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ABSTRACT

This paper reports on the findings of an evaluation of Project Giant Step, a program funded by New York City to provide comprehensive services to all 4-year-olds in the city, beginning with low-income children who are unserved by existing programs. Both the costs and effects of Project Giant Step are examined. Effects of the program on children were determined by means of the Preschool Inventory, which measures achievement in areas regarded by the developers as necessary for success in school. The findings indicate that the program had a significant impact on children's cognitive performance, and that the magnitude of the program's effects was directly related to program costs. It was found that the higher a program's expenditures per child, the higher the average cognitive gains of the children. Results provide some insights into the tradeoffs that policymakers must make between the quality of care in publicly funded early childhood programs and the number of children that can be served. Included are 15 exhibits of related material. (GLR)

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COST-EFFECTIVENESS OF EARLY CHILDHOOD PROGRAMS LOW-INCOME CHILDREN: FINDINGS FROM THE EVALUATION OF PROJECT GIANT STEP

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ABSTRACT

This paper reports on the findings from an evaluation of Project Giant Step, a universal program funded by New York City to provide comprehensive services to all four-year-olds in the city, beginning with low-income children and their families who were unserved by existing programs. The paper examines both the costs and effects of Project Giant Step. The findings show that the program had a significant impact on children's cognitive performance, and that the magnitude of these effects were directly related to program costs--the higher a program's expenditures per child, the higher the average cognitive gains made by children. The analysis provides some insights into the tradeoffs that policymakers must make between the quality of care provided in publicly-funded early childhood programs and the number of children that can be served.

INTRODUCTION

Begun in the fall of 1986, Project Giant Step provided a half-day comprehensive program for four-year-old children and their families. It combined an appropriate developmental and educational experience for children with support services for families and a program to involve parents in their children's education. The program was offered in selected public schools, day care centers and Head Start programs in New York City communities with large numbers of economically disadvantaged children unserved by existing programs. Project Giant Step was coordinated by the Mayor's Office of Early Childhood Education and administered by the New York City Board of Education (BOE) and the Agency for Child Development (ACD).

The program's educational component consisted of three hours of classroom experience, either mornings or afternoons, five days a week, nine months a year. It addressed a range of concerns including social, emotional, physical and cognitive development, as well as health and nutrition. Parent involvement activities were designed to increase parents' understanding of and

involvement in their children's education. Support services to families were intended to provide self-help mechanisms so that parents could assist themselves and their families. During the 1987-88 academic/school program year, the program was funded to serve approximately 8,000 children and families. In the 1988-89 program year, it was funded to serve more than 10,000 children and families.

In July 1987, Abt Associates Inc. of Cambridge, Massachusetts was awarded a contract to conduct an evaluation of the program. The evaluation of Project Giant Step was a three-year study to examine the implementation and assess the cost-effectiveness of the program. In the first two years of the evaluation, we examined the impact of Project Giant Step on a randomly selected sample of approximately 900 children, their families and the teachers and other staff who worked with them. Classroom observations, assessments of children through developmental tests and ratings of social behavior, as well as interviews with staff and parents, provided the basis for an analysis of the program's short-term effects. In the final phase of the study, the evaluation linked program costs to outcomes. This paper presents findings on outcomes for children at the end of the program year, on the costs of the program and on its cost-effectiveness.

PROGRAM EFFECTS ON CHILDREN

The design for the Study of Program Effects called for selection of two samples of children and their parents. The first group of children was selected in the fall of 1987; a second group of children was selected in the fall of 1988.

The criterion for the selection of individual program sites was that they be fully operational by the end of the 1986-87 school year. Twenty-three program sites (all but one of the initial program sites) were selected for the first year of the study. The Board of Education administered 12 and the Agency for Child Development administered 11 of the 23 sites. The sites contained between one and four Giant Step classrooms. Within each of these sites we selected randomly one class per classroom (that is, a morning or an afternoon class) for a total of 24 BOE and 21 ACD classes. In each of the classes chosen, we sought agreement to participate in the study from parents of all the children and then selected randomly 10 to 12

children (10 in BOE sites, 12 in ACD sites), from those whose parents agreed, for a total of 492 children. The sample size chosen took into account the expected attrition of children. A decision was made at the end of the 1987-88 school year to continue the study in the same sites and to enlarge the sample of children selected, to provide greater protection against attrition. Exhibit 1 shows the sample design for the study.

Measures

Several aspects of child development were identified as relevant to the evaluation of the program in the first two years: cognitive functioning; social interaction; emotional well- being; and disposition towards learning. Measures were selected to address these aspects of development; however, since the cost-effectiveness analysis used cognitive gains as the outcome measure, only the cognitive measure selected is discussed here.[1]

Three criteria governed the choice of a measure of cognitive functioning and school readiness for use in the prekindergarten year. They were:

- the test should have been previously used in large studies of low-income populations and should provide appropriate norms for comparison;
- the test should be available in a Spanish translation; and
- the test should take less than 30 minutes to administer.

After reviewing a large number of measures we selected the Preschool Inventory (PSI) as the pre- and post-test measure for the preschool year.

The Preschool Inventory (PSI) was developed by Bettye Caldwell and her associates in 1965 to provide Project Head Start with a practical measure of preschool achievement. It was intended to measure the achievement of three- to six-year-olds in educational skills traditionally expected of middle-class kindergarten children. The PSI provides a measure of achievement in areas regarded by the developers as necessary for success in school. The test score is defined as the number of correct items (out of a total of 32 items). The instrument was designed to be

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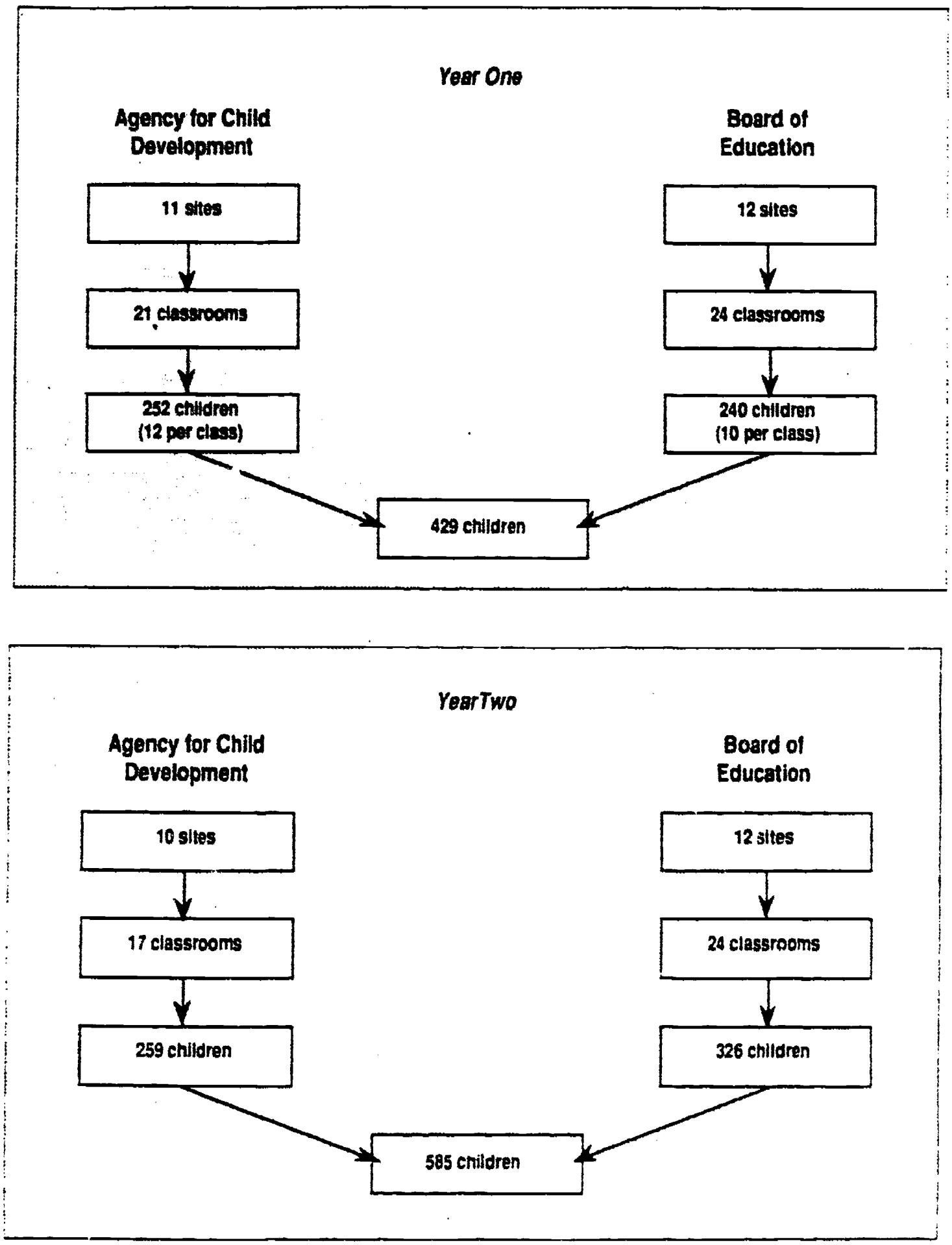
[1]For a discussion of social-emotional outcomes see Jean I. Layzer et al. **Evaluation of Project Giant Step Year Two Report: The Study of Program Effects**, (Cambridge, MA, Abt Associates Inc., June 1990).

