The Cost Savings to Special Education from Pre-Schooling in Pennsylvania

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Pennsylvania Build Initiative
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BUILD and Pennsylvania BUILD

The Build Initiative is designed to help states build a coordinated system of programs, policies and services that:

- Respond to the needs of families
- Carefully use public and private resources
- Effectively prepare young children for a successful future.

Pennsylvania is one of five states selected to participate in this national initiative. To learn more about Pennsylvania Build, contact Harriet Dichter, hdichter@state.pa.us, at the Pennsylvania Department of Education, Office of Policy, 333 Market Street, Harrisburg PA 17126, or visit http://www.pde.state.pa.us/early_childhood/cwp/view.asp?Q=104772&A=179. To learn more about the national Build initiative, visit http://www.buildinitiative.org.

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Executive Summary

Annually, the state of Pennsylvania spends almost $1 billion on special education. Federal and local contributions bring this total up to $2.7 billion. It is therefore imperative to ensure these funds are spent efficiently and to investigate ways to save on expenditures. One possibility is that – with early intervention to support children's development – the need for expenditures later is reduced. *This Report examines the potential cost-savings to special education budgets from additional investments in pre-schooling*.

Using state-specific and national data, with evidence from published research, a set of economic models are derived. These models calculate the fiscal consequences of expanding pre-school programs. The models use data on: pre-schooling costs; special education costs; and the impact of pre-schooling on rates of special education.

Two policy scenarios for Pennsylvania are considered: fully available pre-schooling and targeted pre-schooling. These policies would supplement the investments already being made in the state.

Fully Available pre-schooling:

- 50% of four-year olds (76,000 children) would be offered publicly-funded programs.
- To make pre-schooling fully available would cost $547-$653 million annually.
- The program would save $102 million in special education costs, reducing special education expenditures by 12%.
- These savings in special education would offset 16-19% of the pre-school program costs.

Targeted pre-schooling:

- 20% of four-year olds (30,640 children) would be offered publicly-funded programs.
- Targeted pre-schooling would cost $221-$263 million annually.
- The program would save $68 million in special education costs, reducing special education expenditures by 8%.
- These savings in special education would offset 26-31% of the pre-school program costs.

1. Introduction

1.1 Investing in Young Children

Providing education for young children is an investment in their future. It can also benefit all members of society, because of the spill-over effects from having a better educated population. The critical question is: How much should we as a society invest in pre-schooling?

The answer can be determined by comparing the costs of pre-schooling with the array of subsequent benefits. The costs of pre-schooling include staff salaries, classroom space, and curriculum materials. High-quality programs require: curriculum plans; teachers with certification and in-service training; meals; and screening/referral services (NIEER, 2003).[i]

Offsetting these costs are the many benefits to participants and to society. Individual benefits include: enhanced academic attainment and college progression; improved health; and higher wages. Societal benefits include: more efficient education systems; higher tax payments by participants; lower reliance on welfare; and lower rates of criminal activity. Prior research on targeted programs – and aggregate economic models – has found that these societal benefits alone exceed the costs of the programs (Belfield et al., 2004; Karoly and Bigelow, 2005; Reynolds et al., 2002).[ii]

The focus of this research is on only one of the benefits of pre-school: the cost-savings that arise from reduced placement in special education. Studies have found that pre-schooling programs significantly reduce the rate of special education placement; these are documented below. Across the US, over $80 billion is spent annually on special education (approximately one-fifth of all public spending on education). Given this substantial commitment, it is imperative to invest wisely and efficiently; even very minor improvements in how resources are allocated could free up millions of dollars. And where pre-schooling programs are effective for children who might need special education, the economic consequences may be considerable.

This Report calculates **the likely savings in special education budgets from expanding pre-schooling for Pennsylvania**. The Report is structured as follows. In Section 2, pre-schooling provision in Pennsylvania is described; two policy scenarios are set out to expand provision – making pre-school available either to all children or to a target group which might benefit the most. For each policy, the impact on pre-school is described, and the total cost

of such a policy is estimated. Current provision and funding of special education across the state is also described. Section 3 reviews the evidence on the extent to which pre-schooling programs reduce special education. This evidence is then used to model the reduction in special education requirements for Pennsylvania. In Section 4, the expected cost-savings are set against initial investment costs and against the total expenditures on special education. This allows for adjudication as to whether expanding pre-schooling would yield economic benefits to the state. Sensitivity analysis is also performed to see how the amounts of cost-savings might vary. Finally, Section 5 gives a concluding summary.

2. Pre-School and Special Education in Pennsylvania

2.1 Pre-School Provision

There are 147,000 three-year olds, 152,000 four-year olds, and 152,000 five-year olds in Pennsylvania (Census, 2000). With current policy changes, the pre-schooling options for these children are improving significantly.

Only a few years ago, investment in these pre-schoolers was low. Relative to other states, Pennsylvania invested only a small amount in pre-schooling and coverage for young children was limited: there were 15,000 children in special education pre-schooling; and 26,100 in federally-funded Head Start (data for 2003-04). Beyond these programs, the 2004 *NIEER Yearbook* reported that only 2,600 (<2%) of four-year olds – and no three-year olds – were being served, with only 6% of districts offering pre-school programs. (Moreover, the *NIEER Yearbook* recorded existing public programs as satisfying 2 of 10 quality benchmarks). This left 84% of children without access to public pre-schooling. (Some of these children were in childcare or in private programs, the educational quality of which was unknown, see Etheridge et al., 2002).

