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ABSTRACT

The findings of several longitudinal studies of low income children who participated in experimental preschool intervention programs over the past decade and a half are summarized in this report. The data resulting from these studies are organized into four categories: (1) preschool effects on target children's later school performances, including retention in grade, significant changes in achievement and intelligence test scores, and assignment to special education classes in the primary grades; (2) attitudes and values of the children and parents involved in the program related to children's achievement motivation and self-esteem and parents' aspirations for their children; (3) kinds of preschool programs that were most effective in helping the target children avoid placement in special education classes; (4) determinants of special education placements. Data showed that the early education programs studied apparently had lasting effects in the following areas: reduced number of target children assigned to special education classes; reduced number of children retained in grade; higher achievement test scores for children at the fourth grade level; higher IQ scores for target children than controls (in three projects); higher achievement oriented attitudes and values. All programs were found to be about equally effective in helping target children avoid special education placement. (SE)

SUMMARY: LASTING EFFECTS AFTER PRESCHOOL

Further analyses of longitudinal studies conducted by:

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A report of the Consortium for Longitudinal Studies

under the supervision of

Irving Lazar and Richard B. Darlington

October, 1978

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Final Report, HEW Grant 90C-1311 to the Education Commission of the States

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A number of distinguished professionals have served as consultants, critics, and respondents at professional meetings and have given of their time to do careful, independent study of various parts of our work. We wish particularly to acknowledge the contributions in this regard of Dr. Robert McCall of Boys Town; Dr. Shirley Moore, University of Minnesota; and Dr. Virginia Shipman and Dr. Irving Sigel of the Educational Testing Service.

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IN MEMORY

This report is dedicated to our friend and colleague, Dr. Ira Gordon, who died suddenly of a heart attack on September 7, 1978. Ira's contributions to the well being of children and his pioneering work in improving the lot of the poor will remain classic chapters in the history of child development. His wisdon, compassion and good sense played a significant role in the success of this collaborative effort. We miss him sorely.

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INTRODUCTION

Do preschool intervention programs have a significant long-lasting impact on low-income children? Head Start was built on the assumption that early education, parental involvement, and the provision of medical and social services could enable children of low-income parents to do as well in school as their middle-class peers and thus help them leave the ranks of the poor. Based on this premise, a vast array of programs and curricula emerged. The age of children at entry into programs, the length of intervention, the settings, the teachers, and the materials employed all varied in a flood of new programs for low-income children and their parents.

Ten years ago, critics began to question the effectiveness of Head Start and other such programs. Based on early IQ scores, they claimed that any cognitive effects of early intervention programs fade out within a year or two. That conclusion now appears premature and can be refuted. Low-income children who attended preschool programs in the 1960's are now in their later years of childhood and adolescence. Consequently, we can now reexamine the question of the effectiveness of preschools using direct measures of children's actual school performance.

This report summarizes the findings of longitudinal studies of low-income children who participated in experimental preschool intervention programs over the past decade and a half. Twelve investigators, members of the Consortium for Longitudinal Studies,[1]

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[1] Formerly the Consortium on Developmental Continuity.

collaborated by pooling their initial data and designing a common follow-up study. The programs involved in this Consortium were conducted completely independently of one another, mostly during the early and mid 1960's. They were carried out across the country, in urban and rural areas, in the northeast, the south, and the midwest. The low-income children who were enrolled in these programs ranged from 9 to 19 years of age at the time of the follow-up in 1976-77. The original data were reanalyzed and all new data were analyzed by an independent research group at Cornell University, which had not itself designed and carried out an experimental preschool program.

This Consortium of investigators realized that they had a unique accumulation of information. What their studies had in common, and what made them worthy of further analysis, was the care with which they were conducted. All were carefully planned from the start, with rigorous staff training, constant program supervision, periodic evaluation, and at least some follow-up of the children involved. They had explicit and standard intervention programs, so that the content of the child's experience could be specified. Children's abilities had been measured before the program started, so that later tests of children's abilities could be compared to a baseline. Moreover, the studies had allowed for scientific analysis of the effectiveness of their respective programs by selecting either controls -- children drawn in advance from the same population who did not participate in the programs -- or comparison groups of non-participating children.

Generally, the children who participated in the programs and the control children were from low-income families who were eligible for some type of federal assistance. When they entered the studies they ranged in age from 3 months to 5 years. They were predominantly black (87%); the average level of their mothers' education was 10 1/2 years; 40% did not have a father in their homes; and 51% had three or more siblings.

The studies from which the data presented here were drawn (see Table 1) may be grouped by delivery system into three categories. Center-based studies provided nursery school type programs with varying degrees of structure in the program curriculum. Instruction usually took place in small groups but in some cases was on a one-to-one basis. Parents were kept informed about the programs, visited them and observed them, but were usually not actively involved in the day-to-day educational program.

Home-based studies directed their educational efforts primarily toward the parent, usually the mother, as the major instrument of change and influence in the child's life. Activities, toys, and games were brought to the family home by a parent educator or home visitor, who trained the mother to use the activities and to promote her child's development through parent-child interaction. All of these programs dealt with children under 4 years of age.

The third group of studies combined these approaches, providing a center-based nursery school program coupled with a periodic home visit in which both parent and child were involved. In some

programs the emphasis during the home visit was closely related to the center program; in others it had a more general content.

Table 1 provides a summary of the characteristics of the preschool programs. Table 2 summarizes characteristics of the children who participated in the studies,[1] either by attending programs or by serving as controls.

[1] Background characteristics, IQ scores, and preschool attendance are listed only for the eight projects included in the regression analyses of school outcome, to be detailed later in this report.

Table 1

Characteristics of Early Education Programs and Ages of Subjects for Each Data Set

Principal Investigator	Early Education Program	Location	Population (1970) 000	Type of Delivery System	Subject Birth Year	Age at Entry to Program	Length of Program (years)	Years of Program	Age at 1977 Follow-up
Beller	The Philadelphia Project	Philadelphia, Pennsylvania	1,949	Center	1959	4 years	1 year	1963-64	18
Deutsch	Institute for Developmental Studies	New York, New York	7,895	Center	1958-1962	4 years	5 years	1963-71	15-19
Gordon	The Parent Education Program	Gainesville, Florida	64	Home	1966-1967	3 mos. to 2 yrs.	3 years	1966-70	10-11
Gray	The Early Training Project	Murfreesboro, Tennessee	26	Home/ Center	1958	3.8 or 4.8 yrs.	14 mos. or 26 mos.	1962-65	19
Karnes	Curriculum Comparison Study	Champaign-Urbana, Illinois	89	Center	1961-1963	4 years	1 year	1965-66 (2 waves)	14-16
Levenstein	The Mother-Child Home Program	Glen Cove, Manhasset and Freeport, Long Island, New York	26 8 40	Home	1964-1968	2 yrs. & 3 yrs.	1 - 1 1/2 years	1967-72	9-13

Table 1 (Cont.)

Principal Investigator	Early Education Program	Location	Population (1970) 000	Type of Delivery System	Subject Birth Year	Age at Entry to Program	Length of Program (years)	Years of Program	Age at 1977 Follow-up
Miller	Experimental Variation of Head Start Curricula	Louisville, Kentucky	361	Center & Center/ Home	1964	4 years	1 year	1968-69	13
Palmer	Harlem Training Project	New York, New York	7,895	Center	1964	2 or 3 years	1 or 2 years	1966-68	13
Weikart	Perry Pre-school Project	Ypsilanti, Michigan	30	Center/ Home	1958-1962	3 yrs. (1st wave) 4 yrs.	2 yrs. (1st wave) 1 year	1962-67 (5 waves)	15-19
Woolman	Micro-Social Learning System	Vineland, New Jersey	47	Center	1963-1968	4-5 yrs.	1-4 yrs.	1969-73	9-14
Zigler	New Haven Follow-Through Study	New Haven, Connecticut	138	Center	1962	5 years	4 years	1967-71	15

Table 2

Background Characteristics, IQ Scores, and Preschool Attendance for Each Data Set

Data Set (n)[a]	Mean Mother's Educational Level	Mean No. of Siblings	Mean Pretest IQ Score	Mean IQ Score at 6 Yrs.	Percent Father Present	Percent Black	Percent Male	Percent Preschool Participants (vs. control)
Beller (56)	10.94[b] (1.7)	2.96[b] (2.4)	92.89 (55)[c]	97.25 (53)[c]	75.0	92.9	50.0	58.9
Gordon (64)	9.98 (1.9)	2.59 (1.9)	----	92.50 (62)	---	92.2	43.8	89.1
Gray (52)	8.67 (2.7)	4.17 (2.3)	89.25 (48)	90.94 (50)	67.3	100.0	50.0	65.4
Karnes (61)	10.16 (1.9)	3.46 (2.7)	95.84 (61)	104.75 (56)	62.3	62.3	50.0	100.0
Levenstein (125)	10.69 (1.9)	2.50 (1.6)	84.52 (121)	97.67 (118)	70.4	94.4	56.8	81.6
Miller (120)	10.68 (2.0)	3.24 (2.1)	----	94.42 (120)	45.0	91.97	46.7	85.0
Palmer (219)	11.13 (1.8)	2.41 (2.1)	92.12 (132)	95.54 (195)	72.6	100.0	100.0	78.5
Weikart (123)	9.42 (2.2)	3.89 (2.6)	79.02 (123)	88.63 (120)	52.9	100.0	58.5	47.2
Mean (820)	10.21	3.15	89.82[d]	94.86[d]	63.6	91.7	50.8	72.2

Note. IQ scores are Stanford Binet (except PPVT for Levenstein). Palmer IQ scores are at age 5 instead of 6. Data are not available for Gordon and Miller pretest IQ score, and Gordon father presence.

