

Cost Comparison of Early Intensive Behavioral Intervention and Special Education for Children with Autism

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Abstract The financial implications of the increased prevalence of autism, though rarely discussed, will be extremely important to society. We compared the costs associated with 18 years of special education to the costs associated with the implementation of an average of 3 years of Discrete Trial Training as an Early Intensive Behavioral Intervention (EIBI) in an effort to minimize the need for special education. Our results indicate that the state of Texas would save \$208,500 per child across eighteen years of education with EIBI. When applied to the conservative estimate of 10,000 children with autism in Texas, the State would save a total of \$2.09 billion with EIBI. Implications for taxpayers, policymakers, and treatment are discussed.

Keywords Autism · Cost · Early intensive behavioral intervention · Special education · Discrete trial training

The prevalence of autism is a topic currently receiving a great deal of attention, since evidence indicates an exponential rise in autism over the last decade. It was generally considered stable and rare with a .05% prevalence rate in the population for decades after Lotter (1966) conducted one of the first epidemiological studies of autism, but the DSM-IV-TR (2000) revised the prevalence rate by reporting a range from 2 to 20 per 10,000 people. This range is a reflection of the more recent reports of higher prevalence of autism around the globe, implying an overall increase in autism diagnoses over the years. For example, Bryson, Clark, and Smith (1988) indicated a prevalence of 10 per 10,000 individuals in Canada, and Webb et al. (1997) reported a prevalence of 9.2 per 10,000 in a Welsh district, a change from the 3.3

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per 10,000 of 10 years earlier. In an elegant study of prevalence in Northern Finland, autism was seen in 12.2 of 10,000 individuals, a reported increase from the 4.75 individuals from only nine years earlier (Kielinen, Linna, & Moilanen, 2000). California perhaps represents the most drastic increases in prevalence rates, with a Department of Developmental Services (2003) report indicating a 634% increase in autism prevalence from 1987 to 2002.

While the causes of this substantial increase in the prevalence of autism are unknown (for an excellent review, see Wing & Potter, 2002), the consequences are far reaching. For example, the rise in prevalence elicits the need for additional services and places a substantial burden on governments to fund programs for the epidemic number of children with autism. Unfortunately, this upward trend does not appear to be decreasing anytime soon, portending substantial costs in the future. A large financial implication of the rapidly increasing rate of diagnoses of Autism Spectrum disorders includes growing costs associated with special education, which is the focus of the current study.

The standard educational service for children with autism is special education, a term that generally reflects an eclectic assortment of educational and therapeutic techniques that are as varied as the school districts from which they come. Special education generally serves a highly heterogeneous group of children, such as a mix of children with autism, Down Syndrome, learning disabilities, mental retardation, or other developmental disabilities. In addition, some populations of children benefit from the programs more so than others, since the typical services are more appropriate for specific deficits or dysfunctions. For instance, for children with autism, empirical evidence concerning the effectiveness of special education, in any of its forms, is difficult to locate. However, based on a select few studies that test the effectiveness of special education or eclectic treatments, children with autism in special education do not demonstrate significant improvement in adaptive, social, cognitive, or language functioning (Eikeseth, Smith, Jahr, & Eldevik, 2002; Freeman et al., 1991; Freeman, Ritvo, Needleman, & Yokota, 1985; Howard, Sparkman, Cohen, Green, & Stanislaw, 2005; Smith, Groen, & Wynne, 2000). Furthermore, special education generally costs thousands of dollars per year in addition to funds designated for regular education. For example, in Texas, the 2002 state budget included approximately \$11,000 per child per year for special education (Houston Independent School District, personal communication, 2004).

Independent of special education, many treatment services have offered promising gains in combating the impairments associated with autism. There exists a myriad of interventions for autism, which range from dietary manipulation to intensive psychodynamic therapy. There are only a few, however, that have empirically demonstrated efficacy. Among those with empirical support, a particular class of treatments for autism incorporates principles of Applied Behavior Analysis (ABA), which emphasizes environmental associations and contingencies. While ABA treatments vary in intensity and structure, they all share similar principles. In addition, when discussed within the context of treating young children, these techniques are also referred to as Early Intensive Behavioral Interventions (EIBI).

One prototypical EIBI, which has garnered a tremendous amount of support, is Discrete Trial Training (DTT; Lovaas, 1987; McEachin, Smith, & Lovaas, 1993). DTT consists of an average of 35 h per week of one-to-one behavior intervention that occurs in the child's home. The intervention is implemented by a team of 5 to 7 therapists, who each work for 6 h per week in two-to-three hour sessions. Ideally, the child receives 5 to 7 h of treatment per day, for 5 to 7 days per week. DTT generally lasts from 2 to 6 years with the average child requiring services for 3 years (Jacobson, Mulick, & Green, 1998). In addition, DTT is relatively costly, averaging \$40,000 per year with a range from \$20,000 to \$60,000 per child per year. Economy of scale, parent and family involvement, and other factors influence the specific cost of a program. There is a parent-directed model of DTT, which utilizes the

parents as resources, that costs an average of \$22,500 per child per year and has demonstrated comparable effectiveness to the intensive DTT (Sallows & Graupner, 2005).