However, within the last few years, the amount of state investment in pre-K has sharply increased for three- through five-year olds. In 2004 the state set up a $200 million Education Accountability Block Grant for school districts; although districts have flexibility in determining how the grant should be allocated, two-thirds has been targeted toward early childhood education programs. In fiscal year 2004-05 block grant programs served 2,995 children, bringing the total number of children served in school district pre-kindergarten programs to 5,676 and the number of school districts offering pre-K to 58. In that same year, the state made an investment of $15 million in preschool Head Start as well to serve nearly 2,500 children.

In the 2005-06 budget, an additional $15 million is proposed to be available for the Head Start Supplemental Assistance Program (SAP), for a total investment of $30 million, as well as a total of $689 million for child care access and Early Intervention.[iii] Child care programs are being improved through Keystone Stars, with participation from nearly 60% of the state's early childhood centers. Both Early Intervention and Subsidized Child Care are projected to increase the total number of children served.[iv]

2.2 Expanding Pre-School Provision

These new initiatives represent a strong new commitment to the education and development of pre-schoolers. Nevertheless, there is capacity for expansion, if funding can be made available. Here, the goal is to examine the consequences if such funding was available: even as the baseline of pre-schoolers is growing, *what are the economic consequences of greater investment in pre-school?*

One question is whether pre-schooling should be expanded in a targeted fashion, i.e. available only for certain groups of children, or fully available, i.e. available to all families who wish to take up the opportunity.

Several factors are important in deciding between targeted and fully available programs. First, fully available programs are likely to have weaker impacts than targeted programs, because the children in the latter are those who most need early education. But, fully available programs do raise achievement for all.[v] Second, even as evidence on pre-schooling is mainly from studies of targeted populations, these populations are representative of a reasonably high percentage of all children (e.g., dropouts, who may compose as much as 30% of all children, Swanson, 2004). So, a targeted program might need to be reasonably-sized, covering between one-third and one-half of all children. Finally, targeted programs may not adequately reach the intended children, and they will raise the costs of screening children, of determining who is eligible, and of monitoring eligibility. If targeting is inaccurate, then there may be both efficiency and equity reasons for offering expanded provision to ensure all children who merit pre-kindergarten programs receive them.

Here, both targeted and fully available programs are modeled. Only one age cohort of children – those aged four in 2004 – is considered. (The analysis may then be applied to the next set of four-year olds (in 2005), and to subsequent age-cohorts). Offering access to pre-schooling would alter the placements of children across the programs currently offered in Pennsylvania. Some children will not take up programs; others are already in preschool offered by schools, Head Start, child care, or special education. These children are unaffected. However, many children are not in pre-school but would be were it high-quality, accessible, and available at no cost. This group would now have the option to participate in pre-schooling.

Table 2.1
Pre-Schooling for Four-year Olds: Current Provision, Fully available, and Targeted

Pre-Schooling Type	Current Provision (as of 2003-04)*		Fully available Pre-School		Targeted Pre-School	
Federal Head Start	13,000	(9%)	13,000	(9%)	13,000	(9%)
Special Education	7,500	(5%)	7,500	(5%)	7,500	(5%)
Pre-school enrollment	2,600	(2%)	2,600	(2%)	2,600	(2%)
No public provision (or new provision after 2004)	128,900	(84%)	52,900	(34%)	98,260	(64%)
New pre-school enrollment	-		76,000	(50%)	30,640	(20%)
Total	***152,000***		***152,000***		***152,000***	

Notes: * Head Start programs and special education programs are also available for 3-year olds. This Table does not include information on privately provided child care across the state. *Sources:* Census (2000); NIEER Yearbook (2004); PA Dept. of Education, Special Education Statistical Summary, 2003-2004 (Table 7). The SESS reports 19,425 children ages 3-5 receiving special education services.

Table 2.1 shows the distribution of provision for children aged four in 2004. The first column shows the current situation. Given the growth in options since 2004, the fourth row shows a 'catch-all' category of those with and without pre-schooling availability as the system grows. Importantly, because of eligibility changes within the system, the numbers of students in each category will fluctuate over time. However, *the model is intended to calculate the net effect of a change in policy: that is, whatever the baseline provision is, what will be the economic impact of expanding pre-school programs to cover more children?* The key aspect of Table 2.1 is the difference between the columns, not the absolute numbers in each column.

The second and third columns show the distribution of children under the proposed policy scenarios of fully available or targeted pre-schooling:

FA: With pre-schooling fully available for 4-year olds, half of all children would take up the opportunity to enroll, i.e. 76,000 new places would be made available.

T: With targeted pre-schooling for 4-year olds, 20% of all children would be eligible to enroll, with eligibility determined by income, residence, or by screening. This program would serve 30,640 additional children.

The intention is to imagine ambitious yet feasible policies, without making pre-kindergarten programs compulsory.[vi] (Enrollment rates would still be below those in Georgia and Oklahoma, where pre-K is fully available). Importantly, any publicly-funded programs must be high quality to ensure that

the benefits to the children and the state are realized.[vii] Fundamentally, such high quality provision cannot be established without the allocation of sufficient resources (although the resources must be allocated effectively).

2.3 Pre-School Expenditures and Unit Costs

The amount of funding necessary for 30,640-76,000 new pre-school places is calculated from expenditures and unit costs data from Pennsylvania State Department of Education.

Unit costs for pre-school are reported in the first column of Table 2.2. No relevant data is available on the cost structures for pre-school programs, so comparable costs for other educational services must be used (for a discussion and a cost template, see Muenchow et al., 2004; Gill et al. (2002) provide cost estimates for a full-day, small-scale program in Pennsylvania).