Exhibit 1

Study Sample for Year One and Year Two



sensitive to experience and can therefore be used to demonstrate changes associated with educational intervention. It has been used as a test instrument in many large-scale research projects that explored the effectiveness of preschool programs. It has consistently demonstrated excellent psychometric properties. In addition, at the time of its selection, it was the only widely-used preschool test for which a Spanish translation was available. Simple and quick to administer, it met the needs of the study admirably.

Administration of the PSI

For the Giant Step evaluation, the PSI was administered to two cohorts of children: Cohort I entered Giant Step in fall 1987 and Cohort II entered the program in fall 1988. For each cohort, the PSI was administered in the fall and again in the spring. The average elapsed time between tests was 5.6 months. Children were tested individually at their Giant Step program by an outside tester. The test was administered in English or Spanish, depending on the teacher's recommendation for an individual child.

In Cohort I, for each of the programs and classrooms in the evaluation, a sample of children was selected randomly from the roster for the fall baseline testing. Twelve children were selected from each ACD classroom and 10 from each BOE classroom. In Cohort II, fall testing was done with every child for whom parental permission to participate was given. Therefore the Cohort II sample is larger.

In Cohort I, 454 children were tested with the PSI in fall 1987. In Cohort II, 585 children were tested. Matched scores were available for 746 children.

Findings

Overall Cognitive Gains. Exhibits 2, 3 and 4 show the pretest and posttest PSI scores for children in Cohorts I and II, and in both Cohorts combined. Gain scores on the PSI over the Giant Step year were computed for the children who were tested at both fall (pretest) and spring (posttest). As Exhibits 2, 3 and 4 show, in both Cohorts, children gained an average of about one item per month. In order to assess whether the attrited and non-attrited children were

Exhibit 2

Mean PSI Scores for Cohort I by Site

		Fall 1987			Spring 1988			Number of Items Gained Fall-Spring			Items Gained Per Month		
		Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N
Combined Totals		**12.6**	**6.1**	**454**	**17.8**	**6.6**	**364**	**5.1**	**5.1**	**364**	**0.95**	**1.1**	**364**
ACD Centers	1	9.5	5.4	24	17.5	4.8	22	8.0	3.0	22	1.60	0.6	22
	2	8.6	3.8	18	13.6	4.9	14	4.9	5.7	14	0.83	1.0	14
	3	13.7	3.1	12	18.2	5.3	10	4.9	3.4	10	0.82	0.6	10
	4	10.8	6.3	24	16.8	4.5	14	6.0	4.6	14	0.93	0.7	14
	5	18.3	3.8	12	22.2	3.9	12	3.9	4.0	12	0.78	0.8	12
	6	10.0	6.0	19	15.3	6.6	15	6.7	5.6	15	2.59	2.4	15
	7	13.2	7.2	24	23.6	4.7	22	10.1	6.1	22	1.63	1.0	22
	8	14.3	7.7	12	19.6	7.1	11	5.9	5.7	11	0.98	0.9	11
	9	12.7	6.3	48	16.2	6.6	39	4.1	5.4	39	0.68	0.9	39
	10	13.6	6.5	10	21.3	8.6	7	7.0	3.3	7	1.17	0.6	7
	11	14.8	6.0	12	19.1	7.2	10	4.2	3.3	10	0.70	0.5	10
ACD Totals		**12.2**	**6.3**	**215**	**18.2**	**6.4**	**176**	**6.0**	**5.2**	**176**	**1.16**	**1.2**	**176**
BOE Centers	1	12.3	6.3	19	17.1	5.2	16	3.7	5.2	16	0.72	1.0	16
	2	14.5	4.4	10	20.1	4.5	10	5.6	2.9	10	0.93	0.5	10
	3	13.0	6.8	20	18.4	6.8	14	5.2	2.9	14	0.74	0.4	14
	4	16.3	4.9	20	20.2	4.0	18	3.4	3.9	18	0.62	0.7	18
	5	8.9	5.9	30	13.1	8.1	17	3.7	2.9	17	0.65	0.5	17
	6	13.6	6.2	20	20.1	5.1	20	6.5	6.1	20	1.08	1.0	20
	7	16.6	4.6	20	18.8	4.3	12	2.7	3.5	12	0.53	0.7	12
	8	14.2	3.6	20	17.4	6.5	14	3.4	3.8	14	0.60	0.7	14
	9	12.7	5.0	20	19.8	6.0	16	7.9	4.5	16	1.34	0.7	16
	10	12.9	4.9	20	19.4	6.9	14	6.4	6.0	14	1.19	1.1	14
	11	12.5	6.6	20	14.9	8.6	19	2.4	7.6	19	0.40	1.3	19
	12	10.9	6.8	20	12.7	6.6	18	1.5	4.8	18	0.25	0.8	18
BOE Totals		**13.0**	**5.9**	**239**	**17.5**	**6.7**	**188**	**4.3**	**5.1**	**188**	**0.74**	**0.9**	**188**

Exhibit 3

Mean PSI Scores for Cohort II by Site

		Fall 1988			Spring 1989			Number of Items Gained Fall-Spring			Items Gained Per Month		
		Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N
Combined Totals		**12.0**	**6.7**	**585**	**19.1**	**6.7**	**382**	**5.9**	**5.2**	**382**	**1.04**	**1.0**	**382**
ACD Centers	1	7.0	5.1	31	missing			---	---	---	---	---	---
	2	11.2	7.1	18	13.3	8.4	13	0.8	7.1	13	0.13	1.2	13
	3	7.8	3.5	37	16.1	5.6	14	7.3	5.4	14	1.21	0.9	14
	4	18.0	6.3	21	23.8	2.4	19	5.3	5.2	19	1.06	1.0	19
	5	10.8	5.8	33	18.5	3.4	18	8.4	4.8	18	1.41	0.8	18
	6	14.6	6.9	27	27.4	1.0	26	12.0	6.4	26	2.62	1.4	26
	7	17.5	6.7	15	22.6	6.4	15	5.1	4.5	15	0.79	0.7	15
	8	10.3	6.9	49	16.9	6.2	38	6.6	5.1	38	1.10	0.9	38
	9	16.1	6.9	17	18.6	8.2	11	3.3	3.9	11	0.55	0.7	11
	10	17.1	5.3	11	20.7	5.5	9	2.9	4.1	9	0.48	0.7	9
ACD Totals		**11.8**	**7.0**	**259**	**20.1**	**6.8**	**163**	**6.5**	**6.1**	**163**	**1.21**	**1.2**	**163**
BOE Centers	1	11.2	5.5	28	15.2	5.6	20	3.6	4.4	20	0.59	0.7	20
	2	11.1	6.9	26	16.3	8.1	21	5.8	4.0	21	0.96	0.7	21
	3	10.1	6.5	26	17.5	5.7	16	6.7	2.9	16	1.15	0.5	16
	4	14.7	6.8	32	23.4	4.3	24	6.7	3.2	24	1.12	0.6	24
	5	10.4	6.0	53	14.5	6.1	36	4.6	4.9	36	0.78	0.8	36
	6	14.0	5.6	27	20.0	5.2	23	5.3	3.7	23	0.88	0.6	23
	7	14.8	5.9	29	22.1	4.9	23	7.1	4.2	23	1.18	0.7	23
	8	10.1	5.6	16	19.0	8.2	5	7.4	3.8	5	1.27	0.6	5
	9	14.1	4.9	21	23.2	4.3	9	9.8	5.5	9	1.63	0.9	9
	10	16.9	5.7	22	20.7	5.9	15	3.5	4.7	15	0.59	0.8	15
	11	8.6	4.6	21	18.1	4.4	9	5.9	2.4	9	0.98	0.4	9
	12	10.0	6.8	25	14.1	6.0	18	2.9	3.2	8	0.54	0.6	8
BOE Totals		**12.1**	**6.4**	**326**	**18.3**	**6.6**	**219**	**5.5**	**4.3**	**219**	**0.92**	**0.7**	**219**