[a] Figures in parentheses indicate number of children in all calculations except IQ scores.

[b] Figures in parentheses below mean mother's educational level and mean number of siblings are standard deviations.

[c] Figures in parentheses indicate number of children in IQ score calculations.

[d]

METHODS

Data for this study were collected in two stages. First, the original data on individual children, collected independently by the projects prior to their joining the Consortium, were duplicated and sent to the central office. This original data included any IQ, achievement, or other psychological test data plus demographic information. Second, each project collected follow-up data in 1976-77 using a common format developed by the Consortium. These included a parent interview, a youth interview, school record and achievement test forms, and the latest revision of the age-appropriate Wechsler Intelligence Test.[1]

Longitudinal studies provide a valid and direct way of examining the effects of preschool programs on the same children over time. Nevertheless, it is important to recognize the research problems that might affect the validity of results. Three specific problems will be discussed here: (1) attrition, (2) sample assignment procedures, and (3) secondary analyses.

The Problem of Attrition

The most basic hazard in longitudinal research is attrition; that is, the loss of subjects over time due to their death, moving, refusal to participate, etc. It is important to know the rate of subject loss and whether the "lost" subjects were different in some way from those who were found and interviewed. In addition,

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[1] Several of the analyses reported here are based on some, rather than all, of the Consortium studies. This is due to a number of factors, including incomplete data collection at the time of these analyses, differences in sample selection, and noncomparability of original data for some variables.

it is important to know whether treatment children (those who participated in preschool programs) and control children were lost at similar or different rates and whether both the treatment and control groups "lost" the same kinds of children. (For example, did the study lose the brightest control children and the low-IQ treatment children?) We have analyzed the problem of attrition in an unusually thorough manner. These analyses did reveal serious problems for one project and as a result those data have been omitted from all analyses. For the remaining projects, the attrition analyses found that the final samples ("found" children from both treatment and control groups) are representative of the original samples and the final treatment and control groups appear to be equivalent.[1]

Sample Assignment Procedures

Assignment of children to treatment and control groups is a particularly knotty problem in intervention research. For ethical and practical reasons, the experimental ideal of random assignment to treatment and control groups is often unattainable in real-life settings. On the other hand, "quasi-experimental" studies in which comparison groups are constructed by matching on variables such as SES and pretest IQ can produce seriously misleading results.

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[1] For more details, see Appendix A of the full 1978 technical report.

In general, the projects included in this report came closer to true experimental designs than is typical in this sort of research However, there was considerable variation from project to project. Several (Gray, Gordon, Weikart, and Palmer) closely approximated true random assignment. Others (Beller, Levenstein, and Zigler) would more accurately be called quasi-experiments. One (Karnes) had no control group. One (Woolman) had a comparison group which differed substantially from the program group in terms of selection criteria. The Miller control group was found after the fact to be poorly matched with the experimental group. The analyses reported here took such differences into account and were generally conducted in a conservative manner -- that is, in a manner which minimized the chances of obtaining spurious treatment/control differences. For example, the pooling of results (e.g., in the special education analyses) was done separately for studies we designated as experimental and quasi-experimental in order to insure that the findings would stand up if only the more rigorously designed programs were considered.

Secondary Analyses

This report constitutes a secondary analysis of the data from the Consortium members' projects. This is true even though the 1976-77 data were collected specifically for this analysis, since the design of the projects had been determined prior to the collection of these data.

One problem of secondary research is that the questions which can be posed are limited by the data which have already been

collected. One simply cannot ask whether early education affects social skills in the second grade unless all or many projects measured social skills at that time. This problem is made more complex by the fact that the projects were conducted independently, and, hence, the chances were slim that most projects would have independently collected the same measure at the same time.

Another problem involves how to combine the results of these different projects. We did not combine all the subjects into one pool before analyzing the data because of the biases this could introduce.[1] Instead, we analyzed each project separately and pooled the results of these separate analyses. Pooling results was accomplished by a statistical technique (see Mosteller & Bush, 1954) that in effect tested whether there was an "average" overall effect of preschool programs on children's outcomes.[2]

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[1] As a simple example, consider an analysis which includes two totally ineffective programs. Let program A have a treatment group of size 100 and a control group of size 20. Let both groups have mean pre- and post-test IQ scores of 90. Program B has 20 treatments and 100 controls, with pre- and post-test means of 80. Analyses of each group separately would correctly show no treatment effect. If the two samples were pooled, however, the resulting sample would show a post-test mean difference of 6.7 points.

[2] One null hypothesis with regard to preschool effects on later outcomes might be that no program had any effect. In this case, finding even one program with significant effects would be enough to reject the null hypothesis. However, the null hypothesis we chose to investigate is: averaged across many programs, preschool does not affect later outcomes. In this case, if three programs were to have a positive effect and three a negative effect, they would cancel each other out and, as a result, the null hypothesis could not be rejected.

We employed another statistical technique to make sure that the findings were robust. This involved removing the project with the strongest findings and then testing the remaining projects to see if the results remained statistically significant.

Finally, we made corrections whenever we performed many analyses to insure that our results were not "significant" by chance alone.

In brief, our choices in data and treatment options have been consistently conservative. While this may have minimized our findings, it has maximized our confidence in those findings.

PRESCHOOL'S EFFECT ON LATER SCHOOL PERFORMANCE

Assignment to Special Education and Retention in Grade[1]

The most exciting result from the previous Consortium analyses (October 1977) was the finding that low-income children who had participated in preschool programs were more able to meet the minimal requirements of their schools than were children in control groups. Program children were less likely to be retained in grade and less likely to be assigned to special education classes. These outcomes are important both to the child -- as concrete evidence of satisfactory progress -- and to society. For example, a benefit-cost analysis found that preschool "paid" for itself by reducing children's need for later costly special education (Weber, Foster & Weikart, 1978).

Since then, we have reanalyzed the data to include additional data received since July, 1977. This report addresses the following issues:

(1) Could treatment/control differences in rates of assignment to special education and retention in grade be due to differences in treatment and control group children before the program began?

(2) Is it possible that preschool programs temporarily raised IQ scores, that teachers saw these higher IQ scores and that teachers then refrained from assigning these "brighter" children to special education classes?

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[1] Data on special education placement and retention in grade were collected when most of the children were in the following grades: Gordon, 5th grade; Gray, 12th grade; Weikart, 4th grade; Beller, 12th grade; Levenstein, 3rd grade; Miller, 7th grade; and Palmer, 7th grade.

(3) What kinds of children benefitted? Did preschool help only the children who were already brighter or who came from somewhat more advantaged backgrounds or were all low-income children helped?

The analysis of new data and the answers to these three questions may be found below.

Results: Assignment to Special Education Classes[1]

The combined result from six projects presents strong and robust evidence that early education significantly reduced the number of low-income children assigned to special education classes (see Figure 1).[2] It is important to note that the projects with research designs closely approximating experimental designs had, in general, the most impressive results. For Gordon's project, 23.2% of children who attended preschool were later assigned to special education classes compared to 53.8% of the control children. The comparable figures for Gray's project were 2.8% of treatment children vs. 29.4% of control children; for Weikart's project 13.8% of treatment children vs. 27.7% of control children.[3]

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[1] The N for the following analyses varies somewhat from analyses in the 1977 technical report (Consortium, 1977) due to new data received and a redefinition of retention in grade.

[2] The pooled significance level across the projects resulted in a p value of .0004.

[3] Two projects -- Beller and Miller -- did not find differences in favor of treatment children. For Miller this result was probably due to the initial differences between Miller's treatment and control groups, differences which favored the control group. The Philadelphia schools in Beller's project either rarely or never utilized assignment to special education, or did not record the information on school records. The percentages for the Beller study involve the following actual numbers: one control child and two treatment children assigned to special education over a period of 12 years time.

Results: Retention in Grade

The second measure of actual school performance is the percentage of children who have been retained in grade (grade failure) at least once during their school careers. For the eight projects with this information, the results were similar in pattern to, but less striking than, the results for placement in special education (see Figure 2). All projects except Miller's reported that more control children than treatment children were retained in grade, but only Palmer's findings were statistically significant. When the results for the eight projects were pooled statistically, the difference was significant at the 2% level. Thus, although the evidence is not so dramatic as it was for special education, the overall finding is that there is an "average" effect across projects of preschool experience reducing the incidence of grade failure among low-income children.