Table 2.2
Proposed Additional Spending for Fully available and Targeted Programs

Costing Formulas	Unit Annual Cost Per Child	Total Extra Investment ($ million)
Fully available Program:		
[C1] Based on spending in K-12	$8,590	$653
[C2] Based on Head Start costs	$7,202	$547
Targeted Program:		
[C1] Based on spending in K-12	$8,590	$263
[C2] Based on Head Start costs	$7,202	$221

Sources: NIEER Yearbook (2003); Marshall et al. (2002); PDE (2004); Head Start data.

A plausible formula [C1] is to assume that high quality pre-schooling costs the same as a year of regular K-12 schooling.[viii] In Pennsylvania, per pupil spending in regular classes is $8,590 per year (PDE, 2004). A second costing formula [C2] is also derived, based on the costs of Head Start. In 2003, actual annual unit cost for Head Start provision in Pennsylvania was $7,202; this can be used as the second estimate of the unit costs of a pre-school program.[ix] Both costing formulas are sufficient (and generous compared to pre-K in other states) such that they should guarantee positive outcomes.

Column 2 of Table 2.2 shows the total investment costs for the proposed program. These total costs are calculated as the cost per child under each formula times the numbers of new pupils. Under current cost structures, the **annual investment for the fully available program would range between $547-653 million; for the targeted program total costs would be $221-263**

million. Although this is a substantial commitment of funds, it is a relatively small proportion of total expenditures on education across the state. Annually, Pennsylvania spends $17.1 billion on public education (PDE, 2005). The proposed investment in fully available or targeted pre-schooling would therefore represent an additional 1.3%-3.8% more funding than is currently being spent.

2.4 Special Education Provision

In Pennsylvania, there are 256,401 special education students aged 5-18; this is 13-14% of all students (NCES, 2003). (There are also 15,655 children aged 3-4 and 3,889 adults aged 18-21; the focus here is on the children entering the public school system). Enrollments by disability are reported in Table 2.3. Just over half of these children are classed as having a specific learning disability, with another one-fifth classed as having a speech/language impairment.

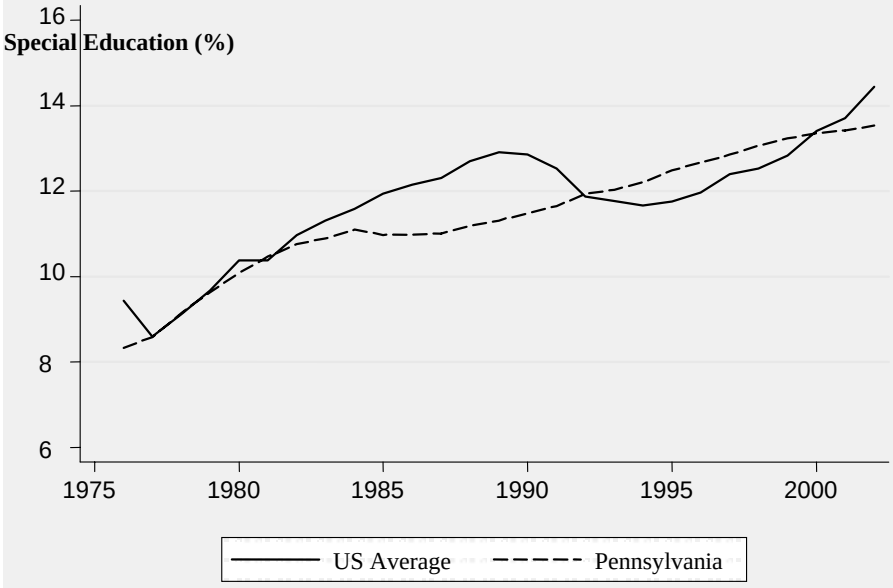
Children also vary by placement/inclusion, i.e. whether they receive special education within a public school or private facility and how much time they spend in each. Currently, 43% of special education students in Pennsylvania receive special education outside regular classes for less than one-fifth of the school day; 34% receive special education for a large part of the day; and 18% receive it for the entire school day. The remaining 4% receive special education in separate public or private facilities. Therefore, most children are placed in regular classroom settings for a significant proportion of the day.

Table 2.3
Special Education Enrollments by Disability (Ages 5-18)

Disability	Enrollment	%
Specific learning disability	138,619	54
Speech/language impairment	43,377	17
Mental retardation	26,325	10
Emotional disturbance	23,998	9
Other health impairment	6,911	3
Autism	6,328	3
Traumatic brain injury, deaf-blindness, visual and orthopedic impairment	3,377	1
Hearing impairment	2,812	1
Multiple disabilities	2,578	1
Developmental delay	2,076	1
Total	***256,401***	***100%***

Source: PA Dept. of Education, Special Education Statistical Summary, 2003-2004 (Table 2).

Figure 1 Special Education Enrollment Rates



Importantly, special education enrollment rates are growing steadily over time. Figure 1 shows the national trend in rates of school children in special education alongside the trend for Pennsylvania. The proportion of children eligible for special educational services has grown from 8% in 1975 to 13-14% by 2003. Given this trend, there is increasing pressure placed on available resources.