In an initial investigation, 40 h a week of DTT were implemented with young children with autism, and the outcome of these children was compared with two control groups, one of which received ten hours a week of DTT while the other received an eclectic treatment within the community (Lovaas, 1987). Evidence indicates that the experimental group demonstrated significant gains in IQ and educational placement at the end of treatment compared to the control groups, which both remained virtually unchanged from pre- to post-assessment (Lovaas, 1987). The gains in educational placement included successful mainstreaming into a typical education classroom and remaining in that setting. Additionally, these findings have been fully replicated and maintained despite modifications to the treatment (Eikeseth et al., 2002; Sheinkopf & Siegel, 1998), and the follow-up study provided evidence that these gains were preserved over time (McEachin et al., 1993). More recently, Sallows and Graupner (2005) published data that replicated Lovaas' (1987) results.

Evidence from these investigations demonstrates that DTT has yielded a range of outcomes for children with autism. Slightly less than half of the participants achieved normal or near normal functioning, allowing them to complete school with little or no assistance (Lovaas, 1987; Sallows & Graupner, 2005). About a third of the children achieved substantial gains, allowing significantly reduced levels of care and assistance (Lovaas, 1987; Sallows & Graupner, 2005). The remaining 10–15% of children did not achieve significant gains in functioning and continued to require the expected (non-treated) levels of assistance (Lovaas, 1987; Sallows & Graupner, 2005). Thus, while costs for EIBI per year are higher than the costs for special education, EIBI only lasts for an average of three years with a substantial portion of the children mainstreaming into regular education, minimizing the need for additional special education funds for the remainder of childhood.

The potential for saving money by implementing EIBI is important only in light of the economic and financial implications of an autism epidemic. Much like financial forecasting in a business setting, national economies often incorporate the goal of investing today in order to yield a net gain tomorrow. While this tenet does not necessarily influence all governmental economic decisions, it certainly provides information for the funding of many of the services provided by a government, including education. In the United States, federal, state, and local governments budget considerable funds for education. From a purely financial standpoint, this is simply an investment with the goal of yielding monetary gains in the future. By investing in children's education for 18 years, the government expects that the children will, on average, assimilate into society as "productive" adults (those who stimulate the economy by paying taxes, investing in stocks, facilitating the development of goods, and providing labor). Thus, when a child grows up to become a productive member of society, he or she proceeds to match and exceed the original 18-year educational investment by the government.

When it comes to special education, such reasoning poses a problem. In addition to the funds reserved for regular education, additional funds are provided to children requiring special education. Without initial treatment, however, children with autism often require special education services for their entire academic career, yielding adults that not only have trouble being productive, but also continue to require additional governmental funds throughout their lifespan. From a strictly financial standpoint, funding education for children with autism is a risky investment. Not only is the government potentially losing money on the investment of typical education for these children, but also on the additional investment of special education. Granted, this investment does not exist in a vacuum. Much of a government's budget reflects a myriad of differing investments, and economic decision-making often incorporates

expected, albeit necessary, losses that are recuperated with unrelated gains. Thus, funds designated for special education might be considered a loss from the outset, but does this investment really need to be an expected loss? How much money could be saved with a new strategy?

Is there any evidence that an intervention for special education populations can produce a positive monetary return on an educational investment instead of an expected loss? While there is a relative paucity of literature examining the cost savings associated with implementing specific treatments instead of special education, there are a few oft-cited studies that present cost-benefit analyses of EIBI (Barnett & Escobar, 1989; Warfield, 1994). These analyses, however, fail to specifically address autism. Furthermore, cost-benefit analyses are not the same as projected cost comparisons. Cost-benefit analyses generally assess previous costs and benefits to evaluate a program's financial outcome. Thus, little projection is necessary. Projected cost comparisons are generally used when there is a lack of historical data on the precise costs and benefits of a program and are utilized to predict costs and benefits in the future. Each type of analysis has its own set of assumptions and inherent limitations and generally answers a different type of question.

Two notable studies addressed the costs associated with autism. Järbrink and Knapp (2001) assessed the costs of autism in Britain with a wide scope, incorporating ancillary elements such as family time costs, medication, and day care. In addition, the scope extended through the child's lifetime, as opposed to a narrower education timeframe. With costs associated with typical development not included, the authors determined that the lifetime costs for one individual with autism is greater than \$2.5 million (Järbrink & Knapp, 2001). While this study highlighted the tremendous costs associated with an individual with autism, it did not consider the costs associated with caring for the entire population of individuals with autism in Britain, nor did it compare the costs of different treatment approaches.

