

Impacts and Implications of the Child-Parent Center Preschool Program

Arthur J. Reynolds, Judy A. Temple, and Suh-Ruu Ou

University of Minnesota

Paper presented at the National Invitational Conference of the Early Childhood Research Collaborative on “Critical Issues in Cost-effectiveness in Children’s First Decade,” Federal Reserve Bank of Minneapolis, December 7-8, 2007. Contact information: Arthur Reynolds (ajr@umn.edu), Judy Temple (jtemple@umn.edu), and Suh-Ruu Ou (sou@umn.edu).

Summary

Although significant progress continues in understanding the effects of preschool programs, questions remain about the reliability of long-term impacts for large-scale programs, cost-effectiveness, and the causal mechanisms of change. In this paper, we describe recent findings on the impact of the Child-Parent Center (CPC) preschool program into adulthood and the processes that lead to these effects. Given the program has been run by the Chicago Public Schools for 40 years, the program's consistent evidence of positive effects and high economic returns have significant implications for policy development and modification. The illustrations also show how a confirmatory, theory-driven approach can help advance knowledge in enhancing children's well-being. Key principles of effectiveness are described for promoting enduring effects.

Introduction

Preschool programs are widely considered to be one of the most effective ways to enhance children's well being (Reynolds, Wang, & Walberg, 2003). Their unique attraction is the documented evidence that programs high in quality have enduring effects and high economic returns. The prominent status of the early education field provides an opportunity to highlight recent findings and emerging research directions. Four questions have received renewed attention:

1. Do the effects of large-scale public programs endure? Can these programs impact broader health and well-being?
2. What are the causal mechanisms that promote long-term effects?
3. What is the evidence in support of cost-effectiveness?
4. What are the key principles for enhancing program effectiveness?

In this paper, we report findings from the Chicago Longitudinal Study of the Child-Parent Center Preschool (CPC) program to address these questions and illustrate advances in the field for enhancing effectiveness. The CPC program is especially relevant to early childhood policy. As the second oldest federally-funded preschool program, CPC has been implemented successfully in the Chicago public schools for four decades. In contrast to many others, the CPC program is a sustained intervention funded and administered through public schools. Funded by Title I of the Elementary and Secondary Education Act (now the No Child Left Behind Act), the program is also innovative in its approach to education. It blends an instructional philosophy of literacy and school readiness with intensive services for parents to strengthen the family-school relationship.

In addition to small classes of 17 children and 2 staff, including a certified teacher, each center has a Head Teacher who functions as a principal, a Parent-Resource Teacher who runs the parent program in the Parent Resource Room, a School-Community Representative, and school nurses and other auxiliary staff who provide health-related services. A kindergarten and school-age component also have been implemented as part of the larger CPC extended intervention model.

The CPC program has demonstrated high economic returns to the public and society at large through promoting school achievement, higher educational attainment, and economic well-being and reducing rates of remedial education, child maltreatment, and juvenile and adult crime. Given the program's history of successful implementation within existing services systems, these findings have special relevance for policy.

Child-Parent Center Program

The CPC program began in 1967 through funding from the Elementary and Secondary Education Act of 1965. Title I of the Act provided grants to local public school districts serving high concentrations of low-income children. The program includes three components: a child-

centered focus on the development of reading/language skills, parental involvement, and comprehensive services (Reynolds, 2000). CPC included a half-day preschool program for three- and four-year-olds, a half-day or an all day kindergarten program, and 2 or 3 years of school-age intervention in co-located elementary schools. The center operates on the nine-month school year calendar. An eight-week summer program is also provided.

Each site is under the direction of a head teacher and is located adjacent to the elementary school or as a wing of the school. Major features of the program are as follows. (i) A structured but diverse set of language-based instructional activities designed to promote academic and social success. An activity-based curriculum called the Chicago EARLY (Chicago Public Schools, 1988) has been used frequently. Field trips are common. (ii) A multi-faceted parent program that includes participating in parent room activities, volunteering in the classroom, attending school events, and enrolling in educational courses for personal development, all under the supervision of the Parent-Resource Teacher. (iii) Outreach activities coordinated by the School-Community Representative include resource mobilization, home visitation, and enrollment of children most-in-need, and (iv) a comprehensive school-age program from first to third grade supports children's transition to elementary school through reduced class sizes (to 25 children), the addition of teacher aides in each class, extra instructional supplies, and coordination of instructional activities, staff development, and parent-program activities organized by the Curriculum-Parent Resource Teacher.

The program theory of the intervention is that children's scholastic readiness for school will be facilitated through the provision of systematic language learning activities in center-based early intervention and opportunities for family-support experiences through direct parent participation in the program with and on behalf of their children (Reynolds, 2000; Sullivan, 1971). The central theory is embodied in this goal statement: "[CPC is] designed to reach the child and parent early, develop language skills and self-confidence, and to demonstrate that these

children, if given a chance, can meet successfully all the demands of today's technological, urban society" (cf. Naisbitt, 1968).

Chicago Longitudinal Study

Now in its 22nd year, the Chicago Longitudinal Study (CLS; 1999) investigates the life-course development of 1,539 children, 93% of whom are African American, who attended government-funded early childhood programs in preschool or kindergarten in high poverty neighborhoods in the Chicago public schools. The four major goals of the CLS are (a) to evaluate the effects of the Child-Parent Center Program over time, (b) to identify the mechanisms through which the effects of participation are manifested, and (c) to investigate the contribution of a variety of family and school factors on children's adjustment. Over the 20+ years of the study, extensive information on parent involvement as measured by teachers and parents has been collected along with other child and family experiences, and children's school success.

The sample includes a complete cohort of 989 children born in 1979-1980 who participated in the Child-Parent Center preschool program between 1983 and 1985 in the highest poverty neighborhoods in Chicago. The comparison group consisted of 550 children of the same age from randomly selected schools implementing full-day kindergarten and other intervention strategies for at-risk children in low-income communities. In addition to full-day kindergarten, 15% of the "treatment as usual" comparison group attended Head Start preschool.

Program and comparison groups were well matched on eligibility for intervention, family socioeconomic status, gender, and race/ethnicity. Program and comparison groups, for example, experienced an average of 4 out of 6 family risk factors (e.g., low education, poverty status, single-parent status). At age 24, roughly 1,400 participants (91% of the original sample) were

active in the study. Table 1 summarizes the characteristics of the groups and intervention experiences.