2.5 Special Education Expenditures and Unit Costs

Special education expenditures are sourced from funds collected at federal, state, and local levels. For Pennsylvania, the federal contribution is approximately 8% of the total, and the state contribution is approximately 30%; therefore, the bulk of funding for special education comes from local government sources (CSEF, 2004, Exhibits I-2, I-3). An aggregate figure for total spending in the state in 1999 is $2.49 billion (up rated into 2004 dollars, but not taking into account any subsequent increases in funding; CSEF, 2004, Exhibit II-6). At the state level, special education appropriations in 2003-04 amounted to $905 million (for 2004-05, this amount is projected to rise to $929 million).[x] Adding federal and local contributions, this would suggest that total all-source special educational expenditures in Pennsylvania are now approximately $2.7 billion.

For purposes of analysis it is more useful to estimate the unit costs of special education, i.e. the cost per child served, than the aggregate amount. Direct unit costs are not available, so they must be estimated. The general benchmark from the comprehensive, nation-wide study by CSEF (2004) is that the average expenditure per special education student is 1.91 times more than for children in regular classes. Given K-12 average per pupil expenditures for regular classes of $8,590 in Pennsylvania in 2003, special education unit costs will average $16,407 (or $15,532).

A full set of unit costs is reported per child in special education in Table 2.4. Column 1 shows a 'best estimate' average and column 2 a lower bound estimate (taking account of sampling error). Unit costs also vary per disability: on average, specific learning disabilities and speech/language impairments are associated with lower unit costs; where children have multiple disabilities, significantly greater resource is needed. For each disability, unit costs are given in the bottom panel of Table 2.4. These are national costs per disability, and so they are weighted to account for the costs of services in Pennsylvania relative to the rest of the country (Chambers, 1998).[xi]

Table 2.4
Special Education Annual Unit Costs

	Unit Costs Average	Unit Costs Lower Bound
Across disabilities [a]	$16,407	$15,532
By disability:		
Specific learning disability	$12,458	$11,572
Speech/language impairment	$12,930	$9,898
Mental retardation	$17,747	$16,463
Emotional disturbance	$16,697	$14,048
Developmental delay	Na[b]	Na[b]
Other health impairment	$15,587	$13,902
Autism	$22,170	$18,773
Hearing impairment	$18,874	$16,170
Multiple disabilities	$23,714	$21,670
Traumatic brain injury, deaf-blindness, visual/orthopedic impairment	$17,691-$30,184	$15,810-$24,657

Notes: [a] Estimates by Pruslow (2001, 553) are lower, at $9,010-$13,827. [b] The unit cost for developmental delay is not available because classification varies significantly across states. All figures are in 2004 dollars. *Sources:* PDE (2004); CSEF (2003, Exhibit 1; 2004, Exhibit II-5).

Finally, unit costs vary by placement: special education costs for children in separate facilities are approximately 4.5 times more than unit costs of special education in public schools (CSEF, 2004; Odom et al., 2001). However, a large majority of special education children in Pennsylvania are in regular school settings, so variations in costs per placement are unlikely to be significant and are not considered in this analysis.

Based on these unit costs reported in Table 2.4, it is possible to calculate the cost-savings that would result if fewer children required special education services. The evidence on how pre-schooling might reduce such a requirement is considered in the next Section.

3. Special Education Cost-Savings

3.1 How Pre-Schooling Reduces Rates of Special Education

Several high-quality studies have found that pre-schooling significantly reduces the incidence of special education. These are summarized in Table 3.1.[xii] A representative estimate based on a review by the CDCP (2002) would be that pre-schooling causes a 12% fall in the rate of special education (study [5]). However, the effect may be as high as 43% for targeted programs where the initial rates of special education are high (study [3]). Using studies [2]-[4], the expected fall is 28%. (Table 3.1 also shows the economic consequences of reducing special education: per child, the cost-savings range from $2,122 to $8,236).

Table 3.1
The Effect of Pre-Schooling on Special Education (SE)

Study	Initial Rate of SE	Rate of SE After Pre-School	Change in Rate of SE	Economic Consequences per Child
[1]	12%	9%	-28%	$2,122
[2]	18%	13%	-32%	$4,886
[3]	28%	16%	-43%	$8,236
[4]	33%	25%	-8%	$6,167
[5]	n.a.	n.a.	-12%	n.a.

Sources: [1] Currie (2001); [2] Conyers et al. (2002); [3] Belfield et al. (2005); [4] Masse and Barnett (2002); [5] CDCP (2002). An early study is not included because insufficient data is available (Plecki, 1995); Gilliam and Zigler (2004) review state-level evaluations and find these to be low quality. *Notes:* Economic values are in 2004 dollars, with a discount rate of 3.5% applied to future cost-savings.

An in-depth study of the effect of pre-schooling on special education has been undertaken by Conyers et al. (2002), using data from the Chicago Child-Parent Centers program. The study shows that special education placement is lower for pre-school children as far as grade 8 (with no data collected beyond 8th grade).[xiii] Importantly, Conyers et al. (2002) find the effect is broadly consistent across disability types (not all disability types could be identified in the research because of small samples). Except for emotional/behavioral

disorders (where there is no difference), pre-school attendance is associated with special education placement rates which are lower by:

- 60% for mental retardation
- 32% for speech/language impairment
- 38% for specific learning disabilities

Given the high-quality methods used to identify these impacts, there may be reasonable confidence in the effects (even as they appear to be very large). Research has also looked at how and why such effects might occur. The most likely explanation is that pre-schooling enhances cognitive ability and school readiness. This in turn has effects such as: lowering the probability that a child is screened into special education (e.g. for developmental delay); allowing the child to progress faster through school; or facilitating inclusion of the child.[xiv] Another possible explanation is that protocols used to classify children into special education may vary: disproportionately, males are designated with learning disabilities (Coutinho and Oswald, 2005), as are minorities (Donovan and Cross, 2002); federal regulations on eligibility may also be factors.