In retrospect, we feel that the weaker findings for retention-in-grade may be explained as follows. First, retention in grade varies widely across school districts, with some districts encouraging "social promotion" and others not. Thus retention in grade may reflect school policy more than it does children's school performance. Secondly, retention in grade and assignment to special education are somewhat intertwined. If a child was in a special education class and remained in that class, s/he was not coded as retained in grade. Since significantly more control children were in special classes, this raises the possibility that

some of the worst control students (in the research design sense) had been differentially removed from the pool of students whom it was possible to retain. This would result in weaker treatment/control differences on retention in grade.

Results: Underachievement

As another measure of school performance, we created a composite variable. Students who were assigned to special education classes and/or retained in grade and/or dropped out of school were coded as "underachievers".[1] Using this new variable, the data analysis from eight projects found a significant and robust result; low-income children who attended preschool were significantly less likely to be classified as underachievers in their later school careers, compared to children in control groups (see Figure 3).

In summary, the new data analyses confirmed our earlier finding: children who participated in preschool intervention programs were more likely than control children to meet at least the minimal standards of their schools. This is especially true in the case of assignment to special education classes, where the effects of preschool were highly significant, robust, and large. Results for retention-in-grade, while statistically significant across the projects, were only moderately robust. Analysis of

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[1] The Beller and Gray projects provided drop-out data. Only two subjects in Beller's project and only two in Gray's dropped out of school having never been previously assigned to special education or retained in grade.

the composite variable of underachievement resulted in significant and robust treatment/control differences.

Results: Early Background Influences (Question #1)

In considering the above findings, we conjectured that perhaps the results in favor of treatment children occurred because the treatment and control children were initially different, before the programs began. Perhaps, for example, treatment children started out as somewhat brighter than the controls. To test this possibility we performed statistical analyses which tested the effect of preschool while controlling for the effects of children's pretest IQ scores, their sex, ethnicity, family size (number of siblings), family structure (father present vs. absent) and their mothers' level of education. These analyses were done for the five projects with complete data on all variables. Another set of analyses were done with seven projects, using all variables except initial IQ scores. The results were similar. The results were highly significant and robust: early education positively affected later school performance independently of the effects of the early background measures.[1] Thus, we can safely conclude that low-income children benefit from preschool programs -- in being more likely to meet the minimal requirements of later schooling -- and that this finding is not due to initial treatment/control differences in

[1] This was true when assignment to special education and underachievement were used as outcome measures. When retention in grade was used, the results were significant but only moderately robust.

sex, ethnicity, early intelligence level or early family background.

Results: Effect of Preschool on Special Education Placements Controlling for IQ at Age 6 (Question #2)

Another alternative hypothesis to explain the results might be: suppose early education programs have a short-term effect on test-taking ability which appears as a temporarily inflated IQ test score. If a child's IQ score at first grade is in his school folder, it might influence teachers to keep the "brighter" children out of special education classes. If this hypothesis were true, then removing the influence of the IQ score at 6 years old would remove any association between attending preschool and placement in special education.

We investigated this possibility by performing statistical analyses which tested the effect of preschool while controlling for the effects of children's IQ scores at age 6, their sex and ethnicity, number of siblings, father presence vs. absence, and mothers' education. This was an extremely rigorous test because controlling for IQ at age 6 means partialling out the programs' effects on children's cognitive ability. Nevertheless, our analyses show that preschool still affected special education, independently of the effects of IQ scores at age 6 and all the other background measures. Results were not significant for grade retention and were marginally significant for underachievement.

Partialling out IQ score at age 6 in predicting assignment to special education served to test the labeling hypothesis that teachers identified treatment children as brighter and so were less likely to recommend them for placement in special classes. The results disproved the hypothesis; preschool experience affected special education placement apart from IQ score at age 6. This means that preschool must have affected the children beyond the purely cognitive influences of teaching concepts and skills, yet in ways which were related to school performance.

In a sense, partialling out IQ score at age 6 has a different meaning when applied to retention in grade. Presumably, teachers retain children in grade not because of differential labeling, but because by some objective criteria the children failed to master the material. Partialling out IQ score at age 6 in effect removes the influence of cognitive ability necessary to master school material.

Results: What Kinds of Children Benefitted (Question #3)

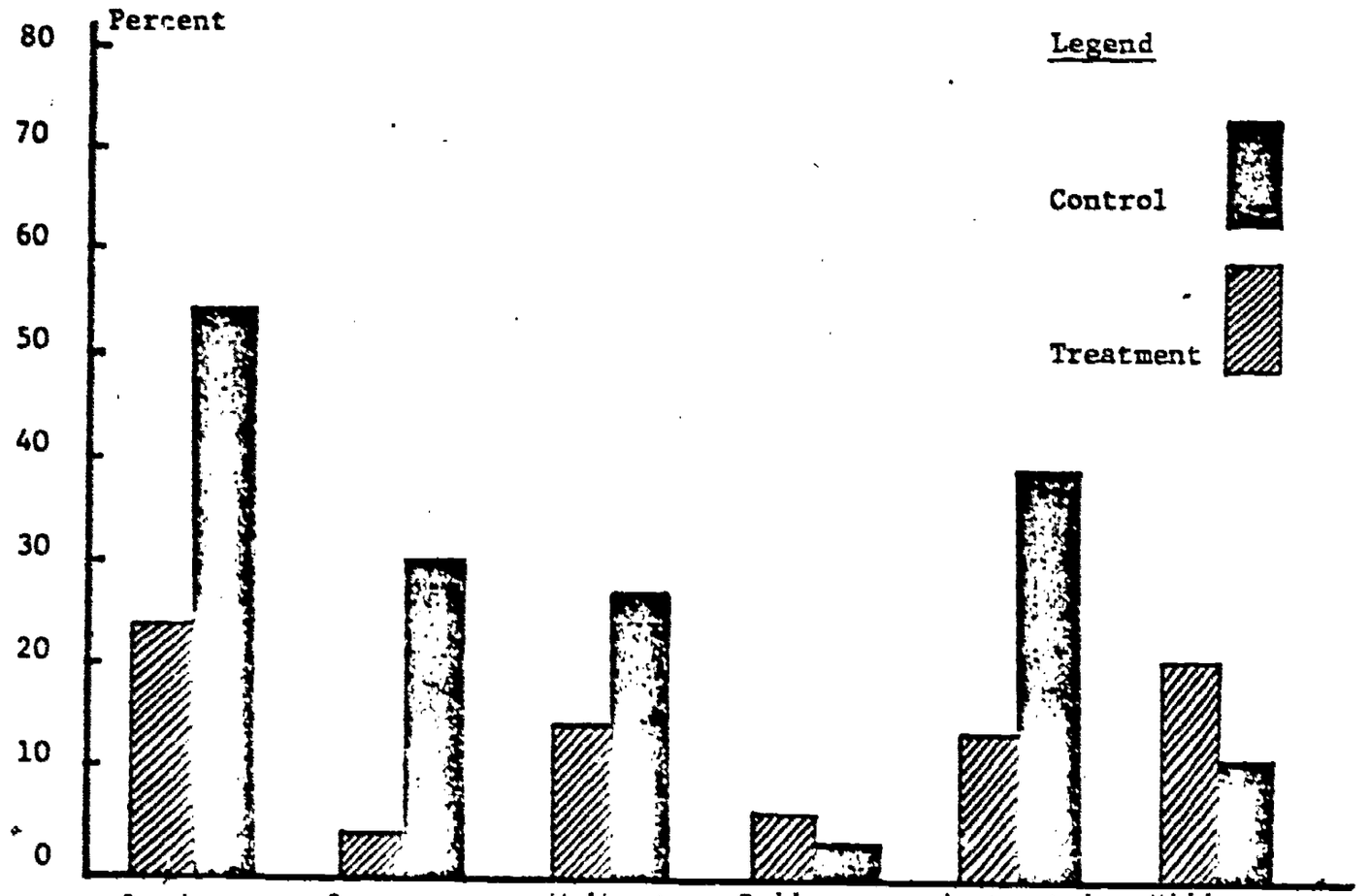
It is possible that the findings that preschool reduced assignment to special education and retention in grade were due to the fact that only certain children were helped -- for example, the brightest ones. Five projects had complete data on children's IQ scores prior to preschool. On the basis of our analyses, there was no evidence that preschool helped brighter or less bright children more or less than others.

Another possibility is that children from some family backgrounds benefitted more than others. We examined the following aspects of children's backgrounds: sex of child, ethnic background, family structure (father present or absent), family size (number of siblings), and mother's level of education. We asked whether children who differed from one another on the above aspects received more or fewer benefits from early education and retention in grade (grade failure). Based on six projects with complete data, we concluded that preschool apparently helped all children avoid assignment to special education and retention in grade, regardless of their sex, ethnic background and family background.

In sum, these results imply that policy-makers need not worry about selecting which ethnic groups or family configurations or levels of intelligence to serve. All lower-income children can apparently benefit from preschool experience.

We may summarize our analyses of the effect of preschool experience on later school outcomes as follows. These analyses have been performed with both individuals and subgroups of the projects (Darlington, 1978a) as units of analysis. Some analyses have controlled for pretest IQ and family background variables. Some have even controlled for posttest IQ. Some considered the possibility that only certain kinds of children benefitted. All of these analyses have yielded the same basic conclusion: preschool makes a positive contribution to the later school performances of low-income children.