Jacobson et al. (1998) conducted an investigation of the costs associated with autism in Pennsylvania. Their methodology provided a projected cost comparison between children who received EIBI and those who did not. Their investigation was wide in scope, spanning the lifespan and taking into account such factors as public services, regular education, and family support services. Their analysis of EIBI benefits revealed a savings ranging from \$656,000 to \$1,082,000 per child across the lifespan, depending on the effectiveness of EIBI. They then extended these findings to 100 individuals with autism to illustrate the additive savings. The current investigation utilized similar logic with some minor modifications.

Marcus, Rubin, and Rubin (2000) responded to the Jacobson et al. (1998) article with some criticism. They suggested that the Jacobson et al. (1998) cost-benefit analysis was flawed because it was based on Lovaas' (1987) outcome results, which had not yet been replicated. Sallows and Graupner (2005), however, recently published data that replicated results for children with autism who received DTT. One could even argue that the results from the Sallows and Graupner (2005) study were more encouraging than those of Lovaas (1987). Marcus et al. (2000) criticized the Jacobson et al. (1998) article because other intervention approaches were not considered in the model. They stated, "There has not been (and may never be) a comprehensive comparison study of different intervention approaches" (p.595), suggesting that other approaches may be equally effective for maximizing cost savings and treatment gains. As Howard et al. (2005) recently pointed out, however, "there is little empirical evidence regarding the efficacy of non-behavior analytic treatment models..." (p. 4). In addition, in the Howard et al. (2005) study, behavioral intervention was compared to two groups of children receiving eclectic-based approaches. Not only do the data suggest that behavioral intervention was superior to the other approaches, but the results also suggest

that the eclectic-based approaches were ineffective and possibly even deleterious (Howard et al., 2005).

In addition, Marcus et al. (2000) incorporated a professional perspective from a school administrator in a metropolitan area. The administrator reported that among children with autism who have received a variety of intensive interventions (including Lovaas-based interventions) through the school system, she had never seen a child progress to the point of not needing additional support. Viewed from a different perspective, the administrator's comments actually could support some of the assumptions in the Jacobson et al. (1998) model. By suggesting that children with autism often experience a number of different intensive interventions (including some non-behaviorally oriented approaches) in special education, the administrator essentially is commenting on the aforementioned eclectic nature of special education. Some evidence suggests that DTT requires a substantial number of treatment hours per week to be maximally effective (Lovaas, 1987). If DTT and other behavioral approaches are interspersed among a variety of non-behavioral approaches, it is unlikely that the number of hours of DTT is sufficient to yield the gains necessary to advance a child from special education to typical classes. The administrator's comments also could be interpreted in light of the recent negative evaluation of eclectic early intervention for children with autism (Howard et al., 2005).

Our study follows from the Jacobson et al. (1998) study, but with slight modification. We present the first assessment of the projected costs and benefits of EIBI in Texas. It also simplifies the Jacobson et al. (1998) analysis by using a dichotomous outcome. In addition, since projected EIBI cost-savings per child have never been extended to a population, our findings will be discussed in terms of the entire population of children with autism in Texas. With the current investigation, projected costs associated with special education are directly compared to Discrete Trial Training as a feasible EIBI. It is hypothesized that the comparison will highlight a considerable cost differential between services. More specifically, we believe that providing EIBI to all children with autism in Texas, in an effort to prevent the children from attending special education, will result in millions, and possibly billions, of dollars in savings. In addition, the results will highlight a cost-efficient service model that maximizes the potential for the recovery of children with autism.

Method

We utilized a method from Jacobson et al. (1998) for hypothetically comparing the costs of special education to the costs of EIBI for children with autism in Texas. The formula incorporates special education costs, EIBI costs, EIBI effectiveness, population estimates of children with autism in Texas, and the expected number of years required for each type of service. The formulas are outlined in Equation 1 and Equation 2 below.

Equation 1: Formula for computing projected savings associated with EIBI per child with autism in Texas

$$C = S(18) - [E(3) + S(.28)(15)]$$

C = Per-child savings

S = Annual special education costs (either state-budgeted or actual)

E = Annual EIBI costs

18 = Necessary years of special education for children who do not receive EIBI (age 4–22)

3 = Average number of years of EIBI (age 4–22)

.28 = Proportion of children who receive EIBI but fail to mainstream into regular education (72% offset)

15 = Necessary years of special education for children who receive EIBI but fail to mainstream into regular education (age 4–22).