3.2 Reductions in Special Education after Pre-School

A set of models are derived to calculate the reductions in special education with the proposed pre-school program.

To ensure that gains are not overstated, a conservative modeling approach is adopted. First, all assumptions are drawn from published studies; if alternative assumptions are plausible, the more conservative one is applied. Second, special education costs are assumed to not exceed the general inflation rate (even as real per pupil expenditure grew 8% between 1994 and 1998, CSEF, 2004, Exhibit I-4). Third, the models do not count benefits arising even as a child continues to receive special educational services. As examples, pre-schooling may help with learning such that the special educational services that the child receives will be more efficiently delivered; or pre-schooling may raise the amount of time that a child spends in regular classes. Thus, the provision of special education – for a given disability – would be more efficient. In this conservative model, all that is being counted is placement out of special education. (No effect on special education resources for those aged 18-21 are calculated either). Finally, any financial consequences that occur in future years are discounted (i.e. valued at a lower rate); the standard discount rate is 3.5% (for a full and recent review, see Moore et al. 2004).[xv]

Thus, if sizeable cost-savings are found, there should be reasonable confidence that these gains do exist. It is unlikely that this economic analysis will have overstated the advantages of the proposed investment.

The impact of the program on special education (SE) cannot be identified precisely from the literature. However, there are a number of plausible scenarios:

[a] Representative impacts, i.e. a 12% reduction in SE

[b] Representative impacts by type, i.e. a 12% reduction in SE but restricted to children with mental retardation, speech/language impairment, and specific learning disabilities (i.e., those disabilities specifically identified by Conyers et al., 2002)

[c] High impacts based on the average of studies [2]-[4], i.e. a 28% reduction in SE

[d] Type-specific impacts, i.e. a 60% fall in mental retardation, 32% in speech/language impairment, and 38% in specific learning disabilities (i.e., the sizes of reductions specifically reported in Conyers et al., 2002)

[e] One-third representative impacts, i.e. a reduction in SE one-third the size in scenario [a]

[f] One-third type-specific impacts, i.e. reductions in SE one-third the size of scenario [d]

Each of these scenarios is modeled, and applied for the fully available and targeted program. The average effect is then used to calculate cost-savings.

The difference across the two programs is that the fully available program should be able to serve more students and therefore should enroll more of the children who might require special education services.

FA: Under a **fully available pre-school program** 50% of the cohort is newly enrolled. It is assumed that this 50% (76,000) will include 75% of the children who might need special educational services.

T: With a **targeted program** (to 20% of the age cohort) programs may be delivered specifically to children who are most likely to require special education services, but this cannot be perfectly managed.[xvi] Therefore, it is assumed that this program will only enroll 50% of the children who might need special education.

The effects on special education enrollments for a single age cohort are set out in Table 3.2. For a given cohort of 152,000 four-year olds, 19,723 will be eligible for special education when they enter the public school system. This group is given in the first row. The remaining four rows of Table 3.2 show how special education enrollments will be reduced across disability types as a result of either a fully available (U) or targeted (T) pre-school program. Only two scenarios are reported: [a] and [d]. (The full set of models is reported in the Appendix).

Table 3.2
Special Education Enrollments Per Age Cohort by Disability Types

	Mental Retard-ation	Speech/ Language Impair-ment	Specific Learning Disability	All Other Types	Total
Current provision	2,025	3,337	10,663	3,698	19,723
Fully available program:					
Model [a]	1,843	3,036	9,703	3,366	17,948
Model [d]	1,114	2,536	7,624	3,698	14,972
Targeted program:					
Model [a]	1,904	3,136	10,023	3,447	18,540
Model [d]	1,418	2,803	8,637	3,698	16,556

Note: All other types cannot be distinguished because of small sample sizes.

For each model, special education enrollments are lower, by between 10-15%; the average effect would be to reduce the number of children in special education each year by approximately 1,800. Potentially, a fully available program could reduce special education enrollments each year from 19,723 to 14,972; this is a fall of 24%. To derive a robust estimate, however, the average across the six scenarios [a]-[f] is applied in the final calculations.

3.3 Estimated Cost-Savings from Special Education

The cost-savings for Pennsylvania can be estimated by combining the model impacts with the costs per child in special education. As each child enters Kindergarten, the school system commits to 12 years of public schooling, including special education. Crucially, pre-schooling provision will influence the size of that commitment.

In Fiscal Year 2003, average state per-pupil spending on each year of regular education is $8,590 (PA DoE, 2005); and, using the lower bound averages, per-pupil average spending on each year of special education is proportionately higher at $15,532 (see Table 2.4). Over the next 12 years, each public school child will receive present value expenditures of: $81,814, if they do not receive special educational services; or $149,297, if they receive special educational services. Therefore, **the lower bound present value difference between education in regular classes and special education is $67,483. This is the average amount that is saved for every child that is placed out of special education**.