Figure 1: Percent of Treatment and Control Children in Special Education

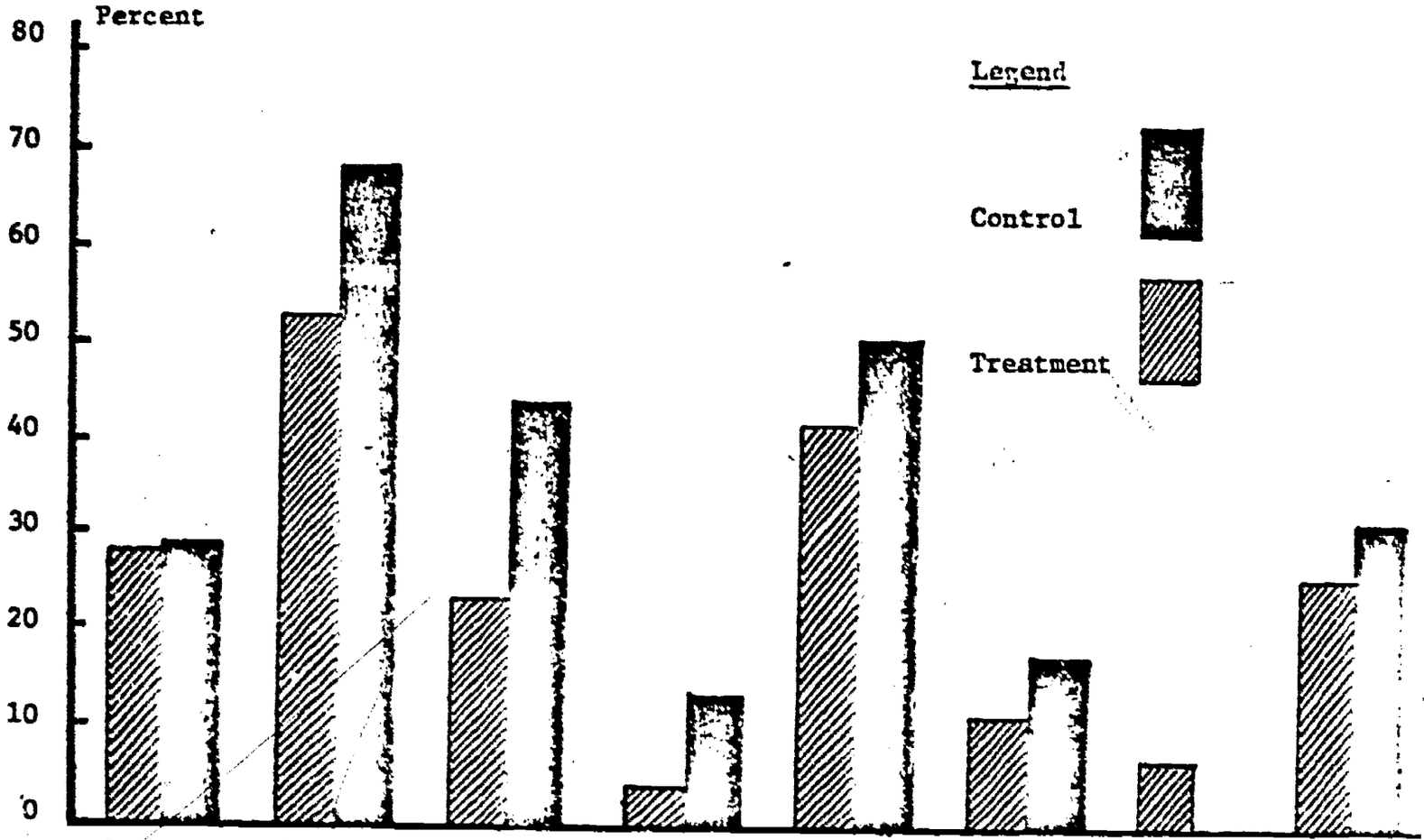


	Gordon	Gray	Weikart	Beller	Levenstein	Miller
eatment %	23.2	2.8	13.8	5.7	13.7	20.4
ntrol %	53.8	29.4	27.7	3.2	39.1	12.5
eatment n	69	36	58	35	102	93
ntrol n	13	17	65	31	23	16
gnificance	.024	.004	.060	(.632)±	.005	(.465)

Pooled Significance Level p = .0004 (two-tailed)

± Figures in parentheses are in the reverse direction.

Figure 2: Percent of Treatment and Control Children Held Back a Grade

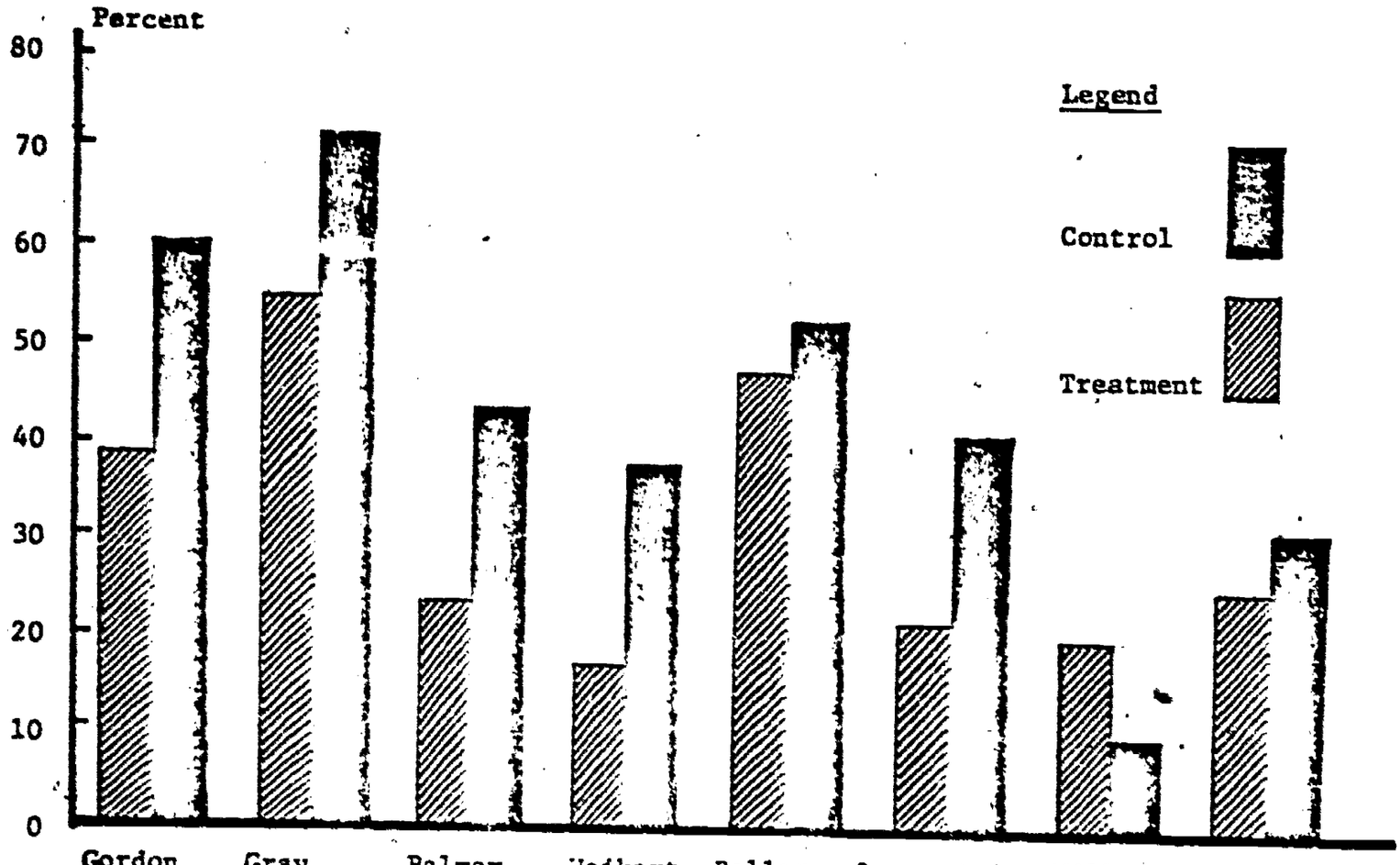


	Gordon	Gray	Palmer	Weikart	Beller	Levenstein	Miller	Zigler
eatment %	27.6	52.9	24.1	4.0	42.9	12.9	7.8	26.6
ontrol %	28.6	68.8	44.7	14.9	51.6	18.8	0.0	32.3
eatment n	58	34	174	50	35	93	90	79
ontrol n	7	16	47	47	31	16	16	65
gnificance	.956	.291	.006	.065	.475	.531	(.248)±	.452

Pooled Significance Level p = .0184

± Figures in parentheses are in the reverse direction.