Equation 2: Formula for computing projected savings associated with EIBI for all children with autism in Texas

$$C = S(18)(10,000) - [E(3)(10,000) + S(.28)(15)(10,000)]$$

C = total savings for all children with autism in Texas

S = Annual special education costs (either state-budgeted or actual)

E = Annual EIBI costs

10,000 = Conservative estimate of children with autism in Texas

18 = Necessary years of special education for children who do not receive EIBI (age 4–22)

3 = Average number of years of EIBI (age 4–22)

.28 = Proportion of children who receive EIBI but fail to mainstream into regular education (72% offset)

15 = Necessary years of special education for children who receive EIBI but fail to mainstream into regular education (age 4–22)

As with the Jacobson et al. (1998) study, our analysis requires certain assumptions. The assumptions are vital to the projected cost-benefit analysis, and there is sufficient justification for their use. Outlined below are explanations for each of the assumptions.

Assumption 1: 72% of children who receive EIBI eventually mainstream into regular education. Of children receiving EIBI, approximately 50% achieve normal or near-normal functioning (Lovaas, 1987; Sallows & Graupner, 2005). Approximately 40% of the children achieve moderate gains, allowing significantly reduced levels of care and assistance (Lovaas, 1987; Sallows & Graupner, 2005). Approximately 10% of the remaining children do not achieve significant gains in functioning and continue to require assistance (Lovaas, 1987; Sallows & Graupner, 2005). Jacobson et al. (1998) used all three outcomes to demonstrate projected costs and benefits. Our investigation, however, simplifies the analysis by removing the group reflective of the moderate gains outcome.

In the Jacobson et al. (1998) method, special education costs were reduced by 55% for the 40% of children who demonstrate moderate gains. Thus, to illustrate with 100 children with autism, 50 would require no additional special education services after EIBI, 40 would require special education services at 45% of its cost, and 10 would require special education services at 100% of its cost. For simplification, the moderate benefits group can be diffused into either the successfully mainstreamed or the unsuccessfully mainstreamed groups by finding the equivalent costs after dichotomization. Incorporating a 55% reduction in costs for services for the moderate gains group results in \$198,000 in aggregated annual special education costs for the 40 out of 100 children with autism demonstrating moderate gains (see Equation 3). Equivalently, again using 100 children with autism, with 22 of the 40 children with moderate gains successfully mainstreaming and 18 unsuccessfully mainstreaming, the total annual special education costs are \$198,000 (\$11,000 times 18 children). Thus, successfully mainstreaming 22 out of the 40 children who achieve moderate gains with EIBI is monetarily equivalent to incorporating a 55% offset in special education costs for the 40% of children with moderate gains. With 50 of 100 children successfully mainstreamed, and

22 of the 40 children with moderate gains successfully mainstreamed, a total of 72 out of 100 children (or 72%) can be included in the success category, with 28 requiring additional special education at 100% of the costs.

Equation 3: Formula for computing special education costs for the 40% of 100 children receiving EIBI who achieve moderate gains

$$198,000 = 11,000(.45)(40)$$

11,000 = Annual state-budgeted special education costs per child

.45 = 45% (55% reduction) of special education service costs associated with the moderate gains group (Jacobson et al., 1998)

40 = Approximate number of children out of 100 that achieve moderate gains

Assumption 2: There is no way to predict the outcome of children engaged in EIBI. Many investigations have explored predictors and moderators of outcome of EIBI (Bibby, Eikeseth, Martin, Mudford, & Reeves, 2001; Fenske, Zalenski, Krantz, & McClannahan, 1985; Harris & Handleman, 2000; Luiselli, Cannon, Ellis, & Sisson, 2000). Despite their results, there are still no definitive child, family, or treatment characteristics that predict outcome. In the future, research on predictors of outcome of EIBI may highlight certain characteristics that help clinicians determine whether a specific child should receive EIBI or not.

Assumption 3: Children with autism, who only receive special education but successfully mainstream into regular education, have a negligible influence on the costs associated with special education. This assumption is reflective of a common belief that is echoed in Jacobson et al. (1998), “Without EIBI the majority of children with autism or PDD will manifest enduring dependency on special education and adult developmental disability services” (p. 206). This statement endorses the common belief that special education services do not provide the necessary gains for successful mainstreaming. Indeed, children with autism who mainstream might do so because they were originally misdiagnosed or erroneously placed in special education. In addition, evidence indicates that special education is not very effective for eliciting significant gains in adaptive, social, cognitive, or language functioning (Eikeseth et al., 2002; Freeman et al., 1991; Freeman et al., 1985; Smith et al., 2000). Evidence might even suggest that “eclectic” interventions have a negative effect (Howard et al., 2005). Similarly, there is some indication that the spontaneous recovery rate of autism is very low (Lovaas, 1987). In fact, in a study of special education by Freeman et al. (1985), less than 5% of the participating children with autism mainstreamed into regular education. Therefore, for the sake of argument, it is safe to assume that a child with autism who enters special education without EIBI intervention will most likely remain there throughout childhood.