Exhibit 4

Mean PSI Scores for Cohort I and II Combined by Site

		Fall Baseline			Spring Posttest			Number of Items Gained Fall-Spring			Items Gained Per Month		
		Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N
Combined Totals		**12.3**	**6.4**	**1039**	**18.4**	**6.7**	**746**	**5.5**	**5.2**	**746**	**0.99**	**1.0**	**746**
ACD Centers	1*	8.1	5.3	55	17.5	4.8	22	8.0	3.0	22	1.60	0.6	22
	2**	8.6	3.8	18	13.6	4.9	14	4.9	5.7	14	0.83	1.0	14
	3	12.2	5.9	30	15.4	7.5	23	2.6	6.0	23	0.43	1.0	22
	4	9.0	5.0	61	16.4	5.0	28	6.6	5.0	28	1.07	0.8	28
	5	18.1	5.5	33	23.2	3.1	31	4.8	4.8	31	0.95	1.0	31
	6	10.5	5.8	52	17.1	5.3	33	7.7	5.2	33	1.94	1.8	33
	7	14.1	7.0	51	25.7	3.8	48	11.1	6.3	48	2.17	1.3	48
	8	16.1	7.2	27	21.3	6.7	26	5.4	5.0	26	0.87	0.8	26
	9	11.5	6.7	97	16.6	6.4	77	5.3	5.4	77	0.89	0.9	77
	10	15.1	6.7	27	19.7	8.2	18	4.7	4.0	18	0.79	0.7	18
	11	15.9	5.7	23	19.8	6.3	19	3.6	3.7	19	0.60	0.6	19
ACD Totals		**12.0**	**6.7**	**474**	**19.1**	**6.7**	**339**	**6.3**	**5.6**	**339**	**1.18**	**1.2**	**339**
BOE Centers	1	11.6	5.8	47	16.0	5.5	36	3.6	4.7	36	0.65	0.9	36
	2	12.1	6.4	36	17.5	7.3	31	5.7	3.6	31	0.95	0.6	31
	3	11.3	6.7	46	17.9	6.1	30	6.0	2.9	30	0.96	0.5	30
	4	15.3	6.1	52	22.0	4.4	42	5.3	3.8	42	0.91	0.6	42
	5	9.9	6.0	83	14.0	6.8	53	4.3	4.3	53	0.74	0.7	53
	6	13.8	5.8	47	20.0	5.1	43	5.8	4.9	43	0.97	0.8	43
	7	15.5	5.4	49	21.0	4.9	35	5.6	4.5	35	0.96	0.8	35
	8	12.4	5.0	36	17.8	6.8	19	4.5	4.1	19	0.78	0.7	19
	9	13.4	4.9	41	21.0	5.6	25	8.6	4.9	25	1.44	0.8	25
	10	15.0	5.6	42	20.0	6.3	29	4.9	5.5	29	0.88	1.0	29
	11	10.5	5.9	41	15.9	7.5	28	3.5	6.5	28	0.59	1.1	28
	12	10.4	6.8	45	13.4	6.3	36	2.2	4.1	36	0.40	0.7	36
BOE Totals		**12.5**	**6.2**	**565**	**17.9**	**6.6**	**407**	**4.9**	**4.7**	**407**	**0.84**	**0.8**	**407**

*Posttest data only from Cohort I. ** Baseline and posttest data only from Cohort I.

systematically different, the pretest PSI scores of the two groups of children were compared. Exhibit 5 shows that in general the children who attrited from the sample between pretest and posttest scored lower on the PSI at pretest, compared with the children present for the posttest. The differences in pretest scores for attrited and non-attrited children were significant only in Cohort II.

The significance of children's gain on the PSI was assessed in two ways. First, the effect size was computed, following the work of J. Cohen.[2] The effect size for the overall gains is .82 in Cohort I and .88 for Cohort II (Exhibit 6). According to Cohen, these effect sizes are large and educationally meaningful.

Second, we estimated what gains on the PSI these children might be expected to make in the absence of the preschool experience. The very large sample of more than one thousand children allowed us to construct developmental norms for the PSI for this population of children, using their own pretest scores. The analysis showed that Giant Step children could be expected to gain .45 points per month on the PSI as part of normal development. The accuracy of this developmental norm was evaluated by comparing it with similar norms from three other national studies of comparable groups of children. There were only small differences among the samples (norms ranged from .35 points gain per month for a sample of children in Home Start to .5 points gain per month for a more middle-class sample of children drawn from the National Day Care Study) and the average across all three samples was .44 points per month, very close to the .45 points per month that we estimated to be the developmental gain for the Giant Step sample. The one item per month gain shown by children in the Giant Step program is thus more than twice what would be expected on the basis of development alone (Exhibit 6a).

To examine further the significance of the gain, we compared it with gains made by children in other national studies. Three previous national studies that used the PSI showed a gain of .61 items per month (Home Start), .63 items per month (Head Start), and .67 items per month (National Day Care Study) (Exhibit 7). Of the three groups, the former two offer the more accurate comparison, since they are composed of children from low-income families. The day care sample represents a broader spectrum of family incomes.

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[2]Cohen, J. **Statistical Power Analysis for the Behavioral Sciences**, (New York, NY. Academic Press, 1977).

Exhibit 5

Mean Pretest (Fall) PSI Scores for Children with and without PSI Posttest Scores

	Cohort I			Cohort II			Cohorts Combined		
	All	ACD	BOE	All	ACD	BOE	All	ACD	BOE
	$\bar{x}$ (n)	$\bar{x}$ (n)	$\bar{x}$ (n)	$\bar{x}$ (n)	$\bar{x}$ (n)	$\bar{x}$ (n)	$\bar{x}$ (n)	$\bar{x}$ (n)	$\bar{x}$ (n)
All children	12.60 (454)	12.21 (215)	12.95 (239)	12.00 (585)	11.84 (259)	12.13 (326)	12.26 (1039)	12.01(474)	12.48 (565)
Non-attrited children (with posttest scores)	12.66 (364)	12.[illegible] (176)	13.17 (188)	13.14 (382)	13.52 (163)	12.85 (219)	12.90 (746)	12.79 (339)	13.00 (407)
Attrited children (missing posttest scores)	12.38 (90)	12.67 (39)	12.16 (51)	9.86 (203)	9.00 (96)	10.64 (107)	10.63 (293)	10.06 (135)	11.13 (158)
Significance of difference between attrited and non-attrited children	n.s.	n.s.	n.s.	p<.001	p<.001	p<.01	p<.001	p<.001	p<.01

Exhibit 6

Gains on the PSI for ACD and BOE Programs

	Cohort I				Cohort II				Cohorts Combined			
	All Cases (n=364) x (s.d)	ACD (n=176) x (s.d)	BOE (n=188) x (s.d)	Signif. of BOE/ACD diff.	All Cases (n=382) x (s.d)	ACD (n=163) x (s.d)	BOE (n=219) x (s.d)	Signif. of BOE/ACD diff.	All Cases (n=746) x (s.d)	ACD (n=339) x (s.d)	BOE (n=407) x (s.d)	Signif. of BOE/ACD diff.
Pretest	12.66 (6.3)	12.11 (6.5)	13.17 (6.0)	n.s.	13.14 (6.7)	13.52 (6.9)	12.85 (6.5)	n.s.	12.90 (6.5)	12.79 (6.7)	13.00 (6.3)	n.s.
Postlest	17.81 (6.5)	18.15 (6.4)	17.48 (6.7)	n.s.	19.05 (6.7)	20.06 (6.8)	18.31 (6.6)	p <.05	18.44 (6.7)	19.07 (6.7)	17.93 (6.6)	p < .05
Items gained	5.15 (5.2)	6.04 (5.2)	4.31 (5.1)	p < .01	5.92 (5.2)	6.54 (6.1)	5.45 (4.3)	p = .05	5.54 (5.2)	6.28 (5.6)	4.93 (4.7)	p < .001
Items gained/ month	0.95 (1.1)	1.16 (1.2)	0.74 (0.89)	p <.001	1.04 (0.95)	1.21 (1.2)	0.92 (0.72)	p <.01	0.94 (1.0)	1.18 (1.2)	0.84 (0.80)	p <.001
Effect size*	0.82	0.93	0.72		0.88	0.95	0.84		0.85	0.94	0.78	

* Effect size is expressed as the ratio of mean change in the PSI score to pretest standard deviation. An effect size of .3 is considered small, an effect size of .5 is considered moderate, and an effect size of .8 is considered large (Cohen, 1977).

Exhibit 6a

Actual Gains on the Preschool Inventory by Giant Step Children compared with Expected Developmental Gains