These amounts vary according to disability type (see Table 2.3). Present value costs for special education services for mental retardation are $160,097; for specific learning disabilities, $110,802; and for speech/learning impairment, $94,529. The saving per child for these disability types is therefore between $12,715 and $78,283. Therefore, **it matters which disability types are impacted by pre-schooling programs.**

Table 3.3
Cost-Savings from Reductions in Special Education ($ millions)

	Current	Fully available Program	Targeted Program
Special Education Students [a]	19,723	14,972-19,131	16,556-19,329
Total Costs [b]			
Average	$880	$778	$812
Range		$651-$857	$627-$865
Cost-Savings Compared to Current Provision:			
Average		$102	$68
Range		$23-$229	$15-$153

Notes: [a] Range is based on applying models [a]-[f]. [b] These costs are additional costs necessary for special educational services, above the costs incurred in regular classes. Present Value figures are discounted over the child's educational span from K–12 at a discount rate of 3.5%. Economic values are in 2004 dollars. See Appendix Tables A1 and A2 for full details.

Total potential cost-savings can be calculated based on the tracks the students follow as a result of attending pre-school or not. A full set of models is reported in Appendix Tables A1 and A2.

Table 3.3 traces through the costs. The first row shows that **for the 19,273 special education students expected to enter kindergarten in Pennsylvania in 2005, $878 million in present value funds will be required over the K-12 period** (i.e., additional over regular educational expenditures per child). The expected number of students is calculated using models [a]-[f] for the fully available and targeted programs. In all cases, the numbers of students in special education fall, and this generates cost-savings.

With a fully available program, the best estimate of the cost requirement for special education is $778 million. A minimum estimate is $651 million and a maximum is $857 million. Thus, **the total cost saving from a fully available pre-K program will be $102 million** (=880-778), with a lower bound of $23 million and an upper bound of $229 million. **This program should therefore save 12% of the total expenditures for special education programs over regular education**.

The **targeted program yields a present value cost-saving of $68 million**, with a lower bound of $15 million and an upper bound of $153 million. The targeted program should therefore **save 8% of total expenditures for special education**.

4. Fiscal Impacts for Special Education

4.1 The Fiscal Consequences of Expanded Pre-Schooling

This Section combines the analyses on the investment costs of the fully available and targeted programs with the anticipated fiscal benefits. It is important to remember that all that is being considered is the economic cost-saving for special education budgets. This assists in making decisions as to the optimal amount of public support for pre-schooling, but it is far short of a complete evaluation of such provision. Moreover, each of the models is conservative, in that it uses lower bound estimates of impacts and high unit cost assumptions. The analysis is only for one cohort of children, i.e. those currently aged four-years old.

Table 4.1
Cost-Savings for Special Education Per Age Cohort ($ millions)

Present Value Figures	Fully available Program		Targeted Program	
	Model C1	Model C2	Model C1	Model C2
Pre-school Program Cost (C)	$653	$547	$263	$221
Special Education Benefits (B)	$102	$102	$68	$68
Benefit/Cost Ratio (B/C)	16%	19%	26%	31%

Notes: Present Value figures are discounted over the child's K-12 educational span at a discount rate of 3.5%. Economic values are in 2004 dollars. *Sources:* C, Table 2.2; B, Table 3.3.

Table 4.1 shows costs for the fully available program of $547-$653 million, and average savings of $102 million. **The savings in special educational requirements would offset between 16% and 19% of the costs of a fully available pre-school program**. That is, for every dollar invested in pre-schooling, there would be a saving of 16-19 cents in the costs of special education alone (not counting other benefits). In the right-hand panel of Table 4.1, **with a targeted program, the cost-savings in special education requirements would offset 26%-31% of the total investment**. For every dollar invested in pre-schooling, there would be a saving of 26-31 cents for special education. This is a substantial reduction in the burden of financing to establish a targeted program.

4.2 Sensitivity Analysis

The averages reported in Table 4.1 are generated from a set of assumptions about who is enrolled and what the fiscal consequences are. The models differ across: enrollment levels (U or T); costs of provision (C1 or C2); different impacts [a]-[f]; and different costs of special education (Lower Bound / Average). Thus, there are 48 possible combinations of models. The full results for these 48 combinations are given in the Appendix Tables.

From the possible assumptions, an absolute minimum and an upper bound effect on special education budgets can be calculated. The range of benefits for a fully available program is $23 million to $229 million. As a proportion of the costs of the program, the minimum percent is 4% and the maximum is 42%. For a targeted program, the benefits are $15-$153 million; the offset to costs is between 6% and 69%. These alternatives are plausible, but are less likely to be relevant than the best estimates.

5. Conclusion

The above analysis has aimed to identify the economic consequences of pre-schooling for special education budgets in Pennsylvania.

In recent years, Pennsylvania has significantly expanded its pre-school programs. This creates a challenge for modeling what will happen to the education system, because it is in a state of flux. For illustration, two programs are considered: a fully available program and a targeted program. The purpose is to estimate the ratio of any cost savings to any additional investment, not to prescribe any amount of investment.

These models would involve 30,640-76,000 new pre-school places, with a financial commitment of between $221 million and $653 million. These programs should yield benefits to the state in terms of cost-savings to special education budgets (as well as other cost-savings and higher tax revenues). Based on state-specific data, national data, and high-quality research studies, these present value cost-savings can be calculated: they range between $68 million and $102 million and will be recouped in the 13 years after pre-schooling has been provided.

Comparing the costs and the benefits, the economic analysis shows that savings in special education budgets would offset 16-19% of the cost of a fully available pre-school program and 26-31% of a targeted pre-school program. For every $1 invested, 16-19 cents or 26-31 cents will be saved elsewhere in the school system. In terms of the overall special education budget, pre-schooling programs will yield savings of 8-12%. Even with extremely pessimistic assumptions, the ratio of cost-savings to investment amounts is significant.