Figure 3: Percent of Treatment and Control Children Who Are Underachieving±



	Gordon	Gray	Palmer	Weikart	Beller	Levenstein	Miller	Zigler
atment %	39.1	55.6	24.1	17.2	48.6	22.1	20.6	26.6
trol %	61.5	73.7	44.7	38.5	53.1	43.5	11.1	32.3
atment n	69	36	174	58	37	104	107	79
trol n	13	19	47	65	32	23	18	65
nificance	.134	.188	.006	.009	.711	.035	(.346)±	.450

Pooled Significance Level p = .0002 (two-tailed)

± Underachieving = placed in special education classes, and/or retained in grade and/or dropped out of school.

± Figures in parentheses are in the reverse direction.

Achievement Tests

For years, educators have noticed that low-income children tend to fall farther behind in school with each year. Preschool intervention programs were specifically aimed at changing this pattern. One way to evaluate the effectiveness of the preschool programs is to examine children's performance on standardized achievement tests.

Several of the investigators had looked at the children's achievement test scores within their own projects. Gray, for example, had data on children's scores on the Metropolitan Achievement Tests (MAT) in the first, second and fourth grades (Gray, Klaus & Ramsey, 1978). In the first grade, treatment children scored significantly higher than control children on three out of four subtests. They were superior on two out of five subtests in the second grade. By fourth grade, treatment children still scored above control children but the differences were not statistically significant. Weikart's project, with data on the California Achievement Test for grades one through eight, found a completely different pattern (Schweinhart & Weikart, 1978). Treatment and control children scored similarly in the first grade but with each succeeding year the treatment children pulled ahead until by eighth grade they scored significantly higher than control children on all three areas (reading, language, and arithmetic) covered by the test. In other reports treatment children scored better than control children on reading, and arithmetic tests in the third grade (Levenstein), on

arithmetic tests in the fifth grade (Palmer) and on reading tests in the seventh grade (Palmer). Miller found no treatment/control differences at the end of sixth grade.

What, then, can we conclude about the effect of preschool on achievement test scores? Once again, as in other analyses, we attempted to pull together the disparate findings by testing to see if there was an "average" effect of all the preschools on children's achievement test performance.

Achievement tests were given by the public school systems, and so most of the investigators could not control which achievement tests were given to their subjects. The school systems also decided when to give the tests (in which grades). Nevertheless, most investigators were able to find at least one grade in which most of their subjects had been given the same test. In particular, there were useful amounts of achievement test information in the fourth grade for six investigators -- Beller, Gordon, Levenstein, Miller, Palmer, and Weikart. This included both mathematics and reading tests for all six investigators. For Palmer, however, the mathematics test information was most usable in the fifth grade rather than the fourth.[1]

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[1] Of the subjects used in this analysis, all from Beller's project took the 1964 edition of the Iowa Test of Basic Skills; all from Gordon's took the 1965 edition of the Metropolitan Achievement Test; all from Levenstein's took the 1965 edition of the Wide Range Achievement Test; all from Miller's took the California Test of Basic Skills; and all from Weikart's took the 1957 edition of the California Achievement Test. Some of Palmer's subjects took the 1970 edition of the Metropolitan Test, and some took the 1972 edition of the Stanford Achievement Test.

In analyzing the data, we decided to control for children's sex, initial (before preschool) IQ scores, and age. Thus, these analyses show the effect of preschool on children's achievement test scores in the fourth grade, independent of any effects of age, sex, or early IQ scores.

Results

According to the data analyses, treatment children scored higher than control children on mathematics achievement tests. This result was both highly significant and robust. The verbal achievement scores showed a suggestive trend in the same direction.

We believe that these treatment/control differences are not only statistically significant but are also of practical importance. Beller's project provides a good example since it fell right in the middle of the six projects in terms of effectiveness. In Beller's project the difference between treatment and control children on math achievement (controlling for age, sex and pretest IQ score) was .52 grade equivalents. That is, treatment children were fully a half grade ahead of the control children who had not attended preschool. This is an appreciable difference, especially considering that 4 or 5 years had elapsed since the preschool experience.

Intelligence Test Scores

Our research has emphasized the effects of preschool experience on actual school performance, as measured by assignment to regular vs. special education classes, passing vs. failing a grade in school, and achievement test scores. The Consortium projects also have data on children's intelligence test scores at three points in time: prior to attending preschool, immediately after the program when children were 5 or 6 years old, and in 1976-77, when they were between 9 and 19 years of age (depending on the project).

Before we describe our analyses of intelligence test scores, it is important to consider the meaning of these measures. The last decade has been marked by a resurgence of controversy about the meaning and use of intelligence tests. Some users argue that the intelligence test is a comprehensive measure of intelligence and our best predictive measure of school performance and later occupational success. Others focus on its limited (and, indeed, distorted) usefulness in assessing members of minority groups and its lack of coverage of areas such as creativity and social competence. Intelligence test scores do predict later school performance. Our position is that intelligence tests predict school performance because they share many properties. For example, many behaviors necessary for scoring well on an intelligence test will also lead to successful school performance, including spontaneous verbalization, persistence at a task, ability to follow instructions, and ability to adapt to structured situations.

We decided to analyze our data on intelligence tests since the majority of the projects had IQ score information and since IQ scores had been used as outcome measures by previous investigators. We repeat that our main interest was and is the effect of preschool on actual school performance. Those measures and analyses provide a different picture from that provided by the intelligence test scores alone.

Does the evidence indicate that early education improves the cognitive abilities of children, as measured by standardized IQ tests? The Consortium projects gathered Stanford Binet IQ data in the years immediately following the preschool experience. Generally, treatment children performed better than control children for at least 3 years after the end of the program (Consortium, 1977). The section below describes analyses designed:

1. to check whether variables other than the preschool experience affected children's IQ scores at age 6;

2. to compare the performances of treatment and control children on the WISC-R test and on the subtests of the WISC-R IQ test, administered when children were aged 9 - 19 years;

3. to ascertain whether preschool helped some children but hurt others (for example, by making school seem dull by comparison);

4. to ascertain if boys benefitted more from preschool than girls or vice-versa in terms of IQ scores; and

5. to ascertain if children with more educated mothers benefitted more or less than children with less educated mothers in terms of IQ scores.

The last two questions ask if there were differential effects of preschool on IQ.

Results: Preschool Influences on IQ at Age 6

First, we performed analyses to tell us whether the preschooler's larger IQ scores at age 6[1] were due to the preschool experience or due to initial (pretreatment) differences between the treatment and control groups. Five projects had complete information on children's sex, pretest IQ scores, father presence vs. absence, number of siblings, and level of mother's educational attainment (all measured before any preschool program began). Two additional projects had complete information for everything except pretest IQ scores. The results of these analyses were both statistically significant and robust: the increase in IQ scores at age 6 shown by children who had participated in preschool programs was attributable to the preschool experience, independent of the effects of sex, initial IQ score, and the various measures of family background.

Results: Effects of Preschool on Later WISC Scores

Next, we asked whether those IQ gains by treatment children were still apparent in 1976-77, this time as measured by the WISC-R test. In general there were few treatment/control differences. Levenstein's treatment children performed better than their controls on all aspects of the WISC-R test, including the subtests. These children were aged 9 through 13 in 1976-77. Palmer's treatment

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[1] At age six all IQ scores were from the Stanford-Binet Test with the exception of the Levenstein project, where IQ scores were from the PPVT.

children scored significantly higher than controls on the performance IQ score of the WISC and on the coding subtest. These children were 12 years old in 1976-77. The Gordon project's own analyses of the 1976-77 data found that children with 2 or more years of treatment performed better than control children on the WISC. These children were 10 years old in 1976-77. However, when we included the children with only 1 year of treatment in Gordon's treatment group, there were no differences between treatment and control children.

In summary, only three projects found any treatment/control differences on WISC-R IQ scores. These were the youngest children. In projects with children aged 13 years and above, there were no treatment/control differences on IQ, including the subtest scores of the WISC-R.

Results: Variability of WISC Scores

We analyzed the standard deviations of the children's WISC-R IQ scores and subtest scores. This was done to see if perhaps preschool had increased the range in IQ scores, raising some children's scores and lowering others. Such variability would be evidence that preschool helped some children but hurt others. However, after examining the results of the data analysis, we concluded that there was no evidence that preschool had increased the variability of children's WISC scores compared to control children's scores.

Results: Differential Effects

We asked: (a) are boys more likely to benefit from preschool compared to girls, or vice versa? (b) Are children with more educated mothers likely to benefit more from preschool compared to children with less educated mothers, or vice versa? The answer to both of these questions was similar. For the five projects with complete data, there was no indication that early education benefitted boys more than girls or vice versa with regard to later WISC IQ scores. For mother's education, six projects were analyzed. Again, there was no evidence that children whose mothers had more education benefitted more than those whose mothers had less education, or vice versa.

In summary, we can conclude that preschool programs resulted in gains in children's IQ scores at age 6, independent of the effects of sex, initial IQ score, and various measures of family background. The superior performance of treatment children on IQ scores continued for 3 or 4 years, but in projects with children aged above 13 years in 1976-77, there was no difference between treatment and control groups on WISC-R scores, including subtest scores. There was no treatment/control difference in the variability of WISC scores. Furthermore, there was no evidence that treatment boys scored higher or lower than treatment girls or that treatment children with more educated mothers scored higher or lower than those with less educated mothers.