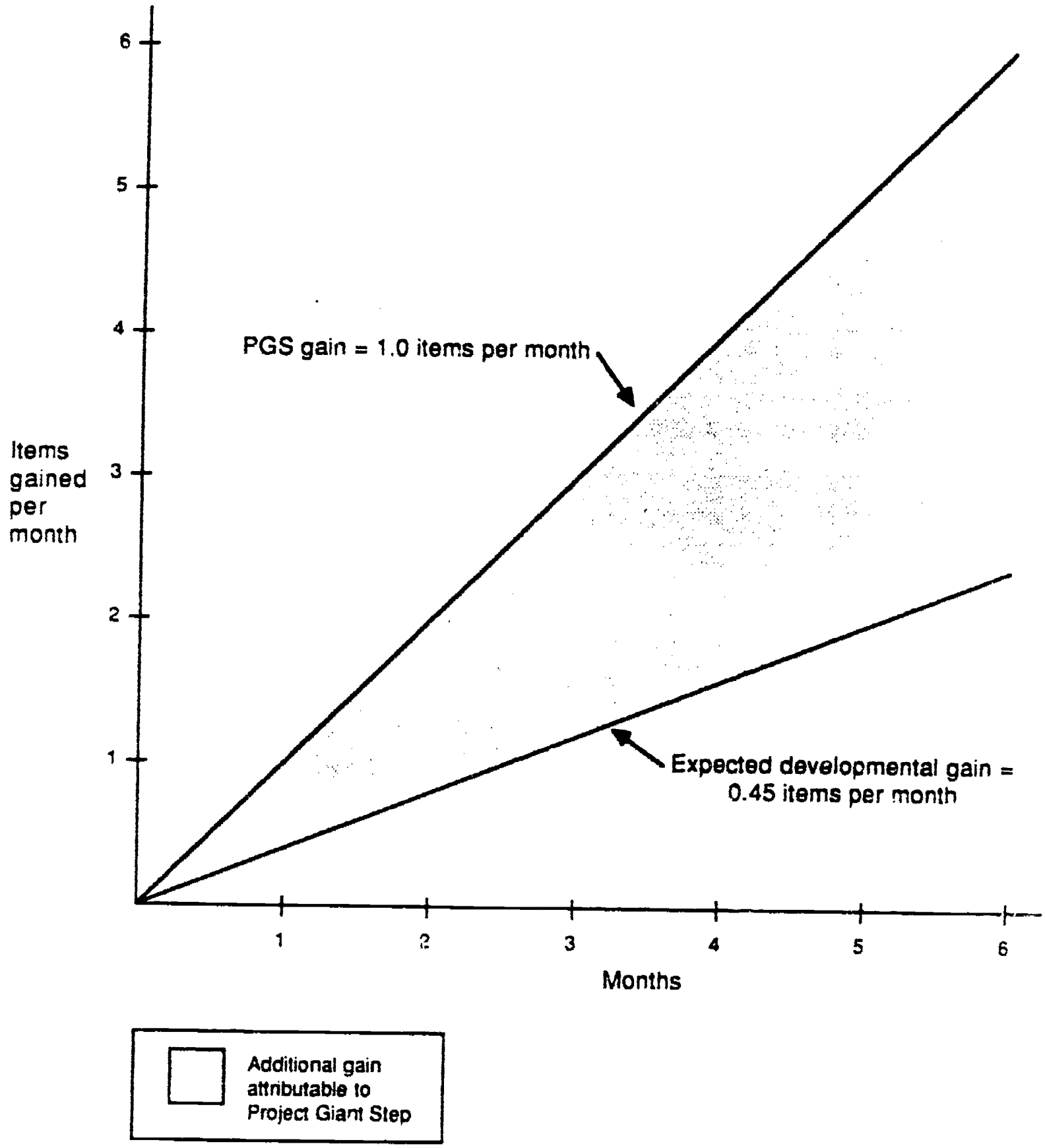
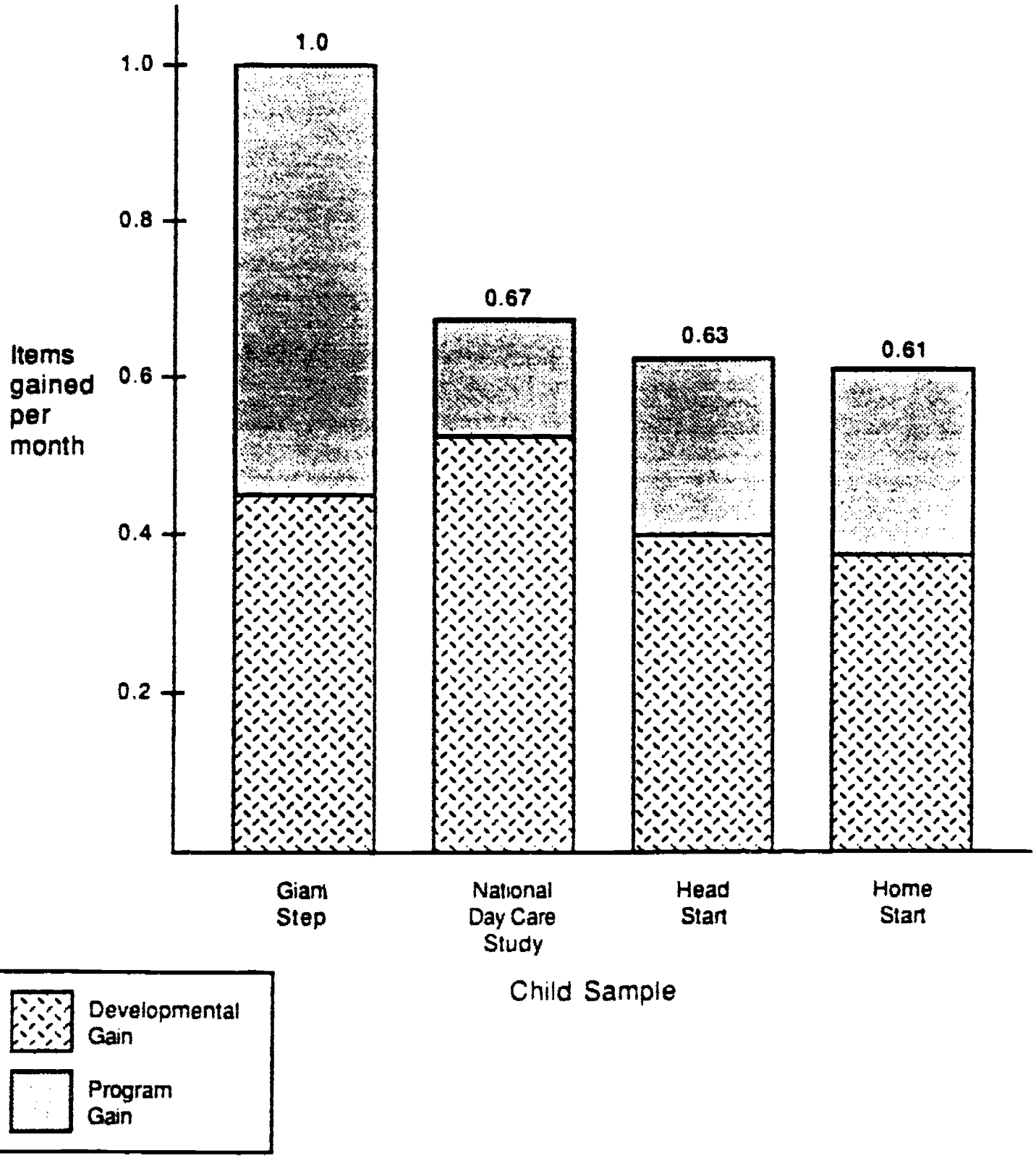


Exhibit 7

Comparison of Monthly Gains on the Preschool Inventory by Giant Step Children with Monthly Gains by Children in other Early Childhood Programs*



*These numbers are taken from several reports of the National Home Start Evaluation (High/Scope Educational Research Foundation) and from Children at the Center, the Final Report of the National Day Care Study (Abt Associates, Inc.).

Exhibits 8, 9, and 10 show the average gains made by children in each of the centers in the Giant Step evaluation. Although substantial variation was found across programs, averages for individual programs were within one standard deviation of the group average (all but five of the 23 programs were within one-half standard deviation of the group mean).

Gains in ACD and BOE Programs. Exhibit 5 summarizes the PSI gains made by children in ACD and BOE programs. Both ACD and BOE programs produced increases on the PSI that were substantially greater than the one-half item per month that might be expected on the basis of development alone. In both ACD and BOE programs, the effect size was large. Information from an independent Chapter I Evaluation of Board of Education Giant Step programs confirms both the magnitude of PSI change and the rate of that change for children enrolled in BOE programs. In this latter data collection effort, the average gain of 4.5 items spread over approximately five and a half months suggests an increase of 0.8 items per month.

COST ANALYSIS

The cost analysis examined the expenditures incurred in the delivery of Project Giant Step (PGS) services during School Year 1987-88 to address three research questions:

- What are the costs of Project Giant Step and how do these costs compare with other early childhood programs?
- What are the costs associated with Giant Step as implemented by the Board of Education (BOE) and the Agency for Child Development (ACD)?
- How are program costs related to outcomes for children?

Measures and Data

Program Expenditures vs. Program Costs. While it is common to think of costs and expenditures interchangeably, the terms are not synonymous. Costs refer to the value of resources used in the delivery of program services, while expenditures refer to cash outlays made by the program. The major difference between the two measures is the value of in-kind

