

New York State Fiscal Analysis Model for Early Childhood Services

Methodology and Technical Manual



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March 2015

Return on Investment (ROI) Methodology for New York State Fiscal Analysis Model for Early Childhood Services

This document reviews the methodology and data used to calculate return on investment (ROI) for New York's early childhood programs for use in the New York State Fiscal Analysis Model for Early Childhood Services. The Cost Model was created for the New York Early Childhood Advisory Council (ECAC). This brief was written by Andrew Brodsky and Simon Workman.

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Categories of Cost Savings

High-quality preschool for high-needs children yields several categories of cost savings. This section contains details of the methodology used to calculate each category of cost savings.

Gains from Child Care

The following methodology is based primarily on research on high-quality preschool for at-risk children. However, the child care programs in New York have a wide range of quality and serve a wide range of children.

Research suggests that gains in child outcomes in years following preschool are specific to high quality programs. Available research does not quantify the return on investment (ROI) associated with various child care quality levels, as measured by quality rating and improvement systems (QRIS). However, several groups of experts, including Helburn and Morris (2012) and APA (2012), have proposed multipliers to account for differences in quality and setting. Following these suggestions, we use the following multipliers in the model:

- Quality Level 4 and 5: 100 percent
- Quality Level 3: 75 percent
- Quality Level 1 and 2: 0 percent

Children who are highest need are also likely to realize the greatest benefits from preschool, because they are receiving experiences that they otherwise would not have. Children with less need may already be receiving these experiences outside of preschool and thus stand to gain less. In order to account for these differences, we suggest applying the following multipliers. These numbers are not based on specific research evidence; but rather represent a “best guess” at the likely distribution of benefits for children in poverty; just above poverty; and at higher income levels.

- Children <100 percent of poverty: 100 percent
- Children between 100 percent and 200 percent of poverty: 75 percent

- Children above 200 percent of poverty: 50 percent In the model users can adjust the quality and poverty levels of enrolled children and view resulting changes in ROI

Reduced Special Education

Special education has been identified as one of the most promising areas in which short-term returns from preschool interventions might be realized. Our methodology is based primarily on analyses conducted by Karoly and Bigelow (2005), which in turn are based primarily on research on the Chicago Child Parent Centers (CPC) program, which follows children who enrolled in preschool in the 1985-1986 school year, in addition to other longitudinal studies.

The reduction in the number of years of special education for children who participated in the Chicago CPC was .7 (Reynolds, 2009, p. 7). This translated to an average savings of \$5,317 per program participant (in 2007 dollars), based on the average annual costs for special education above and beyond regular instruction for the school district in which the children were enrolled, and discounting costs by 3 percent annually. Karoly and Bigelow (2005, p. 79) applied the program effect to a universal preschool program in California, assuming a reduction .7 years applied at age 12. This analysis assumed an annual cost of special education of \$9,637.

These figures were applied to New York by substituting an estimate of \$9,300 per year of special education saved (APA, 2012). This figure was multiplied .7 to represent the average number of years saved per child, yielding an average savings of \$6,510. The total savings due to the reduction of children in special education yields a saving of \$814 per child per year, assuming the cohorts are evenly distributed between ages 5 and 12,

Some experts, including Robert Dugger, have suggested that these returns may be overstated when applied in the modern context, because the “control” group (i.e., those children who did not receive preschool services) was different when the large longitudinal studies began. In current practice, even children who do not have access to a preschool program still are entitled to receive services through the Individuals With Disabilities Education Act (IDEA) and Americans with Disabilities Act (ADA). In the 1960s and 1970s, however, when several of the most studied programs were established, fewer services were available to children who did not receive the program. Thus, differences may be more pronounced.

At least one other study, New Jersey’s APPLE study, has tracked reductions in SPED due to preschool participation, which is presented here for the sake of comparison. This study, which followed children who attended the Abbott Pre-K program, found the program caused a reduction in special education placement in grade 4 or 5 from 17 percent to 11 percent (Barnett et al, 2013). Assuming that children enrolled in special education were enrolled in both fourth and fifth grades, the 6 percentage-point reduction is equivalent to an average of .12 years per child in grades 4 and 5, a lower estimate than the CPC study. However, this does not take into account SPED placement in kindergarten through 3rd grade.

Reduced Criminal Justice Costs

Karoly and Bigelow (2005, p. 81) applied results from the CPC to a universal California preschool program. The CPC study found that preschool participants had .33 fewer petitions in juvenile court by age 18, compared to non-participants. Applying these figures to the California context, the researchers assume 22 percent of juvenile petitions result in incarceration in county facility (at an annual cost of \$25,200) and 1 percent of petitions result in California Youth Authority sentence (at an annual cost of \$49,200). Incorporating the costs of probations, other dispositions, and dismissals results in \$9,480 per petition saved in California. The average savings per CPC program participant was \$3,128. The average per CPC program participant was calculated by applying the .33 petitions in juvenile court to \$9,480. This analysis assumes that cases resulting in detention are for one year, which is a conservative estimate.