Assumption 4: The annual cost associated with EIBI is \$22,500; the annual state-budgeted cost for special education is \$11,000, and the *actual* annual costs for special education is approximately \$20,000. The current study proposes the implementation of the parent-directed model of DTT (Sallows & Graupner, 2005). For this reason, \$22,500 will represent the annual EIBI cost. In addition, the investigators placed a call to the Houston Independent School District (HISD) to obtain information on the education budget, revealing that approximately \$11,000 per child is set aside for special education by the state of Texas (HISD, personal communication, 2004). In addition, there is a distinction between state-budgeted and *actual* costs. The \$11,000 represents state-budgeted costs, or the literal funds supplied by the state of Texas for each child’s special education. The *actual* costs, however, represent the overall costs necessary for providing special education services, approximately \$20,000 per year (HISD, personal communication, 2004). *Actual* costs are generally comprised of state-budgeted,

local, federal, and private funds. Thus, by definition, *actual* costs contain state-budgeted costs. Please also note that special education costs do not include regular education costs. A child receiving special education generally receives both special education and regular education funds. As a result, regular education costs are omitted from the analysis since it is balanced evenly across all children and offers little to the analysis.

Assumption 5: Population estimates and costs associated with services do not change over time. The current analysis maintains a static model of projected cost comparison by omitting inflation and the time value of money, ignoring increases in autism prevalence, and arguing a constant cost of services. The model assumes that current prevalence rates of autism in Texas will remain constant over the years. A 2002 report of prevalence rates indicates there are approximately 10,000 school age children with autism in Texas (Fighting Autism, 2004). The model hypothetically assesses a single school age cohort of children with autism. Thus, savings are applicable to that specific cohort of 10,000 children with autism recognized by the state of Texas. This is a conservative decision, since prevalence rates are skyrocketing at epidemic rates and not all children with autism are necessarily recognized by the state of Texas. Thus, any discovered savings would likely underestimate the money that would be saved with future cohorts. Also, the model assumes that the costs of services will remain stable over 18 years.

Results

Based on a child receiving three years of EIBI, then realizing a 72% offset in special education costs over the remaining 15-year period (due to a 72% reduction in services required following EIBI), a total savings of \$84,300 per child in state-budgeted funds is achieved over the total school years. Comparing the reported *actual* cost of a special education program to a three-year EIBI program (and a 72% special education offset), savings of \$208,500 per child are achieved. These results are illustrated in Table 1. Clearly, there is a higher up-front cost for EIBI with \$67,500 over a three-year period versus a state-budgeted cost of \$33,000 for special education services over the same three-year period. However, that early additional cost is recovered within five years, and the savings over the remaining years are substantial. Similarly, in the *actual* cost example, the additional costs for three years of EIBI, compared to the cost of the first three years of Special Education, is \$7,500. This amount is more than recouped in the first year following EIBI by the reduced need for special school services.

The costs also can be broken down into differential child outcomes. For example, 28% of children who receive EIBI unsuccessfully mainstream into a typical classroom. The costs

Table 1 Projected special education cost savings per child with autism in Texas (Spanning 18 Years)

	State- budgeted annual costs	Total state-budgeted costs age 4 to 22	Actual annual costs	Total actual costs age 4 to 22
Funds provided by the state of Texas for special education	\$11,000	\$198,000	\$20,000	\$360,000
Early intensive behavioral intervention	\$22,500	\$67,500	\$22,500	\$67,500
28% (72% reduction) of special education services for 15 years		\$46,200		\$84,000
Total cost per child who receives EIBI		\$113,700		\$151,500
Savings using EIBI per child		\$84,300		\$208,500

Table 2 Using children who do not receive EIBI as baseline, projected special education cost savings per child with autism in Texas (Spanning 18 Years)

Child outcome	Total state-budgeted costs age 4 to 22	Total actual costs age 4 to 22
Mainstreamed EIBI	130,500	292,500
Not mainstreamed EIBI	– 34,500	– 7,500
Combined EIBI child	84,300	208,500

for these children are much higher than for both the successfully mainstreamed children and the children who only receive special education. These costs are broken down in Table 2, which uses children who do not receive EIBI as baseline and shows net gains and losses for each outcome. For example, there is a net loss of \$34,500 in state-budgeted funds and \$7,500 in *actual* funds attributed to those children who are unsuccessfully mainstreamed. These losses, however, are recouped with the substantial savings from the successfully mainstreamed children, who each yield a net gain of \$130,500 in state-budgeted funds and \$292,500 in *actual* funds across 18 years of education. Note that the costs for the two EIBI outcomes do not average or add up to the “Combined EIBI” condition, which is a function of percentages.