Exhibit 8

PSI Gains over Six Months of Testing for Each PGS Center

Cohorts 1 and 2 Combined

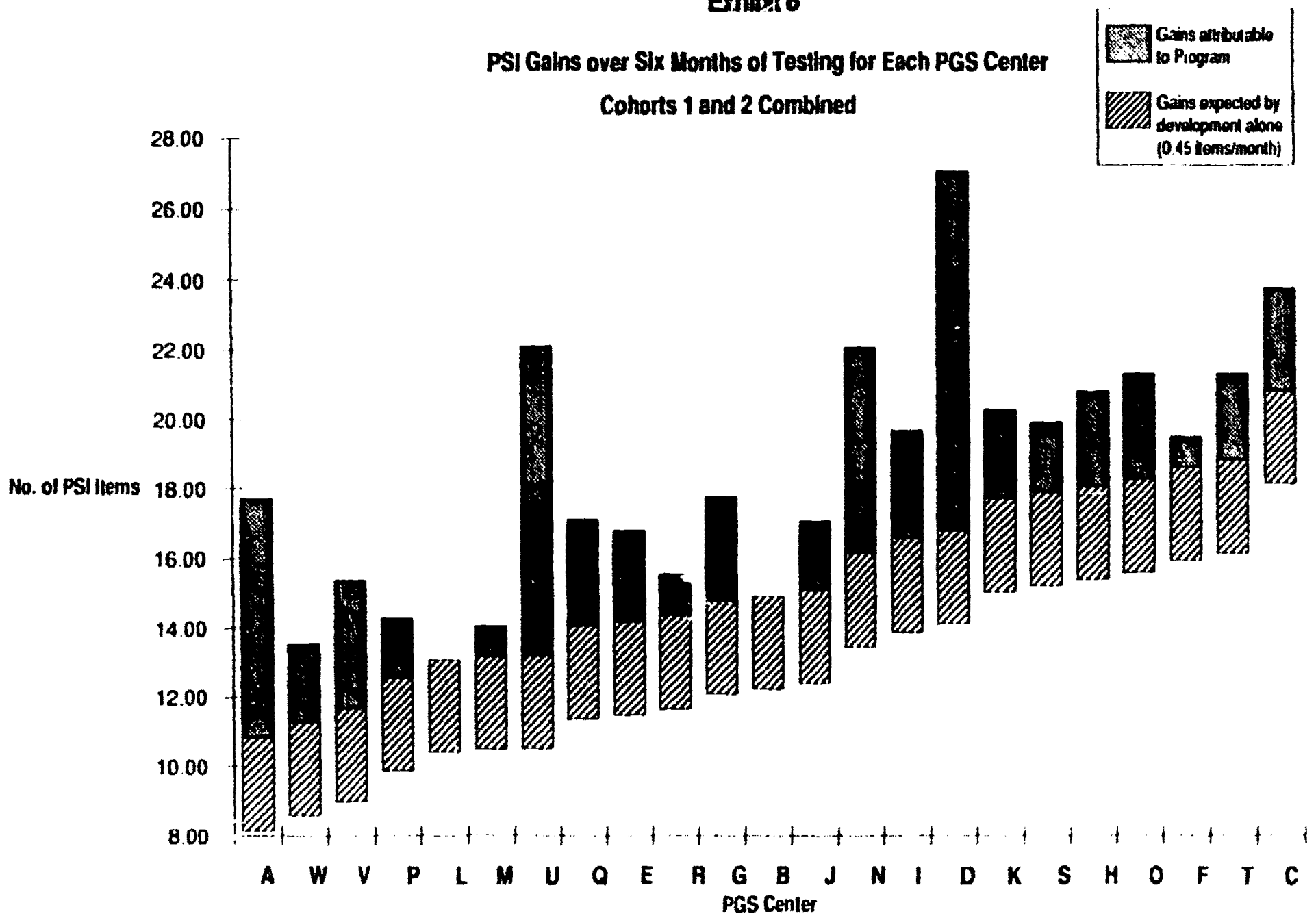


Exhibit 9

Pre and Post PSI Scores and Average Items Gained/Month for Each PGS Center in Cohort 1

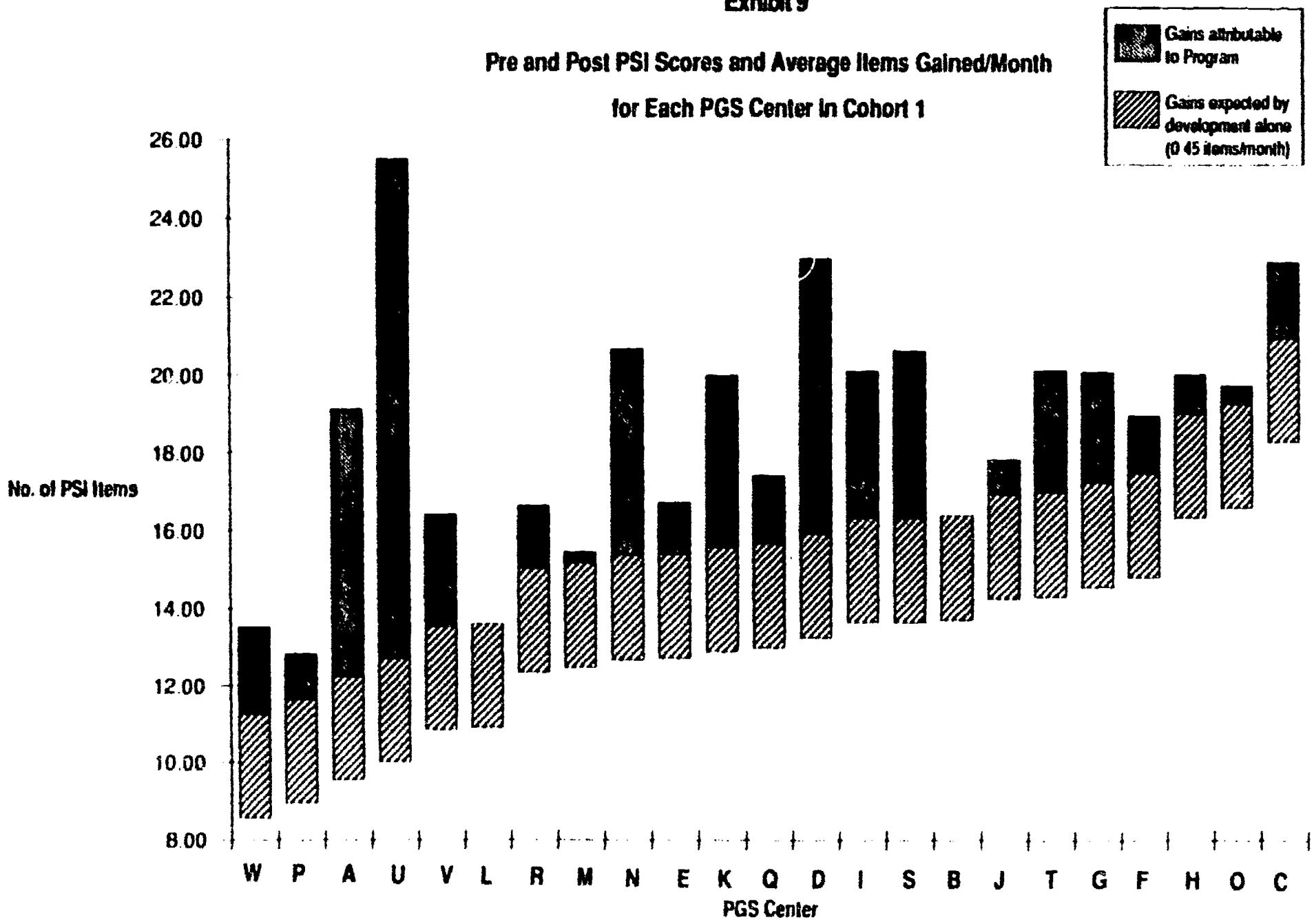
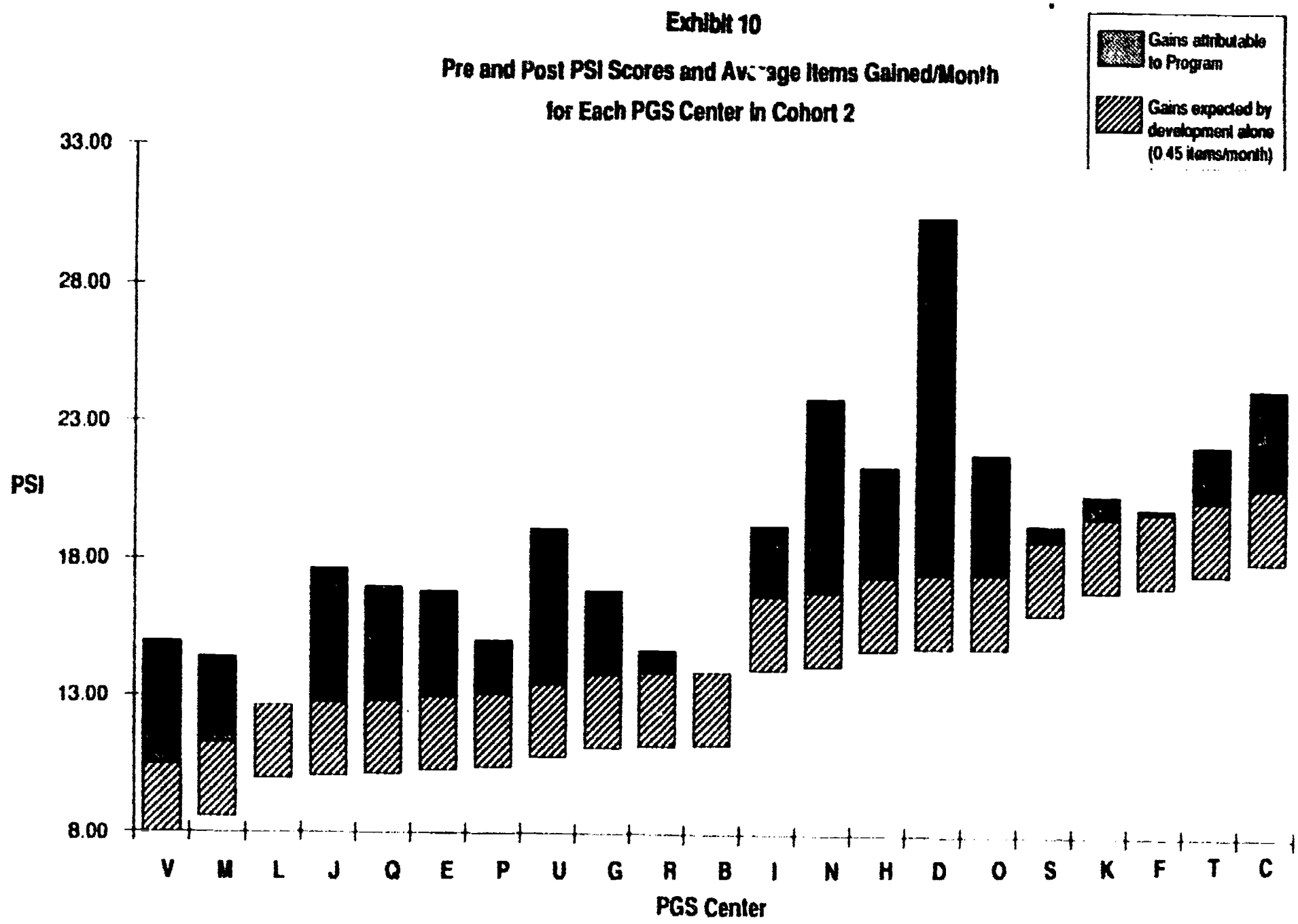