On the basis of similar findings -- that preschool did not permanently raise children's IQ scores compared to control group children -- the usefulness of early intervention programs was questioned and funds were frozen so that federally-sponsored programs could not expand. Therefore, it is important to put these results into perspective, remembering the large and significant differences in favor of children who attended preschool on actual measures of school performance.

ATTITUDES AND VALUES

Did preschool affect children in other ways besides influencing their school performances? This is an important question because (a) many intervention programs attempted to influence children's self-esteem, attitudes and values; and (b) Head Start goals include the stimulation of social development.

Many preschool intervention programs implicitly contained the following simple model for social change. Preschool programs teach children concrete skills and concepts. But skills and concepts must be built upon over the years, so children must also be motivated to continue to learn and achieve in school. They must believe that school is important and possess enough self-confidence to exert the necessary effort. The preschool experience should also affect parents so that they may support their children's efforts. With the backing of new abilities, motivations, values and parental support, children should be able to compete better with their middle-class peers.

This simple model may be tested to some degree and non-cognitive outcomes assessed by using data from the Youth Interviews and the Parent Interviews collected by the Consortium in the 1976-77 follow-up study.[1]

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[1] The Youth Interview covered educational and occupational aspirations, attitudes toward school, current employment status, leisure time activities and interests, social interaction with family, peers and the larger community, and attitudes toward oneself and others. The Parent Interview covered such topics as household composition, socio-economic status, parental aspirations for and evaluations of their child, information on the child's medical history, the parent's current relationship with the child, and parental assessment of the intervention program.

We considered four different content areas here.[1] Three of these areas can be plausibly related to children's success in school.

1. Mother's aspirations for their children. Many programs wanted to foster change in parents as well as children. It may be that preschool programs initially improved children's school performance and this led the mothers to change their attitudes and expectations. The mothers' changes (in attitude and, presumably in behavior) could act as a continuing support for the children's efforts. Therefore, we predicted that treatment mothers would have higher aspirations for their children than would control mothers.

2. Children's achievement orientation. Achievement orientation includes motivation and also any values, attitudes, norms and goals which are important for success in school and later jobs. If our "model" of social change is correct, treatment children should show more achievement orientation than controls.

3. Children's self-evaluations. Self-concept may also contribute to school success in a sort of feedback system, with a positive self-concept increasing children's willingness to strive and good performances increasing children's positive self-concepts. Treatment children should evaluate themselves more positively than do controls.

4. Children's social relationships and social participation. Although not clearly related to academic success, children's sociability was explored to see if there would be any treatment/control differences.

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[1] For more details, see Koretz, 1978.

Results

A broad picture of all children's aspirations (combining treatment and control groups) compared to their parents' positions in life provides a perspective on the treatment/control comparisons which follow. The aspirations of these low-income, predominately Black children was far above what their parents had reached. Most children aspired to white collar jobs; their parents were largely semi-skilled or unskilled employees. The children planned (not hoped) to attend and to complete college; parents at most had graduated from high school. Similarly, all the children rated themselves somewhat better in school performance relative to their peers. In addition, 79% said they got along well with their families, 85% reported that they had "special friends" and 49% reported participating in organized community-wide activities.

Now we turn to a consideration of the four content areas.

Family context of achievement orientation. Data analyses revealed a strong and robust finding concerning mothers' aspirations compared to their own children's aspirations. When asked, "What kind of job would you like (your child) to have later in life," mothers of children who had attended preschool consistently named occupations that were higher than the occupations the children themselves hoped for. This was not true for mothers of control children; some of them named higher and some named lower occupations than those the children had named. Thus, it appears that preschool elevated mothers' aspirations over their children's

aspirations. There was also a general tendency for treatment mothers to have higher vocational aspirations for their children than did control mothers.

Achievement orientation. The strongest finding in this area concerned the youngsters' answer to the probe "tell me something you've done that made you feel proud of yourself." Children with preschool experience were far more likely than control children to respond with achievement-related reasons (such as school or work achievements or straightening oneself out) rather than other reasons (such as good behavior or altruistic acts) for feeling proud of themselves. This result was especially true for older girls.[1]

Self-evaluations. Children normally compare themselves to others and try to judge how "good" they are compared to their friends. Two questions on the Youth Interview asked the children to judge how well they got along with their families and how well they did in school compared to others. On this later question, there was a small difference in the three older projects (Beller, Gray, and Weikart). Treatment children rated themselves as slightly (but significantly) better students in school than did control subjects.

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[1] There were no treatment/control differences on children's educational expectations, whether they were employed or not, how much they earned, and what reasons they gave for admiring their favorite adult. There was some tendency for older treatment children to have lower, more realistic, vocational aspirations than did control children.

Sociability and social participation. We asked several questions about sociability including what children did in their spare time, how much they participated in organized community activities and whether they had "special friends." Analyses of the data found no significant treatment/control differences. However, it may be important to note that although the treatment children did not surpass controls in this area, neither is there evidence that they fell behind. In other words, the preschool programs did not alienate them from their peers and communities. They were as socially active as control children who had no preschool experience.

Summary and Conclusions

These analyses of non-cognitive outcomes were, in one sense, exploratory: we knew preschool had positively affected children's school performance and that it affected more than just cognitive ability. The question was: what was affected? Investigators in the 1960s suggested it would be important to influence children's achievement motivation and self-esteem and to affect parents' attitudes as well. There is some indication that preschool affected those areas. Mothers' aspirations for their children were raised relative to the children's own aspirations. Children were more likely to give achievement-related reasons for being proud of themselves. Older treatment children rated themselves as better students than their peers and tended to have more realistic vocational aspirations. Considering that these results were found

10 to 15 years after participation in preschool, these findings lend some credence to the investigators' early hopes that attitudes could be changed and that the changes would persist.

However, Head Start and other programs were initiated in the hope that changing children's abilities and attitudes would be instrumental in extracting them from poverty. This appears naive in retrospect. Unemployment for Black youngsters (approximately 90% of our subjects) was 39% in 1976 and has not improved. Furthermore, Black unemployment across ages has been twice that for whites since World War II (Kenniston, et al., 1977). The relationship between level of educational attainment and later vocational status has historically been very low for Black persons. For example, a college-educated Black male can expect to attain the average job and income level of a white man with no more than a high school diploma (Ogbu, 1978). It seems important to recognize that preschools can make a difference, but that the larger society and its institutions must also change in order to fulfill the promise of preschool for low-income children and their families.

WHAT KINDS OF PRESCHOOL PROGRAMS WERE MOST EFFECTIVE?

The question inevitably arises: what kinds of programs were most effective? The answer to this question is especially important to policy-makers and it is a question which has, to date, been difficult to answer. Since some of the Consortium's principal investigators had built program variations into their original designs, we decided to investigate this question in hopes that the Consortium data could bring light to bear on the question.

Determining what kinds of Consortium programs were most effective has presented some thorny problems, primarily because ours is a secondary analysis of data which were not, in many cases, originally designed to answer this particular question. In addition, we have had to choose a common measure of program effectiveness and decide whether we could compare projects to one another. The current report should be regarded as one more step in our continuing search for meaningful and valid means of assessing the program effectiveness of the Consortium projects.

Vopava and Royce addressed the question of what kinds of Consortium programs were most effective in 1978.[1] Program effectiveness was measured by determining how much the program helped its children avoid placement in special education classes in their later school careers. Five program characteristics

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[1] See also Consortium (1977) for another, earlier effort.

(which were highly related to one another) were highly related to our measure of effectiveness:

- age of child's entry into program, r = -.64
- home visits, r = .64
- program goals for parents, r = .83
- parent involvement, r = .60
- number of children per adult, r = .83

Together they suggested that the most effective programs involved one instructor working with an infant or toddler and his/her parent in the home.

We have reviewed the above result in accordance with our general policy of reporting results reasonably promptly but then challenging them by testing alternative hypotheses. This rigorous policy, for example, served us well in reporting the findings on the overall effects of preschool on later school performance. Our early findings of positive effects on later school careers (Consortium, 1977) survived the numerous challenges documented in this report, serving to increase our confidence in those findings. In searching for the most effective kinds of preschool programs, we have followed this same strategy. Our work this year aimed (1) to increase the power of the statistical analyses by combining program characteristics which were highly related to one another; and (2) to test the robustness of any positive findings.

The program characteristics analyzed were: (a) age of child at entry to the program; (b) length of program in years; (c) months

per year the program operated; (d) parental involvement;[1] (e) center-based programs; (f) paraprofessional vs. professional staff; (g) preservice training for staff; (h) language goals for children; (i) amount of teaching structure; and (j) hours per year of the program.[2]

As a measure of program effectiveness, we used the reduction in special education placements in the children's later public school careers. This reduction was defined as the percentage of children with preschool experience (treatment group) not placed in special education classes minus the comparable percentage for the control group children from the same project, controlling for children's pretest IQ.