Nevertheless, two important questions may be raised in relation to the burden of funding for special education. One concern is that because funding is split across separate agencies (federal, state, and local), the state will only be obtaining a fraction of the cost-savings identified here. However, as noted above, federal contributions for special education are less than 10% of the overall spending in Pennsylvania; the bulk of the cost-savings will therefore be obtained within the state. A second concern relates to whether such cost-savings can be made if there is political pressure to maintain spending. Here, it is important to be clear about the interpretation of cost-savings in this context. The intention is not to reduce funding for special education, but instead to find ways to better spend the funding that is available and to ensure that services are

efficiently allocated to children whose need for special education is the most compelling.

Finally, the benefits calculated in this report are only a fraction of the full set of benefits. Other studies have identified societal benefits in terms of lower crime, reduced reliance on welfare, and increased tax contributions. These are all benefits to the state either as lower expenditures or higher revenues. Moreover, there will be benefits to the participants in pre-school programs. These benefits are likely to be substantial and they should be part of a full cost-benefit analysis in deciding whether to commit further resources to pre-schooling.

Appendix

Table A1
Fully available Program: Alternative Models

ASSUMPTIONS			AMOUNTS ($ MILLIONS)			RATIOS %	
COSTS	SE COST	SCEN-ARIO	COST (C)	EXPEND (E)	SAVING (S)	S/C	S/E
C1	LB	[e]	547	756	22.68	4	3
C1	LB	[f]	547	756	56.01	10	7
C1	LB	[a]	547	756	68.05	12	9
C1	LB	[b]	547	756	45.59	8	6
C1	LB	[c]	547	756	158.78	29	21
C1	LB	[d]	547	756	168.02	31	22
C1	UB	[e]	547	1003	30.09	6	3
C1	UB	[f]	547	1003	76.39	14	8
C1	UB	[a]	547	1003	90.27	17	9
C1	UB	[b]	547	1003	64.98	12	7
C1	UB	[c]	547	1003	210.63	39	21
C1	UB	[d]	547	1003	229.17	42	23
C2	LB	[e]	653	756	22.68	4	3
C2	LB	[f]	653	756	56.01	9	7
C2	LB	[a]	653	756	68.05	10	9
C2	LB	[b]	653	756	45.59	7	6
C2	LB	[c]	653	756	158.78	24	21
C2	LB	[d]	653	756	168.02	26	22
C2	UB	[e]	653	1003	30.09	5	3
C2	UB	[f]	653	1003	76.39	12	8
C2	UB	[a]	653	1003	90.27	14	9
C2	UB	[b]	653	1003	64.98	10	7
C2	UB	[c]	653	1003	210.63	32	21
C2	UB	[d]	653	1003	229.17	35	23
AVERAGE			**600**	**878**	**101.72**	**17**	**12**

Table A2
Targeted Program: Alternative Models

ASSUMPTIONS			AMOUNTS			RATIOS %	
COSTS	**SE COST**	**SCEN-ARIO**	**COST (C)**	**EXPEND (E)**	**SAVING (S)**	**S/C**	**S/E**
C1	LB	[e]	221	756	15.12	7	2
C1	LB	[f]	221	756	37.34	17	5
C1	LB	[a]	221	756	45.37	21	6
C1	LB	[b]	221	756	30.39	14	4
C1	LB	[c]	221	756	105.85	48	14
C1	LB	[d]	221	756	112.01	51	15
C1	UB	[e]	221	1003	20.06	9	2
C1	UB	[f]	221	1003	50.93	23	5
C1	UB	[a]	221	1003	60.18	27	6
C1	UB	[b]	221	1003	43.32	20	4
C1	UB	[c]	221	1003	140.42	64	14
C1	UB	[d]	221	1003	152.78	69	15
C2	LB	[e]	263	756	15.12	6	2
C2	LB	[f]	263	756	37.34	14	5
C2	LB	[a]	263	756	45.37	17	6
C2	LB	[b]	263	756	30.39	12	4
C2	LB	[c]	263	756	105.85	40	14
C2	LB	[d]	263	756	112.01	43	15
C2	UB	[e]	263	1003	20.06	8	2
C2	UB	[f]	263	1003	50.93	19	5
C2	UB	[a]	263	1003	60.18	23	6
C2	UB	[b]	263	1003	43.32	17	4
C2	UB	[c]	263	1003	140.42	53	14
C2	UB	[d]	263	1003	152.78	58	15
AVERAGE			**242**	**880**	**67.81**	**28**	**8**

Endnotes

[i] Programs vary considerably, including: Head Start for disadvantaged children or universal provision; full-day versus half-day; home visits versus center-based programs with parental involvement; summer school versus year-round; and short-term versus sustained.

[ii] For academic achievement gains for Pennsylvania, see Del Gaudio Weiss and Offenberg (2002). However, there are no published evaluations of pre-kindergarten for Pennsylvania (Gilliam and Zigler, 2004). For general research, see studies by Currie (2001); Masse and Barnett (2002); Reynolds et al. (2001); Campbell and Ramey (1995); McCarton et al. (1997); Benasich et al. (1992); Johnson and Walker (1991); Henry et al. (2003); Loeb et al. (2004); Montes et al. (2003); Belfield et al. (2004); Gilliam and Zigler (2000); and Schweinhart et al. (1993).