Table 1 here

Confirmatory Research Approach

In investigating the effects of the CPC program and other influences, a confirmatory research approach is used called Confirmatory Program Evaluation (CPE; Reynolds, 1998). CPE is a theory-driven methodology for investigating the effects of social and educational programs. In a theory-driven impact evaluation, the explicit theory of the program is highlighted to establish an a priori model of how the program is expected to exert its influence (Chen, 1990). Causal uncertainty is reduced through an examination of the empirical pattern of findings against the expectations inherent in the program. Three key questions addressed in CPE are: (i) Is program participation independently and consistently associated with key outcomes?, (ii) What are the processes or pathways through which participation leads to children's outcomes?, and (iii) Are the estimated effects conditional on child and family attributes, or particular program components? Given their emphasis on multivariate prediction, theory-driven evaluations are more confirmatory than other evaluation approaches.

CPE is aided by the use of six empirically verifiable criteria that strengthen the validity of research findings and their applicability to research findings. They are as follows: Temporality, Size, Gradient (dosage-response), Specificity, Consistency, and Coherence. For example, specificity refers to the situation in which the program-outcome relationship is limited, based on a priori theory, to certain domains of behavior or to particular subgroups such as individuals at high risk of problems. Causal inference is more straightforward in such cases. Consistency indicates whether the estimated effect is similar across sample populations, similar at different times and places, and under different types of analyses and model specifications. At the highest

level of causal interpretation is coherence--the extent to which the evaluation findings show a clear pattern of effects relative to the causes of behaviors the program is attempting to impact, the target population, the program theory, and the program implementation. These criteria and others were used to determine that smoking causes lung cancer (Susser, 1973; U. S. Department Health, Education & Welfare , 1964).

Figure 1 shows five hypothesized pathways through which preschool and other early education programs may affect later child competence. Because the major purpose of early intervention concerns educational enrichment, many outcomes assess school performance. Indeed, enhancing school performance and success are the most frequently reported findings in the literature.

Figure 1 here

Derived from the 40-year literature on the effects of preschool, the hypotheses associated with these pathways provide a foundation for understanding how early childhood programs lead to longer-term effects, and the environmental conditions that promote or limit success. As shown, the effects of preschool are transmitted through (a) developed cognitive and scholastic abilities (cognitive advantage hypothesis), (b) social development and adjustment (social adjustment hypothesis) (c) parents' behavior with or on behalf of children (family support hypothesis), (d) children's motivation or self-efficacy (motivational advantage hypothesis), and (e) the quality of the school environments children experience postprogram (school support hypotheses). Most previous studies have addressed at most, one or two of these hypotheses, and never through formal empirical tests. These hypotheses are described below (see Reynolds, 2000; Reynolds et al., 2004; Reynolds & Robertson, 2003).

Research Examples in the CLS

We summarize findings on the effects of the CPC preschool program in three areas: Impacts on adult health and well-being, economic benefits, and pathways of change leading to better adult well-being.

CPC Preschool and Well-Being at Age 24

Given that the immediate and longer-term effects through adolescence are well documented in prior studies for both preschool and school-age participation (Reynolds, 2000; Reynolds et al., 2001), we summarize impacts of the CPC preschool program into adulthood. In the age 24 follow-up study for 1,400 study participants, Reynolds and colleagues (2007) found that after adjusting for many family background factors, CPC preschool participants had greater well-being in health and social behavior as well as educational attainment and occupational status. Table 2 shows the major findings and they are summarized below.

Table 2 here

Educational attainment. Preschool participants had significantly higher rates of high completion at age 24 than the comparison group (79.4% vs 70.7%) and they had more years of education (11.97 vs 11.65). Rates of attendance in 4-year colleges were similar but slightly favored the preschool group (13.6% vs 10.4%). Effects on educational attainment are consistent across different model specifications and assumptions, including sample attrition. As shown in the Appendix, group differences were robust after accounting for children's propensity to be included in the educational attainment sample.

Occupational prestige. CPC preschool graduates were more likely than their comparison counterparts to have higher-skilled jobs. Whereas 28.2% of the preschool group had jobs defined

as semi-skilled or higher (4 or more on the 8-point Hollingshead scale), this was the case for only 21.5% of the comparison group.

Crime. The preschool group had lower rates criminal behavior ranging from lower felony arrests and incarceration. Whereas 16.5% of the preschool group had a felony arrest by age 24, 21.1% of the comparison group did, a reduction in arrest of 21 percent. For rates of incarceration or jail, the reduction associated with program participation was 20% (20.6% vs 25.6%). No program-group differences were found for nonfelony arrests. Corrections for sample attrition yielded similar effects (Appendix).

Health. Most importantly, preschool participants had higher rates of health insurance coverage (71.9% vs 61.0%) and lower rates of out-of-home placement in the child welfare system (4.5% vs 8.4%). Most of the differences in health insurance were due to preschool participants having higher private health insurance than the comparison group (see Appendix). Although rates of daily smoking and substance misuse were lower for the preschool group, they were not significantly different.

Mental health. The main finding was that preschool participants had a significantly lower rate of one or more depressive symptoms (12.8% vs 17.4%), a 26 percent reduction over the comparison group. Depression symptoms were assessed on the adult survey at ages 22-24. Frequent feelings of depression, sadness, and loneliness in the past month were key criterion.

Participation in the school-age program and in the extended CPC intervention also was linked to better health and well-being on some indicators. Some program effects were stronger for males, 2-year preschool participants, and children in centers rated high in child-initiated activities (see Reynolds et al., 2001, 2007). For example, among males program participants had much higher rates of high school completion than the comparison group. Generally, males benefitted more from the program than females (Reynolds et al. 2007)

Pathways of Change from Preschool to Lower Felony Arrest at Age 24

We investigated the causal mechanisms and processes from preschool participation to the adult outcome of felony arrest based on the 5-hypothesis model in Figure 1. Because preschool was associated with reductions in felony arrest, the processes that lead to this reduction should be identified. This is part of the confirmatory research approach described above. Figure 2 shows the full estimated model. Figure 3 shows select influential paths that help explain the process of change. The model was estimated in LISREL (Joreskog & Sorbom, 1996) structural equation modeling. The model included indicators of all five hypotheses and fit the data reasonably well ($\chi^2 = 300.63$ (29), RMSEA = .08, AGFI = .88). It accounted for 80% of the variance in any felony arrest by age 24.

Figures 2 and 3 here

The significant, standardized coefficients of the model are displayed in Figure 2. The paths leading from preschool participation to felony arrest were diverse. Two intervening factors directly mediated the main effect of preschool participation. They are number of school moves (ages 10-14) and abuse/neglect report (ages 4-17). Preschool participation was associated with lower incidence of child abuse and neglect ($b = -.12$), which was in turn associated to felony arrest by age 24 in the expected direction ($b = .13$). Preschool participants was associated with a lower rate of school mobility ($b = -.13$), which was in turn associated with felony arrest ($b = .08$). The cognitive advantage hypothesis contributed to the preschool effect directly, and its impact was widespread through other intervening factors as well. Program participation was associated with an immediate boost in kindergarten readiness ($b = .35$) that lead to a lower rate of grade retention or special education placement by age 15 ($b = -.15$), and to a lower rate of felony arrest

($b = -.22$). Kindergarten readiness was also associated with better academic achievement at age 14 ($b = .09$), and to a lower rate of felony arrest ($b = -.14$).