Because data associated with the costs of New York's criminal justice system was not available, the California figure of \$3,128 in savings per child was used. Savings were applied at age 14.

Reduced Grade Retention

Children who participated in the CPC were 15.4 percentage points less likely to have been retained in grade by age 15 (through eighth grade) (Karoly and Bigelow, 2005, p. 33). This was multiplied by California's average annual statewide kindergarten-through-12 public school education cost of \$6,961 to estimate the savings due to grade retention in California.

Assuming that each child is retained for an average of one year, the California figures equate to .154 years saved per child. These figures were applied to New York by substituting the average annual per-pupil cost of \$18,618¹, yielding an average savings of \$2,867 per child.

These numbers compare to the APPLE study follow-up, which found the program caused a reduction in retention rates from 19 percent to 11 percent, or 8 percentage points. Retention was measured by whether a child was behind a grade level or more through grade 5 (Barnett et al, 2013). The average number of retained years saved through grade 5, therefore, is at least .08, but likely higher if children were retained more than one year, or if other children were retained later in their schooling. The analysis also assumes no difference in outcomes between children with one year of preschool or two. This assumption is supported by the ABBOTT follow-up which found that children with 2 years of pre-K did not show any advantage in reduced retention over those who enrolled for only 1 year.

Increased Future Income

Increased future income for preschool participants is based on the increased rate of high school graduation and likely higher income for graduates.

Based on data from the U.S. Census Bureau, the estimated lifetime earnings in New York for high school graduates in 2009 was \$30,627, compared to \$20,241 for non-graduates.² These numbers were projected over a lifetime of earnings by assuming a .5 percent annual increase in relative earnings, taking

¹ http://www.census.gov/newsroom/releases/archives/finance_insurance_real_estate/cb12-113.html

² <http://www.census.gov/compendia/statab/2012/tables/12s0232.pdf>

into account inflation and using 2009 dollars. The resulting figures equal \$1,590,476 in higher earnings for high school graduates.

Karoly and Bigelow (2005) estimated that children who attended preschool had an 11 percentage point increase in graduation rates compared to those who did not attend preschool. Multiplying the increased graduation rate by lifetime earnings for graduates yields a figure of \$174,952 per child attending preschool.

Reduced Adult Crime Costs

Karoly and Bigelow (2005, p. 82) estimate that the average reduction in adult crime costs per preschool participant is \$3,708. This figure accounts for crimes committed, up to age 44, and is based on the net present value calculated at age 19, following Karoly et al. (1998).

Reduced Tangible Victim Costs

Reduction in juvenile crime lowers the costs to victims including property loss, lost productivity, medical care and mental health costs. Karoly and Bigelow (2005, p. 82) estimate that the average reduction in adult crime costs per preschool participant is \$13,259. This figure is based on juvenile petitions and type of crime and accounts. The returns are assumed to be realized at age 14.

Reduced Foster and Home Care Costs

Karoly and Bigelow (2005, p. 80) found children who attended preschool had 5.3 percentage points fewer cases of abuse and neglect for ages 4-17. Data from California indicate that 31 percent of cases of substantiated abuse and neglect result in foster care (at a rate of \$19,000 per year) and the remaining 69 percent of substantiated cases result in home care (at \$3,400 per year).

When combined with an estimated \$1,000 administration cost per case of abuse, this yields an average per-case cost of foster care of \$6,200 (31% * \$20,000) and an average per-case cost of home care of \$3,036 (69% * \$4,400). When multiplied by the 5.3 percentage point reduction in cases due to preschool participation, the savings equal \$328 per child for foster care and \$160 for home care.

These calculations assume that 57 percent of savings accrue to state and local sources and 43 percent to federal sources, and are realized at age 10.

Reduced Tangible Losses Due To Child Welfare

Reductions in child maltreatment result in less harm to the victim, measured in tangible losses (medical care/treatment). Karoly and Bigelow (2005, p. 81) estimated a 2003 administrative cost per case of \$7,800 for child abuse and \$1,200 for neglect. Weighted by the distribution of California cases in these two categories (61 percent for child abuse and 39 percent for neglect), the average cost is \$5,231 in tangible victim costs, equivalent to \$6,265 in 2013 dollars. In addition, Aos (2004) estimated approximately \$22,948 in quality of life costs incurred by victims, expressed in 1993 dollars, equivalent to \$33,696 in 2013 dollars. We multiplied the total cost per child of \$39,961 by the 5.3 percentage point decrease in cases of abuse to yield an average savings per preschool participant of \$2,118. Savings are assumed to accrue at age 10.

