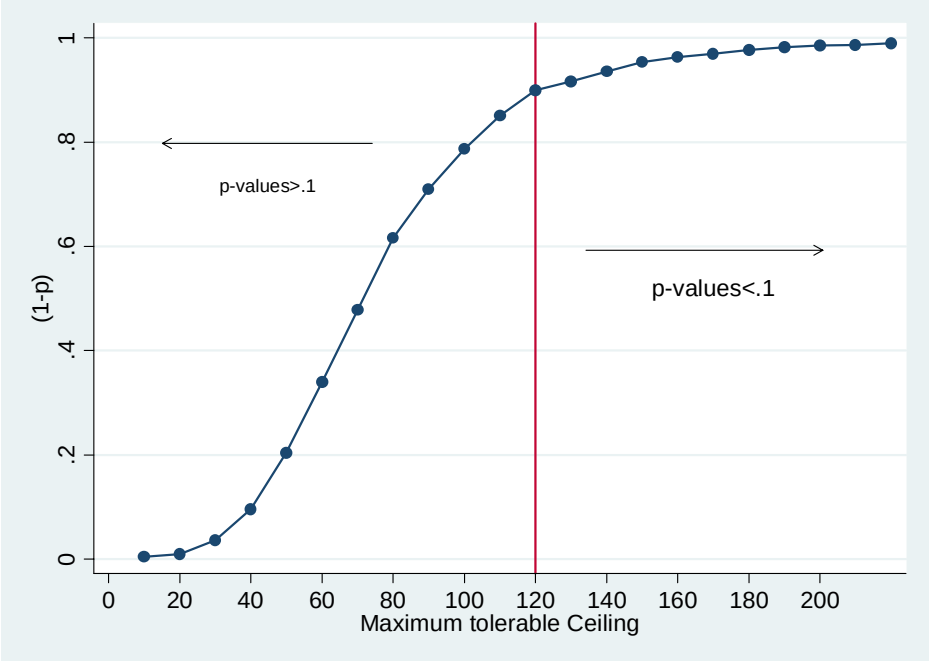


Figure 2: Cost-Effectiveness Acceptability curve for IY Evaluation



Appendix 1:

Figure 1A: Cost-Effectiveness plane for Incredible Years Evaluation