These costs and savings were subsequently extended to the conservatively estimated population of 10,000 children with autism in Texas. A total savings of over \$843 million in state-budgeted funds and \$2.09 billion in *actual* funds is achieved over the total school years. These calculations are demonstrated in Table 3.

Similar to the per-child analysis, the costs for each type of outcome can be extended to the population. Using children who do not receive EIBI as baseline, the gains and losses associated with each of these outcomes are illustrated in Table 4. Contrary to the per-child analysis, which was derived from percentages, the “Combined EIBI” condition for the population represents an additive effect for both EIBI outcomes. Thus, the population costs for unsuccessful mainstreaming plus the costs for successful mainstreaming add up to the total costs for all EIBI children. Aggregating the 2,800 children who unsuccessfully mainstream into regular education over 18 years of education, there is a loss of \$96.6 million and \$21 million in state-budgeted and *actual* funds, respectively. Again, this loss is

Table 3 Projected special education cost savings for all children with autism in Texas (Spanning 18 Years)

	State-budgeted annual costs	Total state-budgeted costs age 4 to 22	Actual annual costs	Total actual costs age 4 to 22
Funds provided by the state of Texas for special education	\$110,000,000	\$1,980,000,000	\$200,000,000	\$3,600,000,000
Early intensive behavioral intervention	\$225,000,000	\$675,000,000	\$225,000,000	\$675,000,000
28% (72% reduction) of special education services for 15 years		\$462,000,000		\$840,000,000
Total cost for all children receiving EIBI		\$1,137,000,000		\$1,515,000,000
Savings using EIBI for all children		\$843,000,000		\$2,085,000,000

Table 4 Using children who do not receive EIBI as baseline, projected special education cost savings for all children with autism in Texas (Spanning 18 Years)

Child outcome	Total state-budgeted costs age 4 to 22	Total actual costs age 4 to 22
Mainstreamed EIBI	939,600,000	2,106,000,000
Not mainstreamed EIBI	– 96,600,000	– 21,000,000
Combined EIBI children	843,000,000	2,085,000,000

recovered with the savings from the 7,200 successfully mainstreamed children, which as a group yield a net gain of \$939.6 million and \$2.11 billion in state-budgeted and *actual* funds, respectively.

Discussion

Projected cost comparisons reveal that the state of Texas has the potential to save over \$2 billion in *actual* costs associated with special education services over an 18-year period. Moreover, this estimate of savings errs on the conservative side of calculation, since epidemiological data indicate an increase in autism prevalence worldwide. Furthermore, the United States Government Accountability Office (GAO; 2005) released a report that indicated that the average federal funds reserved for each child with autism in the United States is \$18,790 per year, which includes \$6,556 for regular education. Thus, regular education costs notwithstanding, an average of \$12,234 per year in federal funds are spent on each child with autism in special education across the country. We used an estimate of \$11,000 for each child per year in Texas state-budgeted funds, indicating that our estimate of saved governmental funds was conservative. The GAO (2005) report also provides support for our findings generalizing to other states. Although each state varies in the amount of state-budgeted funds provided to children with autism, and the state of Texas covers most of the costs associated with this population, it is clear that a significant amount of federal funds would be saved in other states.

In addition, the analysis was limited to special education savings alone; the calculations did not incorporate secondary benefits from mainstreaming children with autism into regular education, such as savings on specialized daycare and medical bills. These secondary benefits extend into adulthood as well. Children who are successfully integrated into typical education settings likely require fewer supportive funds than do adults, since there is a reduced need for adult care services and for supplementing lost income due to unemployment.

The adulthood benefits also reflect a return on an economic investment. As previously discussed, state governments invest in the ability of education to yield productive adults who stimulate the economy. With special education and children with autism, however, this investment is an expected loss, since there is no indication that children with autism who receive special education services for 18 years assimilate into society as productive citizens. In fact, the government likely continues to provide funds for this population throughout the lifespan. Thus, this particular educational investment not only yields a net loss at maturation, but the decision also ensures continual losses thereafter. By implementing EIBI with all children with autism, as a way to prevent the need for special education, the investment not only produces a sizeable savings after 18 years, but it maximizes the likelihood that most of these children will return a profit long after maturation.

Our study also contributes to an additional facet of the criteria needed for labeling an intervention an Empirically Supported Treatment (EST). A task force from Division 12 of the American Psychological Association (1995) established criteria for assessing the integrity of psychological interventions. Chambless and Hollon (1998) elaborated the criteria and discussed the efficacy, effectiveness, and efficiency of psychological treatments. Efficacy and effectiveness of DTT have been addressed in the literature, but efficiency has received little attention. Efficiency refers to the treatment's utility, cost-efficiency, and feasibility (Chambless & Hollon, 1998). The current investigation contributes to knowledge regarding its efficiency, demonstrating that DTT is cost-efficient compared to one alternative service option.