Other than abuse/neglect, another indicator of family support, parents' involvement in school, mediated the effect of preschool through juvenile arrest. Program participation was associated with higher parents' involvement ($b = .14$), which was in turn associated with a lower rate of juvenile arrest ($b = -.10$), and to a lower rate of felony arrest ($b = .21$). Similar to family support hypothesis, another indicator of school support, magnet school attendance or 40% or more above grade level in reading at age 11, mediated the effect of preschool through high school completion and juvenile arrest. Preschool participation was associated with a higher rate of attending magnet schools ($b = .18$), which was associated with a higher rate of high school completion ($b = .15$) and a lower rate of juvenile arrest ($b = -.09$), and then associated with a lower rate of felony arrest ($b = -.37$ and $.21$, respectively).

Some additional findings from the CLS are notable. Using the five-hypothesis model, Reynolds and colleagues (2007) investigated pathways through which participation in the CPC preschool program impacts broader health and well-being, including socioeconomic status, educational attainment, health insurance coverage, criminal behavior, and depressive symptoms. Measures of cognitive advantage (e.g., school readiness scores), family support (e.g., parent involvement), school support (e.g., school quality), social adjustment (e.g., juvenile crime), and motivational advantage (achievement motivation) were mediators and were measured from ages 5 to the end of adolescence. Hierarchical regression analysis indicated that when considered together, the five sets of mediators accounted for 48% of the preschool effect on years of education, 70% on occupational prestige, 47% on health insurance coverage, 100% on depressive symptoms, 48% on incarceration, and 84% on felony arrest. For most outcomes, the

cognitive advantage, social adjustment, and school support hypotheses made the largest contributions to the program effect.

Estimation of the model for court-reported juvenile arrest by age 18, which is significantly associated with preschool participation (Reynolds et al., 2001) indicated that the school support hypothesis, mainly magnet school attendance, accounted for 48% of the indirect effect of the program. This is interpreted as the combined effect of peers and school quality. The cognitive advantage hypothesis accounted for 19% of the indirect effect on juvenile arrest, and the family support hypothesis 21%. For the latter, parent involvement contributed positively to the maintenance of effects and child abuse and neglect contributed negatively.

Economic Returns Relative to Costs

Cost-benefit analysis (CBA) is ready-made for translating evaluation findings into language relevant to the policy making process. It assesses both effectiveness and efficiency, the latter indicating the largest return at the lowest cost. At a minimum, the economic benefit should equal the amount invested in the program--a return of at least one dollar per dollar invested.

Chicago study investigators conducted the first benefit-cost analysis of a large-scale public early childhood program (Reynolds et al., 2002). Program benefits were estimated in 2006 dollars for five main categories: reductions in expenditures for remedial education, reductions in criminal justice system expenditures for both juvenile and adult arrest and treatment, reductions in child welfare system expenditures, averted tangible expenditures to crime victims as a result of lower rates of arrest and to victims of child maltreatment, and increases in projected earnings of program participants and tax revenues as a result of higher levels of educational attainment (Reynolds et al. 2002).

At a cost of roughly \$8,000 per child for 1.5 years of half-day preschool, the program generated a societal return per participant of over \$84,000 (see Table 3). This is a return per

dollar invested of \$10.15. Exclusive of intangible crime victim savings, the return per dollar invested was \$7.14.

Table 3 here

Total benefits to the general public (taxpayers and crime victims) were about \$57,000 per child. The largest benefit was in crime savings as 49% of the total benefits were in reduced criminal justice system costs and averted crime victim savings. The second and third largest benefit categories were program participants' increased earnings capacity (30.2% of total) and resulting tax revenues projected from higher educational attainment (10.7% of total). K-12 savings in remedial education (2.4% of total benefits) and child welfare savings (1.2% of total benefits) also contributed) also provided significant benefits to the public. Savings in the child welfare system associated with lower maltreatment also contributed. Table 3 shows the categorical breakdown of economic benefits and costs per program participant.

Because the Child-Parent Center study is the first cost-benefit analysis of a public preschool program, the findings increase the generalizability of results to publically funded programs, including emerging universal access programs. Findings also indicate that school-based prevention programs during early childhood can lead to reduced child maltreatment and delinquency. These findings are of special significance given the paucity of evidence that treatment programs to prevent maltreatment and delinquency.

Compare the evidence on economic returns of preschool program such as CPC to other intervention programs and policies. Small class sizes are associated with increased school achievement but impacts are not large or enduring. The benefits of remedial education such as tutoring and summer school are, at best, inconsistent and short-lived. The track record of child welfare treatment, delinquency and dropout prevention programs is weak and given their

treatment focus, even the best have low cost-effectiveness. Many of these programs have an important role to play but preventive investments in high-quality preschool have demonstrated the largest and most enduring benefits.

Figure 4 shows the returns per dollar invested for programs with available cost-benefit analyses over the first nine years of life by the age of entry into intervention. These include family centered home visiting programs, preschool and prekindergarten programs, full-day kindergarten, and class-size reduction programs. Age 0 refers to intervention begun prenatally (WIC and Nurse-Family Partnerships). Although programs at all ages show evidence of positive economic returns exceeding \$1 per dollar invested, preschool programs for 3- and 4-year-olds generally show the highest returns. For comparability, we limited the studies in the figure to assessments of benefits into early adulthood. Returns for Perry Preschool Program assessed at age 40 were estimated at over \$16 per dollar invested (Schweinhart et al. (2005).

Figure 4 here

Principles of Effectiveness

Findings from the CPC study and other projects indicate that greater investments in high-quality programs that provide child education and intensive resources for parent involvement are needed. Since the availability and quality of preschool services are not high, programs with demonstrative effectiveness such as CPC warrant emulation. Research on the CPC program suggest six main principles of effectiveness are key to long-term effects and cost-effectiveness.

First, a coordinated system is in place beginning at age 3 and continuing to the early school grades. Program implementation within a single administrative system in partnership with communities can promote stability in children's learning environment which can provide smooth transitions from preschool to kindergarten and from kindergarten to the early grades.

Today, most preschool programs are not integrated within public schools and children usually change schools more than once by the early grades. In the movement to universal access to early education, schools can take a leadership role in partnership with community agencies. More generally, programs that provide coordinated or “wrap-around” services may be more effective under a centralized leadership structure rather than under a case-management framework. The CPC program, for example, is an established program in the third largest school system in the nation. Findings from the CPC cost-benefit analysis give a good indication of the size of effects that could be possible in public schools, the largest administrative system of any universal program.