Exhibit 10

Pre and Post PSI Scores and Average Items Gained/Month for Each PGS Center in Cohort 2



contributions used by the program (including facilities, equipment, and volunteer staff). The choice between costs and expenditures is not clear-cut.

The availability and use of in-kind contributions varies considerably across early childhood and day care programs. If there is interest in replicating Project Giant Step in other settings, then it is important to know the resource requirements of the program. If the focus of the analysis is program costs, then it is necessary to identify and consistently value all of the in-kind resources.

It is, however, difficult to impute a fair market value to the in-kind resources used by the PGS sites. This is especially true of the school facilities used by the BOE sites. Because the BOE sites use available space in school buildings, the amount of space used is not subject to a "market test." There is no information available on the amount of space that would be used by these PGS sites if they had to pay for the space used. In addition to questions regarding the amount of space that the BOE sites would actually use, there is also the issue of imputing a value for this space. At a minimum, the imputed rental value of the space used by the BOE sites is subjective and open to question. More importantly, the imputed rental value would not be subject to a market test (i.e., how much would the PGS site be willing to pay for the space if it was not able to obtain the "free" use of the space from the BOE?). For the BOE sites, the value of donated space is likely to be a major element of total program costs and would seriously distort any comparisons between the BOE and ACD sites.

Pragmatic considerations dictated the use of expenditures rather than costs in the analysis. While financial statements contain data on expenditures incurred during the school year, reliable information on the value of in-kind contributions used by the program was unavailable for use in the analysis. While the PGS Program Profile contains information on the use of volunteer and consultant staff, there is not enough detail to estimate the value of these resources.

Although focusing exclusively on program expenditures may not give an accurate picture of the true comparative costs of the PGS sites, it does provide useful information for budgetary planning. The expenditure analysis provides information on the additional city funds that would be needed to run PGS (i.e., what does the city have to spend for PGS over and above what it is already spending for other programs whose resources might be shared with PGS?). For budgetary planning, program expenditures are more relevant than program costs.

Measures. Project Giant Step was a performance-funded program. That is, each PGS site received approximately the same amount per child. Each PGS classroom was designed to serve 20 children. As the PGS program requirements specify the staffing pattern for each PGS classroom, the funding for each site was determined by planned rather than actual enrollment. In School Year 1987-88 each PGS site received $2,750 per slot plus an additional $500 for each new child in the program. The funding formula has important implications for the examination of PGS expenditures.

Child care centers typically adjust their staffing and grouping patterns to reflect actual enrollment and attendance. To the extent that actual enrollment falls short of planned enrollment, child care centers reduce the number of staff employed. PGS sites did not have this flexibility. The PGS regulations specified the staffing pattern for each classroom: each classroom was required to have a teacher, assistant teacher (or educational assistant), and a program assistant (or family assistant). Under-enrollment at a PGS site resulted in higher staff:child ratios than called for in the regulations and higher than anticipated expenditures per child. Without the flexibility to adjust staffing to actual enrollment, PGS sites that operated at less than full capacity appeared to be overly expensive on a per child basis.

PGS expenditures were therefore examined in relation to actual enrollment and planned enrollment (i.e., capacity). In addition, since PGS was a part-day program that followed a school-year calendar, its expenditures per child are not directly comparable to those of developmental child care programs that provide full-time care on a year-round basis. To allow for meaningful comparisons with other early childhood education and child care programs, PGS expenditures were also examined on a per child-hour basis. A total of four measures were used to examine PGS expenditures:

- expenditures per child enrolled = annual expenditures/number of children enrolled at site;
- expenditures per slot = annual expenditures/total capacity of site;
- expenditures per child-hour enrolled = annual expenditures/(enrollment x number of operating days per year x 3.0 hours per day); and
- expenditures per capacity-hour = annual expenditures/capacity x number of operating days per year x 3.0 hours per day).

The above measures focus on the overall unit expenditures of the PGS sites to answer the question: how much additional did each of the PGS sites cost the city during SY 1987-88?

Data. Annual expenditure data for SY 1987-88 were obtained from the audited year-end financial statements of each of the PGS sites.[3] The PGS Management Information System (MIS) was used to obtain enrollment, capacity, and number of operating days for each of the PGS sites for SY 1987-88.

Findings

Expenditures Per Child. As indicated above, PGS is a performance-funded program. In SY 1987-88 each PGS site was funded at a level of $2,750 per slot. In addition, for any new classroom added, sites received a one-time allowance of $10,000 to purchase core equipment and materials. PGS sites therefore received an average of between $2,750 and $3,250 per slot depending on whether any new classrooms were opened at a site.

Overall, the 23 PGS sites included in the study spent an average of $2,007, well below the level of funding for the program. Because many of the PGS sites were operating at less than full capacity (average capacity utilization equaled 91%), average expenditures per child enrolled were somewhat higher than expenditures per slot. PGS sites reported expenditures of $2,274 per child enrolled in SY 1987-88.

There was, however, substantial variation in expenditures per slot and per child enrolled among the 23 PGS sites included in the analysis. Annual expenditures per slot ranged from a low of $911 to a high of $3,389. Expenditures per child enrolled ranged from $911 to $5,103.[4]

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[3]A separate financial statement was obtained for each ACD site. However, in the case of the BOE sites, data were provided at the district level. Detail provided on the financial statement was used to allocate district expenditures to each of the PGS sites within each district.

[4]Expenditures per child enrolled at Site U were somewhat anomalous. Capacity utilization at Site U was substantially lower than that of any other PGS site included in the study. While all of the other sites had capacity utilization rates between 75% and 100%, capacity utilization at Site U was only 55%. Thus while Site U spent $2,830 per slot, this amounted to $5,103 per child enrolled. If we exclude Site U, $3,887 was the maximum amount spent per child enrolled.

Although there was variation in annual expenditures per child within the two groups of sites, the major source of variation was between the BOE and ACD sites. Across the ACD sites, average annual expenditures per child enrolled were nearly double the average across the BOE sites ($2,934 vs. $1,670). This disparity in spending between BOE and ACD sites is quite surprising, especially since PGS was a performance-funded program.

Average expenditures across the ACD sites were consistent with the level of funding for the program. The expenditures at each of the ACD sites were equal, or approximately equal, to the available funds. By contrast, expenditures among the BOE sites were considerably less than the level of funding. Quite simply, the BOE sites did not spend the funds available for PGS. On average, the BOE sites spent only 61 percent of the PGS funds available.

Expenditures Per Child-Hour. Because many early childhood programs are part-day and/or part-year programs, it is common to express program costs in terms of the cost per child-hour of service. This measure allows for meaningful cost comparisons among different types of early childhood and day care programs.

Exhibit 11 shows the average annual cost per child-hour for each of the 23 PGS sites included in the study. Overall, PGS sites spent an average of $4.47 per child-hour enrolled, with a range of between $1.79/hour and $10.24. The average among the ACD sites was $5.77/hour compared with an average of $3.27 among the BOE sites.