The heterogeneity of children enrolled in special education may explain its apparent lack of effectiveness. For example, a child with autism may not benefit from services designed for children with Down Syndrome, and vice versa, since each type of disorder reflects different types of dysfunctions and deficits that require specific attention. Just as children with autism should receive EIBI, different populations might benefit from receiving treatments deemed effective for that specific population. For this reason, it would behoove policy makers to reconsider the role of educational services with children with developmental disabilities. Indeed, it may mean a minimization of the education system's role in providing services and a maximization of population-specific treatment implementation by mental health practitioners. Following from this, special education would then have expanded resources to serve children who failed to mainstream into typical education despite implementation of appropriate interventions.

Some of the concerns about the Jacobson et al. (1998) model brought forth by Marcus et al. (2000) require comment for our study. For one, Marcus et al. (2000) suggest that Jacobson et al. (1998) were insensitive to the restricted resources found in most school systems. It might be the case that school systems are limited with resources, but our study might provide one solution for freeing up many of those resources. Marcus et al. (2000) also suggest that the Jacobson et al. (1998) model implies that there is only one effective treatment for autism. Our study makes no such implication. We simply are comparing one approach to another in terms of potential cost savings (eclectic special education approaches vs. DTT) and not suggesting that there is only one effective treatment for autism. In fact, many of the children likely will require some special education services after the implementation of DTT. There are many empirically supported alternative behavioral treatments that could be considered as part of the special education curriculum. Further, this study is not an attempt to "fan the flames" (Marcus et al., 2000, p. 597) of divide between families of children with autism and treatment providers. We simply are offering a potential plan for saving money and maximizing recovery by utilizing one of the most empirically supported treatments for autism to date. Finally, our investigation acknowledges that children with autism who receive early intensive behavioral intervention often do not fully recover. We agree with Marcus et al. (2000) in that many of these children continue to exhibit residual symptoms of autism through the lifespan and that achieving status in regular education classrooms does not necessarily imply that these children are symptom-free.

Our analysis has its limitations. One limitation is that spontaneous recovery and special education successes are not incorporated into the formula. Some may argue that this is a liberal decision, but it is important to note that this projected cost-benefit analysis is not precise, since approximate numbers are incorporated throughout the calculations. For example, there are not exactly 10,000 children with autism in Texas, nor does it cost exactly \$11,000 per year for special education. The current analysis is an approximation of the costs saved by implementing EIBI, and the influences of spontaneous recovery and special

education successes were deemed negligible. Similarly, as with any projected cost-benefit analysis, expected values are not going to match reality when the events unfold. For example, state-budgeted funds allocated for special education may change, or percentages of success may vary due to differential EIBI implementation. While this limitation is warranted, the magnitude of cost savings affords some margin of error, especially when *actual* instead of state-budgeted costs are considered. Finally, some may argue that a change in policy and implementing a new service plan has tremendous start-up costs. Like most financial endeavors, initial start-up costs are recouped over time. While difficult, it would be helpful for future projected cost comparisons to incorporate start-up costs into the calculations. In addition, a demonstration project can address all of these limitations by longitudinally tracking cost savings in a sample of children randomly assigned to either a group only receiving special education or to a group receiving EIBI plus special education as needed.

Ultimately, it is the goal of our paper to demonstrate a financial point, but there is naturally something uneasy about reducing children to a monetary value. Lack of cost-efficiency notwithstanding, special education does little to ameliorate the impairments exhibited by children with autism, and EIBI has yielded moderate to considerable gains in functioning in a substantial portion of children. The bottom line is that a simple change in policy could drastically improve functioning and quality of life for thousands of children with autism in Texas. As a bonus, the taxpayers could potentially save over \$2 billion across 18 years.

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References

- American Psychological Association Task Force on Psychological Intervention Guidelines (1995). *Template for developing guidelines: Interventions for mental disorders and psychological aspects of physical disorders*. Washington, DC: American Psychological Association.
- Barnett, W. S., & Escobar, C. M. (1989). Research on the cost effectiveness of early educational intervention: Implications for research and policy. *American Journal of Community Psychology*, 17, 677–704.
- Bibby, P., Eikeseth, S., Martin, N. T., Mudford, O. C., & Reeves, D. (2001). Progress and outcomes for children with autism receiving parent-managed intensive interventions. *Research in Developmental Disabilities*, 22, 425–447.
- Bryson, S. E., Clark, B. S., & Smith, I. M. (1988). First report of a Canadian epidemiological study of autistic syndromes. *Journal of Child Psychology and Psychiatry*, 29, 433–445.
- Chambless, D. L., & Hollon, S. D. (1998). Defining empirically supported therapies. *Journal of Consulting and Clinical Psychology*, 66, 7–18.
- Department of Developmental Services (2003). *Autism spectrum disorders: Changes in the California caseload: An update: 1999 through 2002*. Sacramento, CA: California Health and Human Services Agency.
- Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (2000). Washington, DC: American Psychiatric Association.
- Eikeseth, S., Smith, T., Jahr, E., & Eldevik, S. (2002). Intensive behavioral treatment at school for 4- to 7-year-old children with autism: A 1-year comparison controlled study. *Behavior Modification*, 26, 49–68.
- Fenske, E. C., Zalsenski, S., Krantz, P. J., & McClannahan, L. E. (1985). Age at intervention and treatment outcome for autistic children in a comprehensive intervention program. *Analysis and Intervention in Developmental Disabilities*, 5, 49–58.
- Fighting Autism (2004). *Texas public schools autism prevalence report: School years 1992–2003*. Retrieved February 23, 2005, from <http://www.fightingautism.org/idea/reports/TX-Autism-Statistics-Prevalence-Incidence-Rates.pdf>