The second principle of effectiveness is that program length strengthens learning gains. The CPC program was offered beginning at age 3 so that children could participate for two years prior to kindergarten. Preschool length was positively associated with school readiness skills (Reynolds, 1995), lower rates remedial education in the early grades, and with lower rates of later child maltreatment. Moreover, the total number of years of participation of CPC preschool and school-age intervention linked to higher school achievement and well-being into adulthood (Reynolds et al., 2007).

A third principle of CPC effectiveness is that teaching staff should be trained and compensated well, preferably with earned bachelor’s degrees, certification in early childhood, and earn competitive salaries. These characteristics are much more likely under a public school model of universal access, notwithstanding the need for established partnerships with community child-care agencies. It is no coincidence that programs showing the highest economic returns—the CPC and Perry preschools--were implemented in public schools by teachers with at least bachelor’s degrees and appropriate certification in early childhood. Staff turnover in school-based programs also is much lower than in other early education settings.

Fourth, educational content should be responsive to all of children's learning needs but special emphasis should be given to cognitive and school readiness skills through a structured but diverse set of learning activities. The CPC and other cost-effective programs have a strong emphasis on cognitive and language skills within a responsive learning environment. Child to staff ratios of less than 9 to 1 in preschool help as well. The curriculum appeared to less important since the programs spanned from Perry's child-initiated approach to Chicago's blended, teacher-directed approach. Extrapolating these findings, preschool and other social programs are more likely to have enduring effects if they provide services that are intensive and are dedicated to the enhancement of educational and social skills.

A fifth principle of CPC effectiveness is that comprehensive family services are provided to meet the different needs of children. As child development programs, preschool must be tailored to family circumstances and thus provide opportunities for positive learning experiences in school and at home. Those with special needs or who are most at risk benefit from intensive and comprehensive services. In the CPC program, parent involvement is more intensive as each center has a parent resource room run by a certified teacher and provides school-community outreach. Parents' own educational and personal development are important program goals. In other programs, such as the Perry preschool and Abecedarian project, family services were provided. Abecedarian provided medical and nutritional services. The Perry preschool had weekly home visits by teachers.

Finally, commitment to on-going evaluations of effectiveness and cost-effectiveness is paramount. From its establishment, the CPC program has been assessed on a regular basis using different methods and approaches. Investigations of longer-term effects have been frequent. Even today, longitudinal studies of effectiveness are rare. Such studies are essential for conducting cost-benefit analysis of alternative programs. Longitudinal studies are more likely to

accurately assess the total impact of program participation. Nevertheless, greater attention to differential effects are needed across a range of child, family, and program attributes. The identification of the processes of effects or “active ingredients” that promote enduring effects also remains a high priority.

References

- Chen, H. T. (1990). *Theory-driven evaluations*. Newbury Park, CA: Sage.
- Chicago Board of Education. (1988). *Chicago EARLY: Instructional activities for ages 3 to 6*. Vernon Hills, IL: ETA.
- Chicago Longitudinal Study. (1999). *Chicago Longitudinal Study: User's guide (Vol. 6)*. Madison, WI: Waisman Center, University of Wisconsin.
- Consortium for Longitudinal Studies. (1983). *As the twig is bent...lasting effects of preschool programs*. Hillsdale, NJ: Erlbaum.
- Joreskog, K., & Sorbom, D. (1996). *LISREL 8: User's reference guide*. Chicago: Scientific Software.
- Naisbitt, N. (1968). *Child-Parent Education Centers, ESEA Title I, Activity I*. Unpublished report, Chicago, IL.
- Reynolds, A. J. (1998). Confirmatory program evaluation: A method for strengthening causal inference. *American Journal of Evaluation*, 17, 21-35.
- Reynolds, A. J. (2000). *Success in early intervention: The Chicago Child-Parent Centers*. Lincoln, NE: University of Nebraska Press.
- Reynolds, A. J. (1995). One year of preschool or two: Does it matter? *Early Childhood Research Quarterly*, 10, 1-31.
- Reynolds, A. J., & Robertson, D. L. (2003). School-based early children intervention and later maltreatment in the Chicago Longitudinal Study. *Child Development*, 74, 3-26.
- Reynolds, A. J., Wang, M. C., & Walberg, H. J. (Eds.). (2003). *Early childhood programs for a new century*. Washington, DC: CWLA Press.
- Reynolds, A. J., Temple, J. A., Ou, S., Robertson, D. L., Mersky, J. P., Topitzes, J. W., & Niles, M. D. (2007). Effects of a school-based, early childhood intervention on adult health and

well-being: A 19-year follow-up of low-income families. *Archives of Pediatrics and Adolescent Medicine*, 161, 730-739.

Reynolds, A. J., Temple, J. A., Robertson, D. L. & Mann, E. A. (2001). Long-term effects of an early childhood intervention on educational achievement and juvenile arrest: A 15-year follow-up of low-income children in public schools. *Journal of the American Medical Association*, 285(18), 2339-2346.

Reynolds, A. J., Temple, J. A., Robertson, D. L., and Mann, E. A. (2002). Age 21 cost-benefit analysis of the Title I Chicago Child-Parent Centers. *Educational Evaluation and Policy Analysis*, 24, 267-303.

Schweinhart, L. J., Barnes, H. V., & Weikart, D. P. (1993). Significant benefits: The High/Scope Perry Preschool study through age 27. Ypsilanti, MI: High/Scope Educational Research Foundation.

Schweinhart, L. J., Montie, J. et al. (2005). Lifetime effects: The High/Scope Perry preschool Study through age 40. Ypsilanti, MI: High/Scope Educational Research Foundation.

Sullivan, L. M. (1971). Let us not underestimate the children. Glenview, IL: Scott, Foreman and Company.

Susser, M. (1973). Causal thinking in the health sciences, concepts and strategies of epidemiology. New York: Oxford University Press.

U. S. Department of Health, Education, and Welfare. (1964). Smoking and health: Report of the advisory committee to the surgeon-general of the Public Health Service. Washington, DC: Public Health Service Publication No. 1103).