PGS expenditures per child-hour are considerably higher than the reported expenditures of high quality, developmental child care. The General Accounting Office (GAO) reported that, nationally, child care centers accredited by the National Association for the Education of Young Children (NAEYC) spent an average of $1.74 per child-hour. However, NAEYC centers in the Northeast spent an average of $2.06 per child-hour. In New York City, the maximum reimbursement rate for preschool care under Title XX was $2.16 per child-hour ($97.25/week for full-day care) in Fiscal Year 1987. In FY 1990, the cost of care for 3- and 4-year-olds in New York State was $132.50 per 50-hour week, or $2.65 per child-hour.[5]

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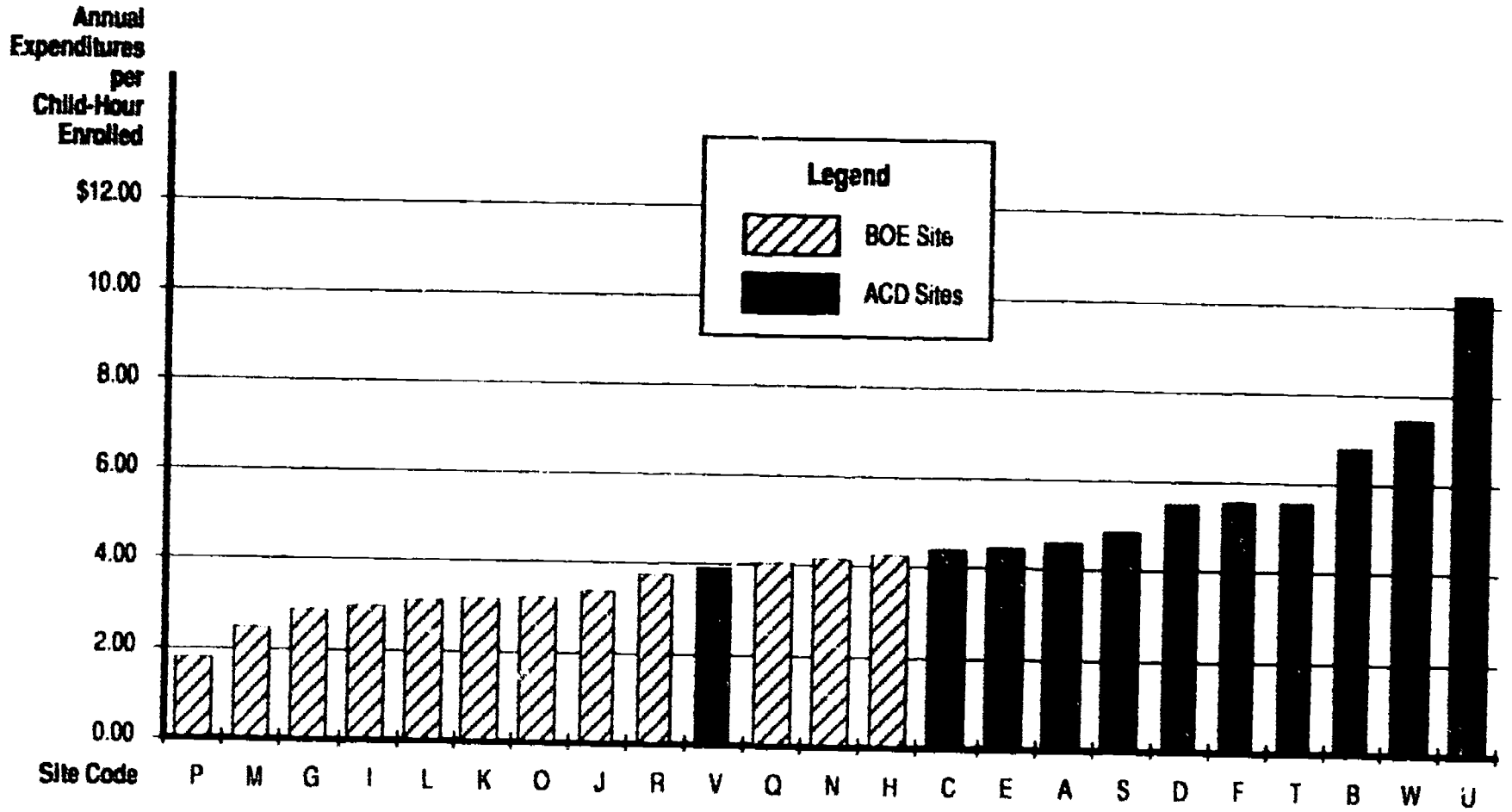
[5]Personal communication from Heidi Farrar, New York City Human Resources Administration.

Exhibit 11

Annual Expenditures Per Child-Hour Enrolled



Overall Average - 4.47 BOE Average - 3.27 ACD Average - 5.77

While PGS appears to be more costly than high quality child care, PGS expenditures are comparable to those of the Head Start Program. Nationally, the Federal cost of local Head Start projects is $2,664 per child, or about $4.50 per child-hour. New York City Head Start grantees spent an average of $4,100 per child, or $4.92 per child-hour in FY 1988.

RELATING COSTS AND PROGRAM EFFECTS

ACD/BOE Differences

As discussed above, the average cost per child-hour was substantially lower in BOE sites than in ACD sites ($2.81 vs. $4.92). It was noted that this difference is primarily due to two factors:

- BOE sites spending less than program funding levels; and
- under-enrollment in ACD sites.

While the staffing pattern in both ACD and BOE sites conformed to the PGS program model of a teacher, an assistant teacher, and a family assistant for each classroom, the underspending among the BOE sites meant that there were relatively fewer other resources available to children in the BOE sites. In addition, the under-enrollment among the ACD sites means that the actual group sizes in ACD sites were smaller than the 20-child classroom specified in the PGS program model. Similarly, the actual child:staff ratios in ACD sites were better than the 10:1 ratio specified in the PGS program model. As previous research has shown that smaller groups are consistently associated with more socially active children and higher gains on developmental tests,[6] one would expect children in the ACD sites to show greater gains on developmental tests than children in the BOE sites. Exhibit 12 shows the average monthly gain on the PSI for each of the 23 PGS sites. As expected, average monthly gain on the PSI was considerably greater in ACD sites than BOE sites (1.16 vs. 0.75 points/month).

While the ACD sites were both more costly and more effective (as measured by gains on the PSI) than the BOE sites, there does not appear to be any difference in cost-effectiveness between the ACD and BOE sites. A cost-effectiveness ratio for each site was computed as:

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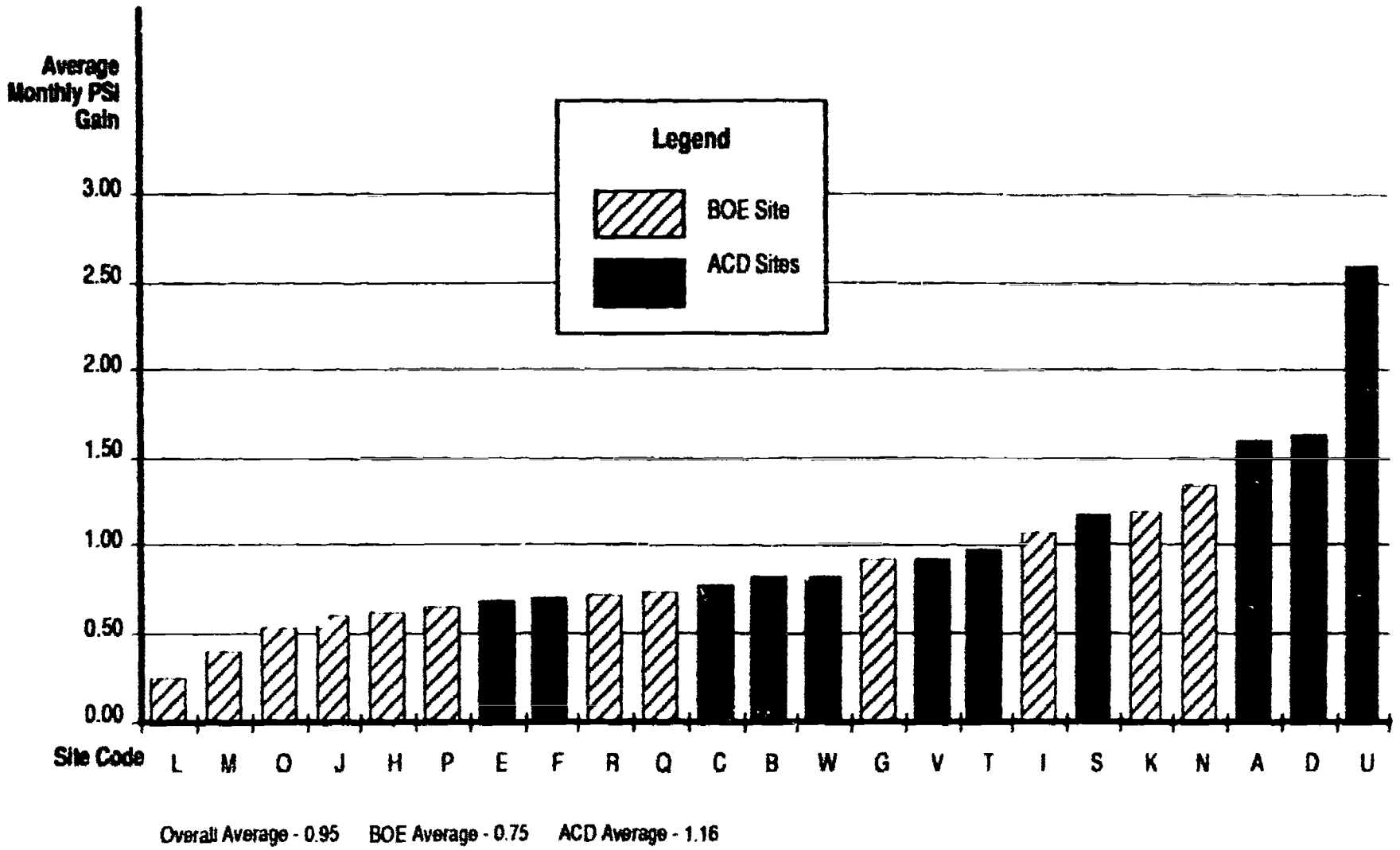
[6]Richard Roupp, et al, **Children at the Center**, (Cambridge, MA: Abt Books, 1979).