[iii] In total, funds may be available from the Accountability Block Grant, Head Start Supplemental Assistance Program, State Basic Education Subsidy Funds, Federal Title I Funds, Early Intervention Act funds and federal IDEA funds, Education for Homeless Children and Youth Program funded by Title VII-B of the McKinney-Vento Homeless Assistance Act, Migrant Education Programs supported by State and federal Title I Migrant funds, Even Start Family Literacy, Reading First, and Child and Adult Care Food Program. [www.pde.state.pa.us/early_childhood/cwp/view.asp?a=179&q=101636]

[iv] Further information is given in [www.pde.state.pa.us/early_childhood/lib/early_childhood].

[v] Participants in Oklahoma's universal program report strong academic gains (of 16%) in overall language and cognitive skills tests, with especially strong impacts for African American and Hispanic students (Gormley and Phillips, 2003). In a subsequent empirical investigation, Gormley et al. (2004) find positive academic effects for all income groups and ethnic groups on the Woodcock-Johnson achievement test. Similarly positive – but not as powerful – academic effects are found in evaluations of the universal pre-K provision in Georgia (Henry et al., 2003). In addition, some benefits from pre-schooling may be magnified as increasing numbers of children participate (e.g. through peer effects).

[vi] This Report does not address implementation issues. School districts may need to phase-in programs before full access is obtained; the need for this is highlighted in the case study in Pennsylvania by Gill et al. (2002). These proposals do allow for a diverse range of pre-school providers – both as part of a state system or privately run. This study does not address issues of provider quality, assuming that any pre-schooling expansion would build on and complement existing public and private early education.

[vii] High quality may be defined as a rating of 5 or above on the Early Childhood Environment Rating Scale – Revised (Harms et al., 1998). This threshold rating corresponds to a program such as the High/Scope Perry Pre-School program. NIEER (2004) lists ten benchmark criteria for establishing high quality pre-kindergarten programs (e.g. the teacher should have a BA, with certification in Early Childhood Education). An alternative benchmark list is given by Muenchow et al. (2004).

[viii] Golin et al. (2004) calculate the cost of pre-school programs for Illinois to be approximately $8,600; this amount is close to per student expenditures in Illinois public schools for K-12 education. Costing exercises have also found that high quality provision does require more resources than are currently available for many pre-school programs, by a factor of 27% (Marshall et al., 2002). However, these amounts vary according to the actual system

implemented. Unit costs will be a function of: hours per day and years per day; setting (school or center); quality standards; and the accountability structure (see Golin et al., 2004). Information on average and marginal costs is not available, nor is information on the costs of monitoring and screening children that would be needed for a targeted program.

[ix] Head Start programs do not offer the same services as targeted pre-K programs, but they are directed at the same age group and motivated in part by the same goals. A third approach is to use the costs per child for a model program, such as the Chicago CPC program; this costs $4,856 per year. A fourth approach would be to use average national spending on pre-K; this is <$4,000.

[x] This includes Formula Funding, pro rata shares of new funding, contingency funds, CORE Services funding, Institutionalized Children's Program, and Community Services funding. Pennsylvania does not use either state mental health funds or private medical insurance to fund special education services (CSEF, 2004, Exhibit I-5).

[xi] Using Tables 2.3 and 2.4 it is possible to calculate an aggregate figure for special education expenditures in Pennsylvania. This figure is the cost per disability type times the number of children with that disability type. Using the lower bound unit costs, aggregate spending is $2.7 billion; using the average unit costs, spending is approximately $3.9 billion. As the lower bound unit costs produce an aggregate number which is close to the actual expenditure, the lower bound estimates are used. Further information is reported at [www.pdeinfo.state.pa.us/education_budget/lib/education_budget /Estimated20042005$$Narrative_7042004_.pdf].

[xii] Other studies were considered. One is omitted because of insufficient data (Plecki, 1995). Gilliam and Zigler (2004) report evaluations of state-funded pre-K on special education referral or placement for 8 states. Two studies are rejected because of small sample sizes (GA, WA). Three studies report lower placement (MD, SC, TX); and three report no effect (FL, MI, NY). Impact effects are available for only one study (MD): 13% of pre-schoolers were in special education by 5th grade; for the comparison group, the rate was 24%. This rate is similar to rates in Table 3.1. Generally, the evaluations may be questioned, as two factors are critical: sample size sufficient to detect changes; and whether the data are calculated cumulatively or for single years.

[xiii] The possibility of fade-out has been noted (Currie and Thomas, 1995; Lee and Loeb, 1995). Yet, early gains may set children on a different trajectory, such that 'skills beget skills', eventually leading to labor market success (Carneiro and Heckman, 2003). Crucially, this study and those cited in Table 3.1 do not find fade-out in terms of special education placement.

[xiv] In Pennsylvania, of those children initially in special education, between the ages 14-21 6% no longer received special education and 54% graduated with a regular high school diploma (PDE, 2004, Table 8).

[xv] Discounting is necessary because $100 received immediately is worth more than $100 received a decade later. The immediate $100 could be invested in an interest-yielding account for ten years. (Discounting also reflects the certainty of money now versus the uncertainty of money later). A discount rate is applied to all money streams received in the medium term and long term, and the further away from the initial investment time, the greater the discount. When a future benefit has been discounted, it is referred to as a present value. So, with a 5% discount rate, a benefit of $105 recouped one year after the investment would have a present value of $100.

[xvi] Also, such a program would need to devote some resources to screening for eligible children. Offsetting this screening cost should be an increase in effectiveness, in that pre-schooling programs would be purposefully designed to enhance the development of children with special educational needs. It is assumed that these last two factors counterbalance each other.

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