Table 1. Characteristics of Study Groups

	CPC Intervention	Comparison
Sample	Complete cohort	Random sample of K sites
Recovery, by age 24	902 of 989 (91%)	487 of 550 (89%)
Key attributes	Reside in highest poverty areas Over 80% of children enroll Mean no. of risks = 4.5; 73% with 4 or more risks Parent ed > than in c-group	Reside in high poverty areas Had school-based enrichment Mean no. of risks = 4.5; 71% with 4 or more risks Area poverty < than in p-group
Intervention levels		
Preschool	100% 1 or 2 years	15% in Head Start
Kindergarten	60% full day	100% full day
School age	69% 1 year 56% 2-3 years	30% 1 year 0% 2-3 years

Table 2: Adjusted Means and Rates for Age 22-24 Well-Being in the CPC Study

Outcome	Preschool group	Control group	Difference
Education by age 24			
High school completion, %	79.4	70.7	8.7*
Years of Education	11.97	11.65	0.32*
4-year college attendance, %	13.6	10.4	3.1
Occupation and Work			
Occupational prestige, % (semi-skilled or >)	28.2	21.5	6.7*
Full time employment	39.4	37.4	2.0
Crime			
Arrest, %			
Felony arrest	16.5	21.1	-4.6*
Conviction	15.3	19.7	-4.4*
Incarceration			
Health			
Out-of-home placement	4.5	8.4	-3.9*
Health insurance coverage	71.9	61.0	10.9*
Daily smoking	17.9	22.1	-4.2
Substance misuse	14.0	17.0	-3.0
Mental health			
Depressive symptoms, %	12.8	17.4	-4.6*

Note. Control variables were measured from birth to age 3 as follows: sex of child, race/ethnicity, parent a high school graduate, single-parent family, parent employment, 4 or more children in family, parent a teen at child's birth, eligible for fully subsidized school lunches, AFDC participation, involvement in child welfare system. CPC school-age also was a covariate. Occupational prestige was a Hollingshead score of 4 or higher on an 8-point scale.

* $p < .10$. Except for depressive symptoms ($p = .06$), all significant differences were $p < .05$.

Table 3
Itemized Benefits Per Participant in 2006 Dollars for the CPC Preschool Program

Costs and Benefits	Benefit Per Participant	Percent of Total Benefit
Program Cost	8,277	--
Program Benefits		
Child care	2,049	2.4%
K-12 education savings	6,026	7.2%
Child welfare savings	976	1.2%
College	-689	--
Participant earnings	25,376	30.2%
Taxes	8,958	10.7%
Crime savings		
Criminal Justice System	8,819	10.5%
Victimization	32,517	38.7%
Tangible	7,578	9.0%
Intangible	24,939	29.7%
Total Benefits	84,032	100.0%
Public and crime victims	56,837	67.6%
Participants	27,195	32.4%

Note. See the CBA report for the estimation procedures. The negative benefits of college attendance reflect the fact that taxpayers fund 2/3 of the cost of college. This cost slightly offsets the earnings increases to participants as well as the increased tax revenues. Earnings are estimates of total compensation before taxes.