Exhibit 12

Average Monthly PSI Gain



Overall Average - 0.95 BOE Average - 0.75 ACD Average - 1.16

CE = (average monthly gain on the PSI) / (cost per child-hour).

The CE ratio for each site is shown in Exhibit 13. Across all PGS sites, the average CE ratio is 0.22. The average CE ratio across the ACD sites is 0.20 compared with 0.24 across the BOE sites.

Trade-Offs Between Costs and Effects

The goal of promoting the development of children in publicly-subsidized early childhood programs must be balanced against the desire to serve the greatest number of children and families at a reasonable cost. The analysis suggests that the substantial cognitive gains made by Project Giant Step children were achieved at a substantial cost. As noted above, the average expenditure per child-hour among PGS sites were considerably higher than the reported costs for high quality, developmental child care.

To the extent that there is a positive relationship between child outcomes and program costs, policymakers face a trade-off between the number of children that can be served in early childhood programs and anticipated cognitive gains. A regression model was used to explore the relationship between children's cognitive gains and program costs. Average monthly gains on the PSI were regressed against two predictor variables: (1) cost per child-hour, and (2) excess capacity. As discussed above, since PGS sites cannot alter staffing to reflect under-enrollment, excess capacity determines a site's actual group size and child:staff ratio. Excess capacity is defined as:

Excess Capacity = 100 * [(Number of Slots - Enrollment) / (Number of Slots)].

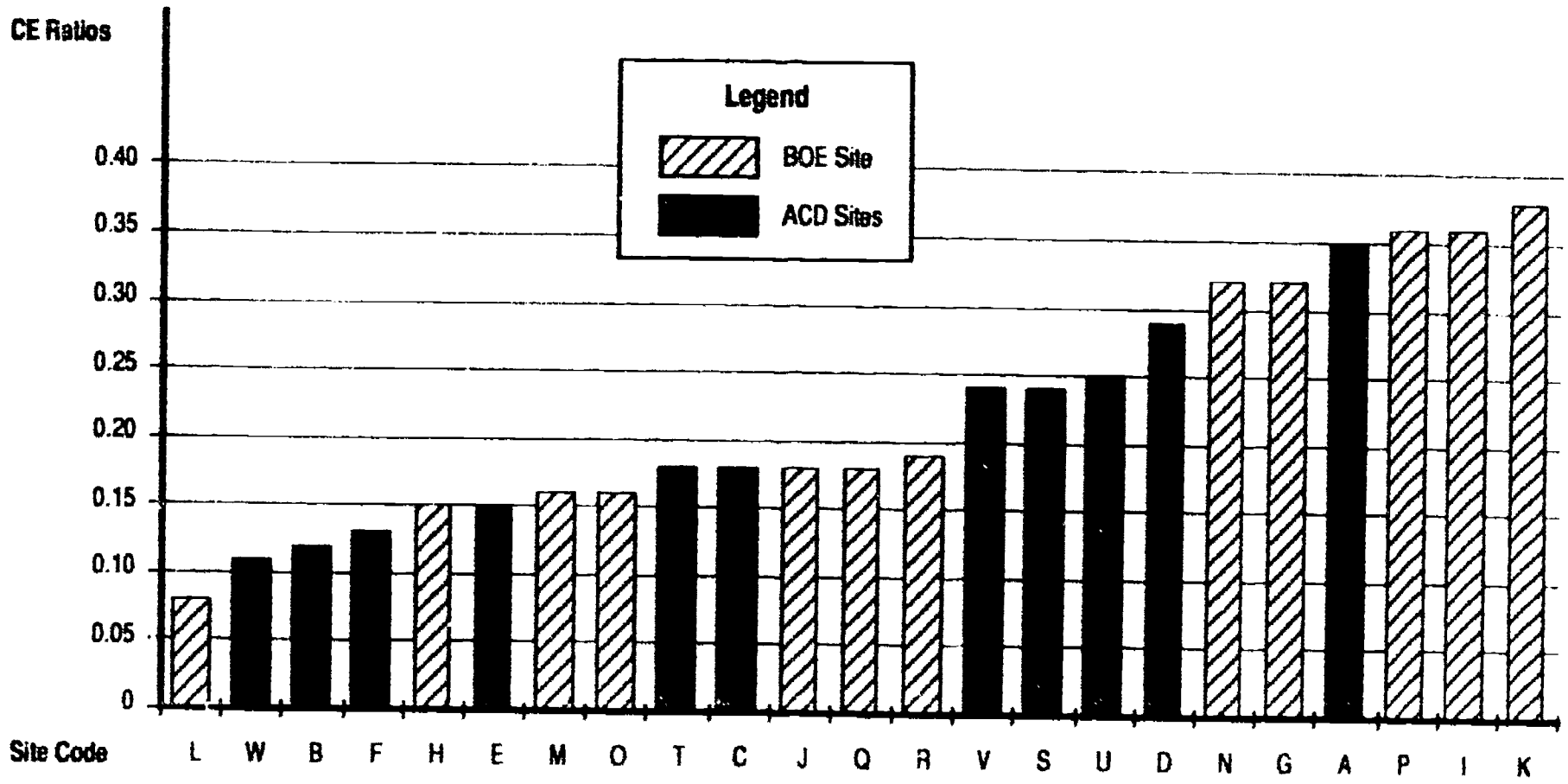
Exhibit 14 presents the regression statistics.

The model explains nearly half of the variance in average monthly gains on the PSI among the 23 PGS sites. Cost per child-hour alone accounts for 41 percent of the variance in PSI gains.

While some degree of caution should be exercised in view of the limited sample size, it is nevertheless useful to use the regression results to examine the trade-offs between costs and anticipated cognitive gains. The regression model is used to predict average monthly gains on the PSI at various levels of cost per child-hour. Similarly, the cost per child-hour determines the number of children that can be served for any given total expenditure level.

Exhibit 13

Cost Effectiveness Ratios*



Overall Average - 0.22 BOE Average - 0.24 ACD Average - 0.20

*CE Ratio = Average Monthly PSI Gain ÷ Cost Per Child Hour

Exhibit 14

Regression Statistics for Model Explaining Average Monthly Psi Gains

	Model 1		Model 2		Model 3	
Variable	**Coefficient**	**T-Statistic**	**Coefficient**	**T-Statistic**	**Coefficient**	**T-Statistic**
Constant	0.231		0.720		0.171	
Cost/Child-Hour	0.135	2.59	-	-	0.174	3.85
Excess Capacity	0.012	1.33	0.240	2.91	-	-
	$R^2 = 0.462$		$R^2 = 0.285$		$R^2 = 0.413$	

Exhibit 15 presents an illustrative trade-off analysis between cognitive gains and the number of children that can be served for a total annual expenditure of $100 million. One would expect gains of 0.45 points per month on the PSI as part of normal child development. This can be used as a benchmark for interpreting the trade-offs presented in Exhibit 15. As noted above, high quality developmental child care centers in the Northeast (i.e., those meeting the NAEYC accreditation standards) spent an average of $2.06 per child-hour. One would expect such care to achieve average gains of 0.61 points per month, well above those expected as part of normal development. At an annual expenditure of $100 million, 86,000 children could be served at $2.06 per child-hour.[7] By contrast, at $4.50 per child-hour (comparable to PGS) one would expect to achieve average gains of 0.94 points per month on the PSI (twice that of normal development), but only serve 39,000 children.

The analysis clearly indicates that there is an important trade-off between anticipated cognitive gains from early childhood programs and the number of children that can be served by such programs. This trade-off establishes some of the parameters for policy options. How one resolves this trade-off is entirely subjective.

[7]Assuming a part-day program such as Giant Step operating nine months per year, five days per week, and 3.0 hours per day.

EXHIBIT 15

Illustrative Trade-Off Analysis: Cognitive Gains vs. Number of Children Served for Each $100 Million Expended (estimated in 1987 dollars)

(1) Cost Per Child-Hour	(2) Estimated Monthly PSI Gain	(3) Monthly Program Effect (a)	(4) Annual Program Effect	(5) Estimated Children Served (b)
$1.50	0.54	0.09	0.80	114,048
$1.75	0.57	0.12	1.10	97,755
$2.00	0.61	0.16	1.41	85,536
$2.25	0.64	0.19	1.71	76,032
$2.50	0.67	0.22	2.01	68,429
$2.75	0.71	0.26	2.32	62,208
$3.00	0.74	0.29	2.62	57,024
$3.25	0.77	0.32	2.92	52,637
$3.50	0.81	0.36	3.23	48,878
$3.75	0.84	0.39	3.53	45,619
$4.00	0.88	0.43	3.84	42,768
$4.25	0.91	0.46	4.14	40,252
$4.50	0.94	0.49	4.44	38,016
$4.75	0.98	0.53	4.75	36,015
$5.00	1.01	0.56	5.05	34,214

(a) Assumes a normal developmental gain of 0.45 points per month.

(b) Assumes: Total annual expenditure = $100 million;
9-month year; 5 days/week; 3 hours/day