Data analysis proved difficult for a number of reasons. Palmer's project had no information on special education placements. Karnes had no control group and thus no way to measure effectiveness comparable to the other projects. Furthermore, careful scrutiny of the data revealed that for local reasons, the effectiveness of the Miller and Beller projects is underestimated by use of special education placements as the measure of effectiveness. Consequently,

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[1] This represents a new variable, created by combining the following five variables: (1) program goals for parents; (2) parental involvement; (3) home visits; (4) children/adult ratio; (5) child group size. These five variables were so highly intercorrelated as to represent a single variable. See Ypelaar (1978).

[2] Transformed to log (hours) to make the variable more normally distributed for correlational analysis.

we eliminated these four from between-project analysis.[1] The projects included in this analysis, then, were limited to Gordon, Gray, Levenstein, and Weikart.

Another problem involved comparing the projects to one another. All took place in different locations, and local school policies vary widely. This raises the possibility that apparent differences in effectiveness might really be due to differences in local school policies.

Two analyses were performed. A between-projects analysis compared the projects to one another after eliminating the Beller, Karnes, and Miller projects. A within-project analysis included Beller, Karnes, and Miller and compared the different types of programs at one site to one another.

In the between-project analysis, there was a tendency for programs with preservice training of teachers to be more effective. Looking at within-project differences, none of the program characteristics emerged as significantly more effective than the others.

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[1] Unfortunately, the problem with the Karnes, Miller and Beller effectiveness measure made it impossible to assess the importance of parental involvement. By unhappy coincidence, these three projects accounted for all the subgroups with low or moderate parental involvement. Since the three projects had over-conservative estimates of effectiveness, analysis would result in a spurious correlation between parental involvement and program effectiveness. Deleting the three projects, as we decided to do, meant that there was no variance on parental involvement; all remaining programs had high parental involvement. Thus, no correlation could be calculated.

In review, we have looked at the data in three different ways -- once in Consortium (1977), once by Vopava and Royce (1978), and once again in this chapter. However, all of these analyses have difficulties. Our first analysis (Consortium, 1977) suffered from using the child rather than the subgroup as the unit of analysis, while the second (Vopava & Royce, 1978) underestimated the difficulties involved in using the Miller and Beller data on reductions in special education placement. The present analyses suffer from several difficulties outlined in the next paragraph.

How can we interpret the current results? We must emphasize that we have <u>not</u> shown that there are no differences in program effectiveness. For example, parental involvement may play a crucial role in preschool education, but our data cannot address that issue. One reason for the lack of findings is that the statistical technique we used is very conservative, leading to a loss of power. When we have so few observations to begin with, this loss of power can be ill-afforded. A second reason is that the dependent variable used here (frequency of placement in special education) may not be the most sensitive variable for differentiating among different programs at different sites; frequency of special education placements varies randomly from city to city and random error lowers the power of the analysis. Third, all of the Consortium preschool programs were exceptionally well-run programs. It is more difficult to find differences

among programs which were uniformly well-run than among programs which were not. Fourth, we must remember the general statistical principle that when the null hypothesis fails to be rejected, the null hypotheses is not therefore proved.

The Consortium is currently planning to reexamine its data in still other ways which may yield still different results. We plan to examine program characteristics in depth in three of the projects which had planned curriculum variations (Karnes, Miller, Weikart). We plan to use achievement test scores as a dependent variable. We will attempt to use alternative methods of analysis which may be more powerful than the statistical analyses reported here. In the meantime, we would caution against putting too much reliance on either the findings reported earlier or the lack of findings reported here. Instead, we note that the data suggest the real need for new experiments specifically designed to separate and measure the effects of these important program variables.

Matching Children to Programs

Another question of interest concerning program characteristics arises which may be answered without including control groups in the analysis. In the groups of treatment children, did some kinds of children respond more to certain programs than to others? For example, did children from single-parent families benefit more from programs with high structure than did children from two-parent families? If such effects were found to exist, it would be possible to make highly specific recommendations in matching children to programs.

Eight of the ten program characteristics were used in these analyses: age of subjects, length of intervention, months of intervention, hours per year of program, parental influence, language goals, preservice training for staff, and amount of structure. The measure of effectiveness was whether children progressed with their age-mates in school or were either retained in grade or assigned to special education classes. The child characteristics included the child's initial IQ score, birth order, level of mother's education, family size (number of siblings), family structure (father present or absent), and the mother's early hopes for her child's future educational attainment (measured before preschool began).

Results

No significant interactions were found. That is, there appeared to be no systematic benefits derived by certain kinds of children

from certain kinds of programs, at least insofar as we could measure. Here again, these analyses were limited by the measures of program effectiveness: retention in grade (yes or no) and assignment to special education (yes or no). These measures do not allow us to make fine distinctions; perhaps there were interactions which these gross measures masked. We are planning to repeat these analyses using achievement test scores which are more fine-grained as measures of effectiveness. In addition, we plan further analyses using new programs and refined measures of program characteristics.

What do these findings of no significant interactions mean? Simply put, children differed on intelligence (initial IQ scores) and had different home backgrounds. Apparently, the eight program characteristics were equally successful with these different kinds of children. For example, starting preschool at age 2 vs. age 4 did not help children from single-parent homes more than those from two-parent homes.

On the one hand these results are discouraging in the sense that they provide no specific guidance to program planners. On the other hand, this is yet another piece of evidence that high-quality preschool programs can benefit a variety of low-income children.[1]

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[1] The reader will recall that attending any of these preschools apparently helped children who differed on intelligence, sex, ethnic background, family structure, family size and maternal education equally in avoiding assignment to special education and retention in grade (see p. 18-19). Similarly, attending any of these preschools apparently helped boys and girls equally and equally benefitted children whose mothers had more vs. less education in terms of WISC IQ scores (see p. 30).

REVIEW OF THE DETERMINANTS OF SPECIAL EDUCATION PLACEMENTS

We are now in a position to integrate some of our findings and attempt to pinpoint the influence of the preschool experience on the development of this sample of lower-income children. We should point out that the discussion which follows is based on longitudinal data, that is, information about each child at several specific times in his/her life span.[1] The details of family structure and size, maternal education, and (initial) IQ score were collected before the treatment children were enrolled in the preschool programs. These variables provide a picture, albeit limited, of the child's circumstances before experiencing intervention. The age at which the children began attending the programs is known. Most subjects were given a posttest IQ test when they were 6 years old, at approximately the age when most children enter first grade. School records for the intervening 3 to 13 years provide information about the child's school performance up to the time of the 1976-77 follow-up.

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[1] Readers more accustomed to research utilizing cross-sectional data might wonder why we did not make use of the age differences among the 2,000 odd subjects to examine relationships among variables in more detail. This procedure was deemed impractical because age of the children is inextricably confounded with project. That is, Gordon's children were aged 9 and Gray's children aged 19 at follow-up. Furthermore, there were cohort differences, with some children entering preschool at the height of the War on Poverty and others entering as the Nixon Administration began dismantling many programs.

Figure 4 represents a diagram of the relationship between early background measures, preschool attendance, IQ score at age 6, and later school outcome, in this case assignment to regular vs. special education classes. A time line has been drawn in to indicate the child's age at each measurement period. Each of the links pictured in the diagram represents an hypothesis test reported in the body of this report or in Royce (1978). Let us use this diagram to guide us through a discussion of the impact of preschool on low-income children.

On the far left are the variables measured before children enrolled in preschool. These are our most direct indicators of the early status of the children's background and their intellectual potential. Although not pictured in the diagram, family background measures were related to the child's early IQ score. Children from two-parent homes with fewer siblings and with mothers who completed more years of school were more likely to score high on IQ tests administered at age 3 or 4. Limited and controversial though they may be, IQ test scores do provide a measure of cognitive ability and, furthermore, are predictive of later school performance. Thus, the relationship of background variables to early IQ scores indicates that even within a lower-income group, some children started out "ahead" of others.

Many of these children then participated in preschool programs of various kinds. The next time we assessed them as a group was at age 6, on the threshold of the first grade. Again, the measure of

cognitive ability was an IQ test score. The reader will note the arrows connecting the background variables with IQ score at 6. These arrows indicate that in one sense the picture is the same as it was before; namely, children from two-parent families with few siblings and with more educated mothers scored higher on this measure of cognitive ability. The preschool attendance variable also connects with the IQ-at-age-6 variable. In other words, preschool became a new factor in these children's lives. Attending preschool also predicted a higher IQ score at age 6. Home background and preschool attendance were both important influences. If the effects of preschool were partialled out, the background variables still predicted higher IQ scores at age 6. And, vice-versa, if the effects of the background variables were partialled out, preschool attendance still predicted higher IQ scores.