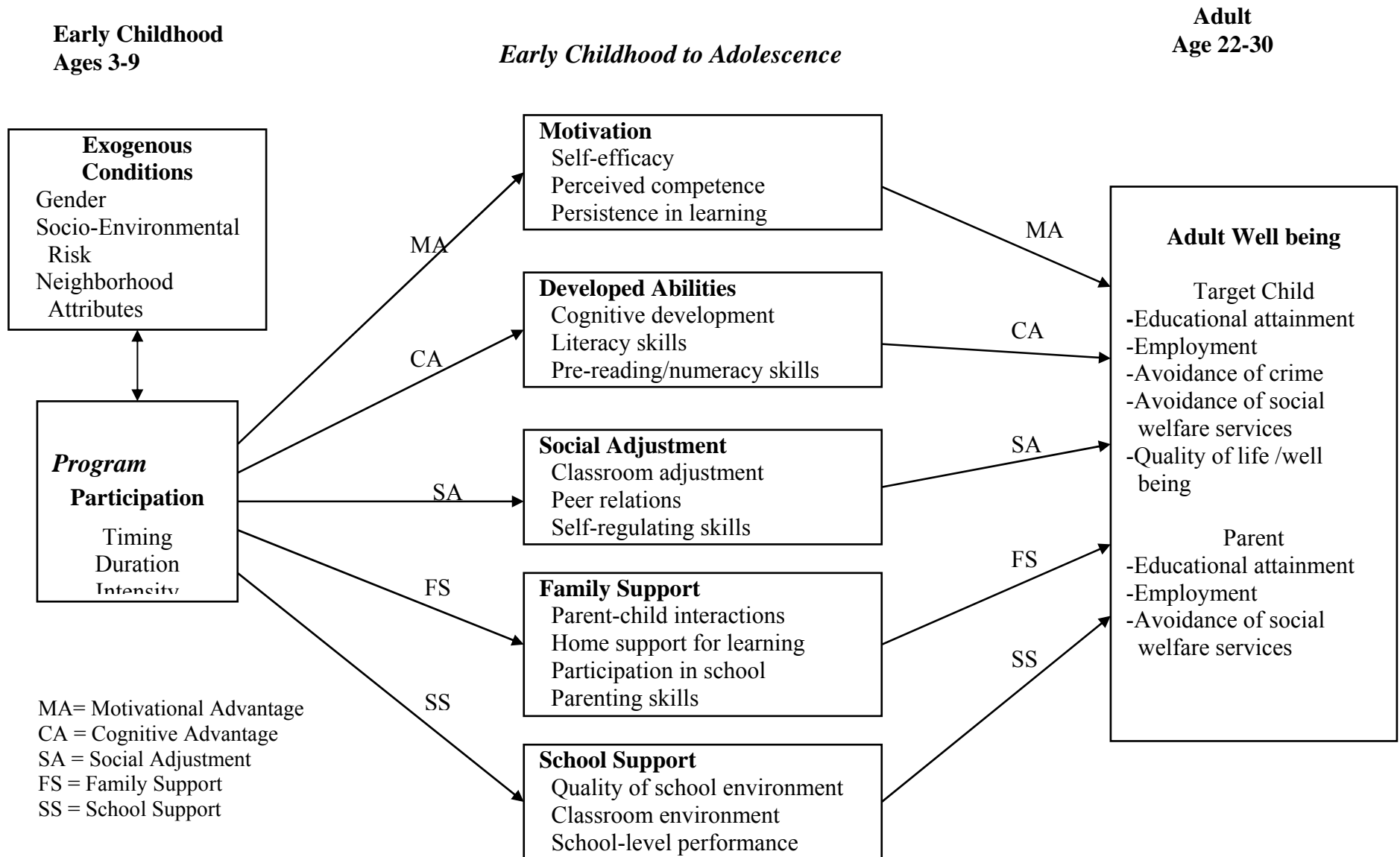


Figure 1. Alternative Paths Leading to Adult Well being

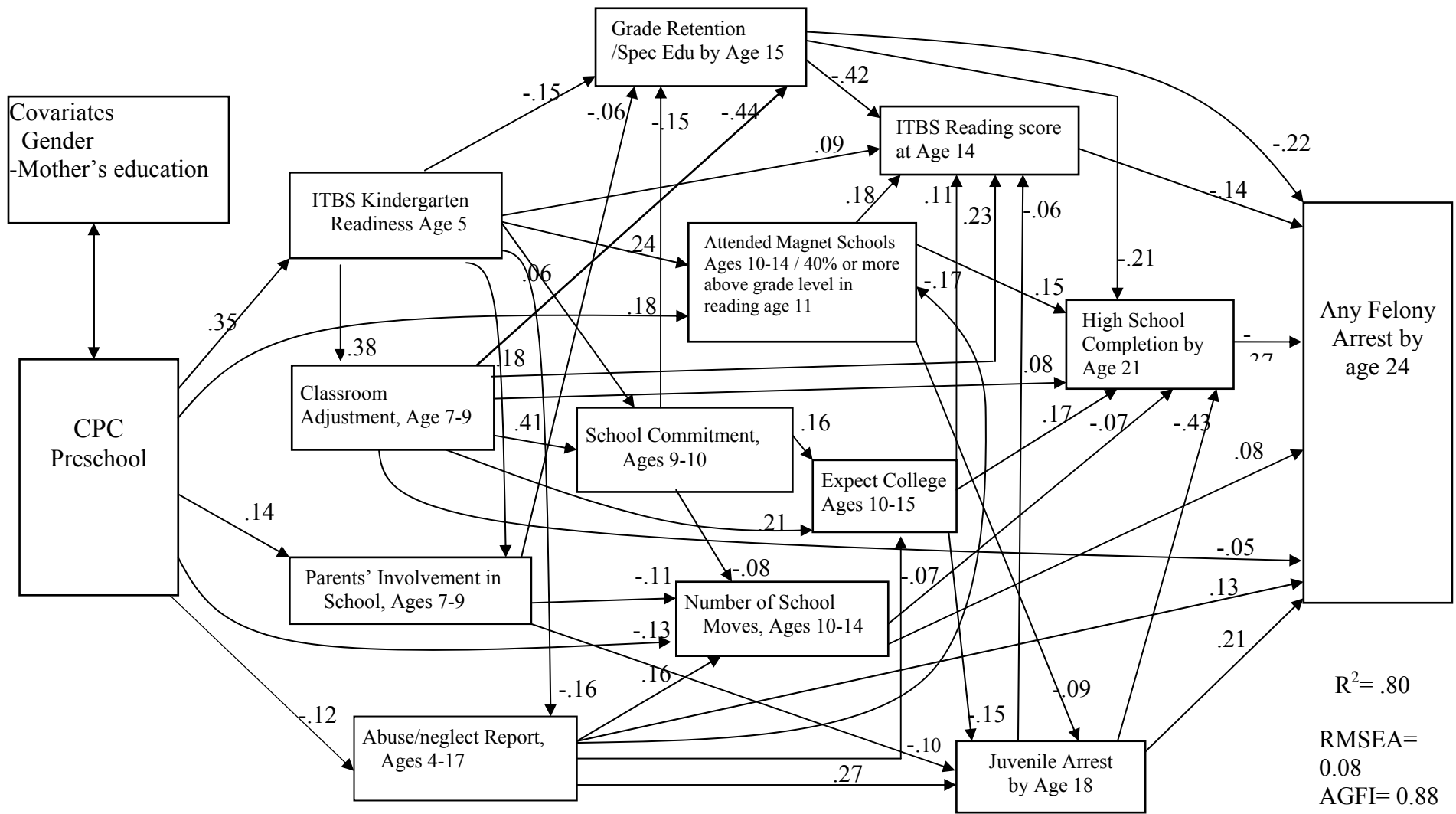


Figure 2. LISREL mediation model for any felony arrest by age 24, coefficients are standardized and adjusted for measurement errors