- Freeman, B. J., Rahbar, B., Ritvo, E. R., Bice, T. L., Yokota, A., & Ritvo, R. (1991). The stability of cognitive and behavioral parameters in autism: A twelve-year prospective study. *Journal of the American Academy of Child Psychiatry*, 30, 479–482.
- Freeman, B. J., Ritvo, E. R., Needleman, R., & Yokota, A. (1985). The stability of cognitive and linguistic parameters in autism: A five-year prospective study. *Journal of the American Academy of Child Psychiatry*, 24, 459–464.
- Harris, S. L., & Handleman, J. S. (2000). Age and IQ at intake as predictors of placement for young children with autism: A four- to six-year follow-up. *Journal of Autism and Developmental Disorders*, 30, 137–142.
- Howard, J. S., Sparkman, C. R., Cohen, H. G., Green, G., & Stanislaw, H. (2005). A comparison of intensive behavior analytic and eclectic treatments for young children with autism. *Research in Developmental Disabilities*, 26, 359–383.
- Jacobson, J. W., Mulick, J. A., & Green, G. (1998). Cost-benefit estimates for early intensive behavioral intervention for young children with autism: General model and single state case. *Behavioral Interventions*, 13, 201–226.
- Järbrink, K., & Knapp, M. (2001). The economic impact of autism in Britain. *Autism*, 5, 7–22.
- Kielinen, M., Linna, S. L., & Moilanen, I. (2000). Autism in Northern France. *European Child and Adolescent Psychiatry*, 9, 162–167.
- Lotter, V. (1966). Epidemiology of autistic conditions in young children, I: Prevalence. *Social Psychiatry*, 1, 124–137.
- Lovaas, O. I. (1987). Behavioral treatment and normal educational and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology*, 55, 3–9.
- Luiselli, J. K., Cannon, B. O., Ellis, J. T., & Sisson, R. W. (2000). Home-based behavioral intervention for young children with autism/pervasive developmental disorder. *Autism*, 4, 426–438.
- Marcus, L. M., Rubin, J. S., & Rubin, M. A. (2000). Benefit-cost analysis and autism services. A response to Jacobson and Mulick. *Journal of Autism and Developmental Disorders*, 30, 595–598.
- McEachin, J. J., Smith, T., & Lovaas, O. I. (1993). Long-term outcome for children with autism who received early intensive behavioral treatment. *American Journal on Mental Retardation*, 97, 359–372.
- Sallows, G. O., & Graupner, T. D. (2005). Intensive behavioral treatment for children with autism: Four-year outcome and predictors. *American Journal of Retardation*, 110, 417–438.
- Sheinkopf, S. J., & Siegel, B. (1998). Home-based behavioral treatment of young children with autism. *Journal of Autism and Developmental Disorders*, 28, 15–23.
- Smith, T., Groen, A. D., & Wynne, J. W. (2000). Randomized trial of intensive early intervention for children with pervasive developmental disorders. *American Journal of Mental Retardation*, 105, 269–285.
- United States Government Accountability Office (2005). Special education: Children with autism. *Report to the Chairman and Ranking Minority Member, Subcommittee on Human Rights and Wellness, and Committee on Government Reform, House of Representatives*. Retrieved February 23, 2005, from <http://www.gao.gov/new.items/d05220.pdf>
- Warfield, M. E. (1994). A cost-effectiveness analysis of early intervention services in Massachusetts: Implications for policy. *Educational Evaluation and Policy Analysis*, 16, 87–99.
- Webb, E. V. J., Lobo, S., Hervas, A., Scourfield, J., & Fraser, W. I. (1997). The changing prevalence of autistic disorder in a Welsh health district. *Developmental Medicine and Child Neurology*, 39, 150–152.
- Wing, L., & Potter, D. (2002). The epidemiology of Autistic Spectrum Disorders: Is the prevalence rising? *Mental Retardation and Developmental Disabilities Research Reviews*, 8, 151–161.