We next assessed the group of children in the 1976-77 follow-up study. They were aged from 9 to 19 years old and either had completed their school careers or were enrolled in grades three through twelve (or, in some cases, had dropped out of school). This time the dependent measure of interest was assignment to regular vs. special education classes: what is the relationship between the children's early background, preschool attendance, and their later school careers (i.e., avoiding placement in special education classes)?[1] Now the picture is quite different. Not surprisingly,

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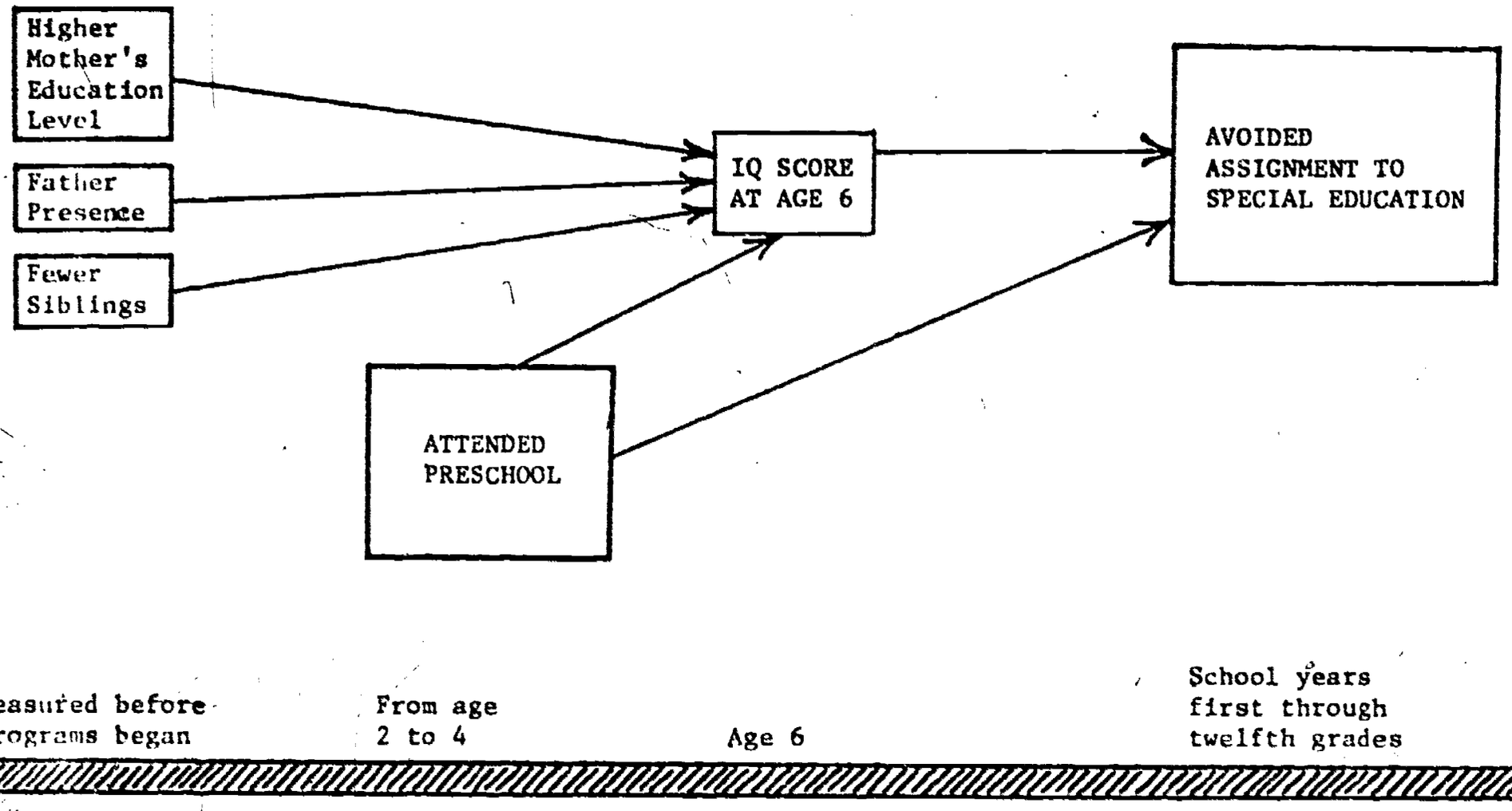
[1] At this point we have only analyzed whether children had ever been assigned to special education classes (or retained in grade). We plan further analyses to ascertain when children were so assigned or retained. Preliminary scrutiny of these data lead us to believe that results will not be substantially different.

children's IQ scores at age 6 strongly predicted their school performance. In addition, preschool attendance predicted avoiding placement in special education, even if the effect of preschool on IQ score at age 6 was partialled out. The home background variables have dropped out of the picture, however. There was a relationship between mother's education and child's later school performance, but it disappeared when the effects of IQ at age 6 were partialled out. Furthermore, we have additional information about preschool attendance and family background that is not, for simplicity's sake, drawn into the diagram. We know that preschool helped all types of low-income children avoid placement in special education, regardless of family structure, family size, maternal education, sex of child, ethnic background, or initial IQ score of the child. Therefore, it seems safe to say that by school age, IQ scores at age 6 and preschool attendance importantly affected later school performance, as measured by children's placement in regular vs. special education classrooms.

Figure 4: Assignment to Special Education Classes: Diagram Showing Network of Variables Suggested by Data, Significant Paths Only



CONCLUSIONS

The Consortium for Longitudinal Studies has collaborated in searching for long-term effects of early intervention programs. The data analyzed thus far and reported here show that early education programs for low-income children apparently had lasting effects in the following areas.

1. Assignment to special education. Early education programs significantly reduced the number of children assigned to special education classes. This result was true after controlling for the effects of the children's initial IQ score, sex, ethnic background, and family background. It held even after controlling for the children's IQ score at age six. Furthermore, the benefit apparently extended to all the participants, regardless of their initial abilities or early home backgrounds.

2. Retention in grade (grade failure). Early education programs significantly reduced the number of children retained in grade. Again, the result was true when measures of early child characteristics and home background variables were controlled. Furthermore, all the children--regardless of sex, ethnic background, early IQ, and home background--benefitted in this way.

3. Achievement test scores. The Consortium had the most information for children at the fourth grade level. The evidence indicates that early education significantly increased children's scores on fourth grade mathematics achievement tests with a suggestive trend toward increased scores on fourth grade reading tests.

4. Intelligence test scores. Low-income children who attended preschools surpassed their controls on the Stanford-Binet IQ test for up to three years after the preschool programs ended. Wechsler IQ scores from 1976-77, approximately ten to fifteen years after the programs ended, show that the preschool participants maintained higher IQ scores than control children in the Gordon, Levenstein, and Palmer projects. There were no treatment/control differences found in projects whose subjects were aged 13 or older. Using the Wechsler IQ scores as outcomes, there was no evidence that preschool had benefitted boys more than girls or vice-versa, or that children whose mothers had different levels of education were helped differentially.

5. Attitudes and values. Children who attended preschool were more likely than control children to give achievement-related reasons for being proud of themselves. The family environment was also apparently affected. Specifically, mothers of children who attended preschool had higher vocational aspirations for their children than the children had for themselves. This discrepancy was not found in mothers of control children.

6. Program characteristics. In an attempt to understand how preschool programs exert their effects, ten different characteristics of the programs were examined: age of children's entry, length of program (in years, months per year, and hours per year), degree of parental influence, location of the program, professional vs. paraprofessional staff, preservice training of staff, language goals for children, and amount of teaching structure. Using assignment to

regular vs. special education classes as the criterion of effectiveness, none of these variables emerged as more effective than the others. In addition, no one type of program characteristic was more effective (using the same criterion) than another with children differing on initial IQ scores, sex, and family background measures. We plan to continue these analyses using new measures of effectiveness and more refined measures of program characteristics. In the meantime, we conclude that these high-quality programs were apparently about equally effective in helping these low-income children.

These are striking findings and worthy of careful consideration. But many questions remain to be answered. We have only scratched the surface with our measures; there is a plethora of unmeasured intervening variables in need of investigation in order to clarify the process by which preschool exerted its impact. By partialling out the effect of preschool on IQ score at age 6, we essentially found that preschool affected children in ways that were relevant to school performance but not related to cognitive skills and abilities. Perhaps children's achievement motivation, values, aspirations, or coping styles were influenced. We reported limited evidence that this was so. Perhaps children's classroom behaviors were affected. Individual investigators (e.g., Beller, 1974) have reported that teacher ratings of children with preschool experience differed from those of control children. Children's families may have been influenced by, for example, changing parents' perceptions of their children, affecting the family dynamics, increasing their hopes for the children's future. Again, we reported limited evidence that preschool affected maternal aspirations. But we have virtually no evidence about

the influence of larger social and historical contexts. How did desegregation and busing enter into this picture? What difference did it make to enroll a child in intervention programs at the height of a societal commitment to social change? To answer these questions, investigators must continue to design and carry out further longitudinal studies. The Consortium for Longitudinal Studies has provided a baseline from which to operate by demonstrating that preschool intervention programs can make a lasting difference in the lives of low-income children.

Apart from these research questions, what are the implications of these findings? Currently the public appears to be disillusioned with large-scale social legislation and spending. We would ask the public and the policy-makers to notice the strength of these findings and to reconsider their commitment to the nation's children, especially low-income children, by continuing to invest in preschool education. It is an investment in their future and in ours.

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