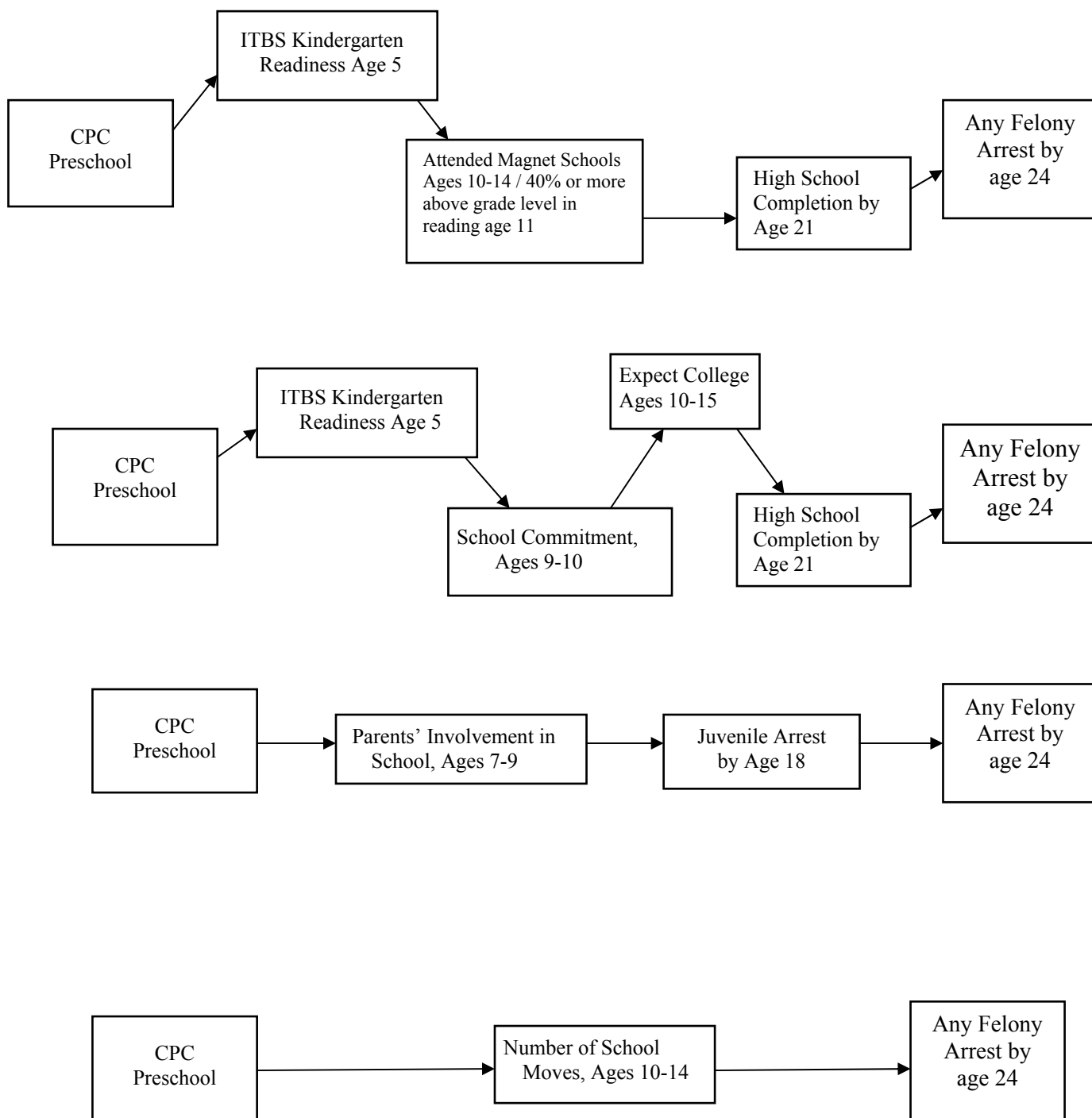


Figure 3. Selected paths for any felony arrest by age 24

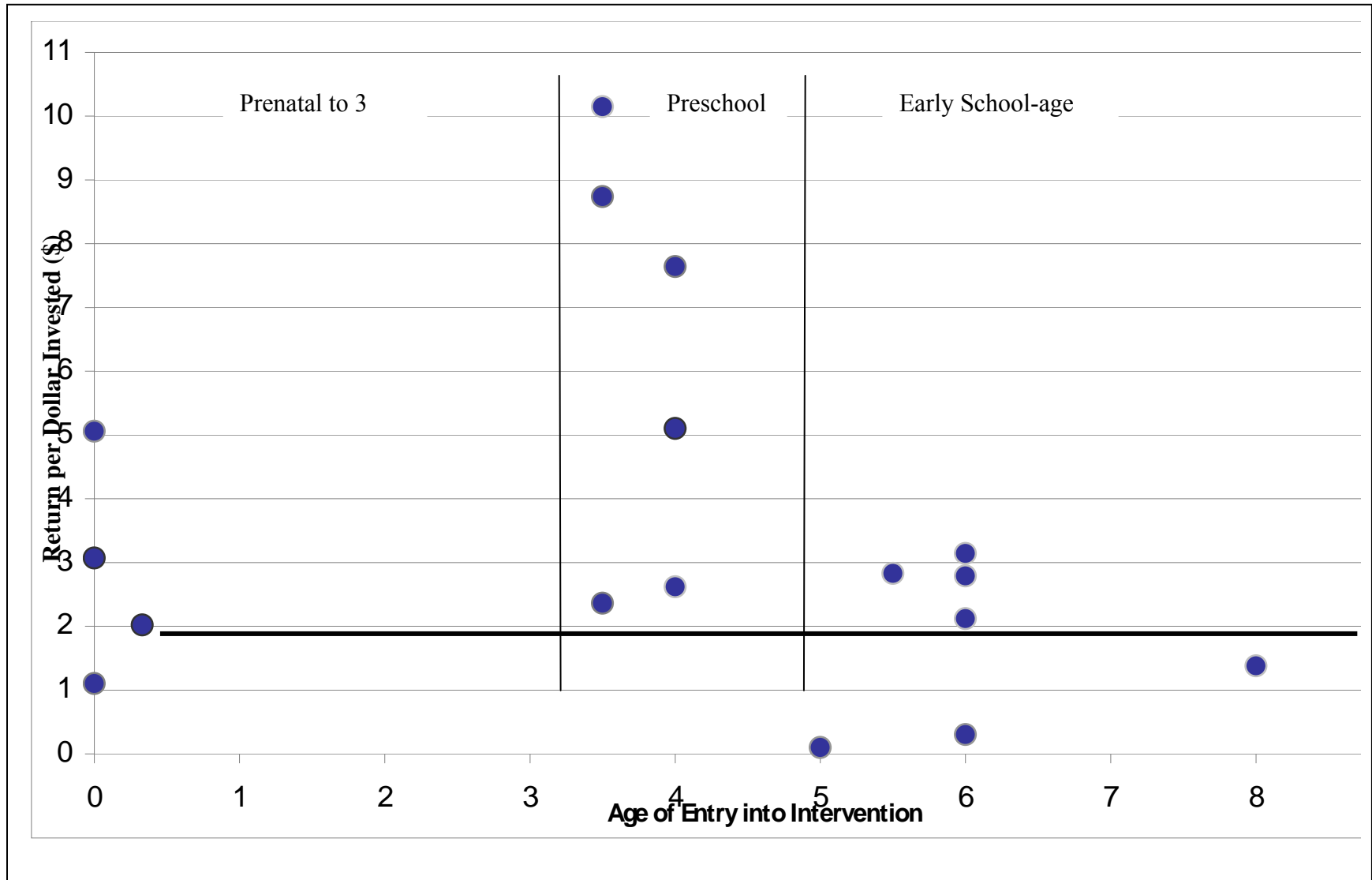


Figure 4. Return Per Dollar Invested by Age of Entry into Intervention

Appendix

Outcomes Regressions – Without and With Attrition Correction

	High School completion								Any felony arrest								Private Health Ins.									
	No attrition correction		Attrit. Correct. Model 1		Attrit. Correct. Model 2		Attrit. Correct. Model 3		No attrition correction		Attrit. Correct. Model 1		Attrit. Correct. Model 2		Attrit. Correct. Model 3		No attrition correction		Attrit. Correct. Model 1		Attrit. Correct. Model 2		Attrit. Correct. Model 3			
	dF/dx	P>z	dF/dx	P>z	dF/dx	P>z	dF/dx	P>z	dF/dx	P>z	dF/dx	P>z	dF/dx	P>z	dF/dx	P>z	dF/dx	P>z	dF/dx	P>z	dF/dx	P>z	dF/dx	P>z		
Gender	0.14788	0.00	0.1291	0.00	0.1170	0.00	0.1333	0.00	-0.3340	0.00	-0.3299	0.00	-0.3358	0.00	-0.3348	0.00	-0.0299	0.28	-0.0552	0.129	-0.0484	0.34	-0.0591	0.26		
Race	-0.13692	0.00	-0.1538	0.00	-0.1432	0.00	-0.1495	0.00	0.0327	0.31	0.0349	0.28	0.0326	0.31	0.0334	0.29	-0.0509	0.37	-0.0487	0.386	-0.0498	0.38	-0.0476	0.40		
Any preschool	0.08733	0.00	0.0847	0.00	0.0905	0.00	0.0861	0.00	-0.0470	0.02	-0.0468	0.02	-0.0471	0.02	-0.0460	0.02	0.0646	0.04	0.0621	0.048	0.0625	0.05	0.0636	0.05		
Any school age intervention	0.02416	0.34	0.0171	0.50	0.0139	0.58	0.0194	0.45	0.0089	0.63	0.0106	0.57	0.0086	0.64	0.0086	0.64	0.0119	0.69	0.0141	0.642	0.0146	0.64	0.0139	0.65		
Single parent 0-3	0.01434	0.64	0.0232	0.46	-0.0083	0.79	0.0211	0.52	-0.0305	0.19	-0.0294	0.20	-0.0303	0.19	-0.0275	0.23	-0.0962	0.01	-0.0930	0.008	-0.0923	0.01	-0.0935	0.01		
Mother is less than 18 years old, 0-3	-0.00527	0.87	-0.0255	0.44	-0.0359	0.29	-0.0225	0.51	-0.0097	0.68	-0.0072	0.76	-0.0107	0.66	-0.0038	0.88	0.0949	0.02	0.0853	0.040	0.0883	0.04	0.0927	0.03		
Mother completed hs, 0-3	0.09394	0.00	0.0792	0.00	0.0588	0.04	0.0828	0.01	-0.0360	0.07	-0.0353	0.08	-0.0361	0.07	-0.0333	0.10	0.0942	0.00	0.0916	0.005	0.0931	0.00	0.0946	0.00		
Mother had some college, 0-3	0.06574	0.12	0.0673	0.11	0.0792	0.06	0.0653	0.13	-0.0612	0.02	-0.0605	0.03	-0.0614	0.02	-0.0591	0.03	0.0470	0.31	0.0441	0.341	0.0445	0.34	0.0450	0.34		
TANF/AFDC, age 0-3	-0.10925	0.00	-0.0983	0.01	-0.0953	0.01	-0.0968	0.01	0.0718	0.01	0.0715	0.01	0.0723	0.01	0.0710	0.01	-0.1787	0.00	-0.1685	0.000	-0.1712	0.00	-0.1719	0.00		
Mother fulltime/part-time employment	0.00409	0.91	0.0094	0.80	-0.0059	0.87	0.0084	0.82	0.0517	0.06	0.0523	0.06	0.0511	0.07	0.0516	0.06	-0.0133	0.74	-0.0079	0.842	-0.0103	0.80	-0.0130	0.74		
Child welfare, age 0-3	-0.05850	0.36	-0.0288	0.64	-0.0075	0.90	-0.0344	0.59	0.1729	0.00	0.1747	0.00	0.1721	0.00	0.1640	0.00	-0.1125	0.12	-0.1097	0.131	-0.1103	0.13	-0.1103	0.13		
Free lunch 0-3	-0.05644	0.12	-0.0725	0.04	-0.0833	0.02	-0.0679	0.06	0.0274	0.26	0.0285	0.24	0.0268	0.27	0.0284	0.24	0.0385	0.34	0.0264	0.530	0.0301	0.50	0.0294	0.51		
Missing values-risk factors (dummy)	0.04440	0.19	0.0796	0.02	0.0835	0.01	0.0647	0.07	0.0105	0.67	-0.0048	0.87	0.0129	0.65	0.0064	0.83	-0.0103	0.81	0.0301	0.598	0.0051	0.93	0.0065	0.91		
Propensity score			0.4971	0.00							-0.1126	0.33							0.2389	0.281			0.0120	0.66		
attrition sample *quantileranking					0.0583	0.00							0.0019	0.85												
q2 dummy							0.1432	0.00							-0.0024	0.93								-0.0153	0.74	
q3 dummy							0.1700	0.00							-0.0292	0.31									0.0318	0.62
q4 dummy							0.1463	0.00							0.0149	0.65									0.0339	0.68
pred.	76.47%		76.87%		76.72%		76.89%		11.26%		11.27%		11.25%		11.11%		38.04%		38.04%		38.04%		38.04%			
Number of obs	1372		1372		1372		1372		1413		1413		1413		1413		1303		1303		1303		1303			
LR chi2(12)	132.94		165.94		153.29		166.81		342.24		343.19		342.27		345.1		88.52		89.69		88.71		89.46			
Prob > chi2	0		0		0		0		0		0		0		0		0.000		0.000		0.000		0.000			
Pseudo R2	0.085		0.1061		0.098		0.1066		0.2488		0.2495		0.2488		0.2509		0.0509		0.0516		0.051		0.0515			
Log likelihood =	-715.8473		-699.35		-705.67		-698.91		-516.68		-516.2		-516.66		-515.251		-824.76		-824.18		-824.67		-824.295			

Prediction of Propensity Scores by Outcomes

	EdAttainm. Sample n=1372		Crime sample n=1413		Health Insurance sample n=1303	
	dF/dX	p-value	dF/dX	p-value	dF/dX	p-value
Gender	0.0086	0.305	0.02587	0.035	0.111	0.000
Race	-0.0029	0.837	-0.00444	0.845	-0.017	0.627
Any preschool	-0.0001	0.994	-0.00058	0.965	0.012	0.553
Any school age intervention	0.0027	0.756	0.00131	0.919	-0.020	0.283
Single parent 0-3	0.0118	0.311	0.00624	0.690	-0.022	0.315
Mother is less than 18 years old, 0-3	0.0089	0.453	0.02473	0.133	0.044	0.069
Mother completed hs, 0-3	0.0129	0.184	0.00465	0.743	0.013	0.539
Mother had some college, 0-3	-0.0060	0.702	0.00883	0.655	0.021	0.478
TANF/AFDC, age 0-3	-0.0037	0.787	-0.00917	0.628	-0.051	0.059
Number of children in the household age 0-3	0.0028	0.800	0.04326	0.006	0.028	0.244
Mother fulltime/part-time employment	0.0066	0.625	0.01377	0.463	-0.016	0.558
Child welfare, age 0-3	-0.0321	0.184	0.00190	0.955	-0.016	0.734
Free lunch 0-3	0.0111	0.410	0.01369	0.479	0.060	0.033
Lowbirth weight	0.0102	0.388	0.03549	0.044	0.032	0.233
Missing values for risk factors (dummy)	-0.0255	0.052	-0.06165	0.001	-0.122	0.000
Income (inc60)	-0.0108	0.226	-0.00014	0.992	0.026	0.201
Word test, kindergarten (sswordk)	-0.0001	0.669	0.00056	0.233	0.000	0.774
Home environment problems (continuous)	dropped		dropped		dropped	
Have at least one health problem 0-5	0.0134	0.627	dropped		dropped	
Missing values for home environment probl.	-0.3023	0.000	dropped		dropped	
Have SSN	0.1180	0.000	0.31466	0.000	0.339	0.000
n=	1539		1539		1539	
Predicted value	89.15%		91.79%		84.64%	