Effects of Increased Student Behavior and Teacher Satisfaction

The model incorporates exploratory analyses that estimate the effects of increased student behavior and teacher satisfaction on future child outcomes. These estimates should be considered speculative as no empirical research has directly evaluated the cost implications of these outcomes based on child care participation.

Using Early Childhood Longitudinal Study (ECLS) data, Belfield (2006, p. 9) found that pre-kindergarten programs raise individual achievement by .14 standard deviations. This is associated with a 16 percentage point increase in measurements of student behavior, which in turn is equivalent to a 10 percentage point job satisfaction for teachers. Increased teacher satisfaction results in three types of cost savings: 1) savings due to reduced turnover; 2) offset costs of salary increases that would otherwise be required; and 3) reduced absenteeism.

Reduced teacher turnover

ECLS data show that an increase in teacher satisfaction of 10 percentage points results in a 12 percent reduction in teacher turnover. Approximately 9 percent of teachers quit each year, so a 12 percent reduction in that number yields a net reduction in the number of teachers quitting equal to 1.1 percent of the entire workforce. The cost of each of these teachers is equal to 33 percent of the salary of a new hire in New York (33 percent of \$48,520³, or \$16,012). This is equal to an average cost per teacher in the workforce of \$176 ($\$12,375 * 1.1\%$).

To convert this figure into a per-child number, we multiplied the cost per teacher to the number of kindergarten to 12 teachers in New York, yielding a total cost of \$37,341,568 (212,168⁴ teachers x \$176 per teacher). We then divided that cost by the number of students (2,766,052) for an average savings per student of \$13.50 per year. This number was multiplied by 13 years of schooling for a total savings of \$175 per student.

Offset costs of teacher salaries

A conservative estimate of the value of a 10 percentage point increase in teacher satisfaction is equal to a 3 percent increase in salary (in other words, teachers perceive the same value from a 10 percentage point increase in job satisfaction as a 3 percent salary increase).

A 3 percent salary increase in New York would be equal to \$2,149 per teacher per year (based on an average annual teacher salary of \$71,628⁵). This is equivalent to a total of \$455,949,032 across all teachers in the state. Dividing by the number of students yields a per-child savings of \$165 per student per year, or \$2,145 across their kindergarten to age12 career. The savings are assumed to accrue evenly between kindergarten and grade 12.

³ http://www.highered.nysed.gov/tcert/career/nyteachers_opporteachers.html

⁴ Source: <http://www.p12.nysed.gov/irs/statistics/public/2012/TABLE6.pdf>

⁵ Source: <http://www.p12.nysed.gov/irs/statistics/public/2012/TABLE7.pdf>

Teacher Absenteeism

We assumed that an increase in teacher satisfaction of 10 percent would also result in a reduction in teacher absenteeism of 10 percent.

In New York the average substitute teacher salary is \$26,000 or about \$130 per day⁶, with an estimated 14,145 substitute teachers (assuming 1 substitute teacher for every 15 full-time teachers). This results in current spending of \$36.8 million on substitute teachers, which equals \$459 per student per year, or \$5,967 per pupil over 13 years of schooling. Multiplying this by 10 percent equals \$597 per student in savings.

Reduced Pressure on School Support Due To Increased Achievement

Applying Early Childhood Longitudinal Study (ECLS) data to Massachusetts, Belfield (2006, p. 9) showed that the .14 standard deviation in individual student achievement due to pre-kindergarten programs should also result in savings to the state on funds being spent on Low-Scoring Student Support. In Massachusetts, \$12.3 million was spent on Low Scoring Student Support in 2006⁷. A conservative estimate is that increased achievement would allow for a 30 percent redistribution of these funds.

In Massachusetts, dividing the total school support funding by the number of students (91,000) yields \$141 per pupil currently spent on the Low Scoring Schools program per year. Thirty percent of this total would equal \$43 per year, or \$550 per student over 13 years of schooling. The assumption is that in New York these savings would be equal to those in Massachusetts. Returns are assumed to accrue equally between kindergarten and grade 12.

Additional Expenses Due to Increased Child Care Participation

Increased Cost of High School Graduation

Source(s): Karoly and Bigelow (2005, p. 34 and p. 79) found an 11 percentage point increase in high school graduation for children participating in the CPC program. Higher graduation rates are likely to contribute to an increase in college participation rates of 1.5 years per graduate. In California, this resulted in an increased cost to the state of \$6,678.

These figures were applied to New York by substituting the state's annual higher education cost per pupil of \$7,783⁸. Multiplying this number by 1.5 years in higher education per student yields an increased cost of \$11,674 per additional high school graduate. This figure is multiplied by the 11 percent higher graduation rate to yield an average cost of \$1,284 per preschool participant.

⁶ Source: <http://www.degreetree.com/resources/how-to-become-a-substitute-teacher-in-new-york>

⁷ Source: <http://children.massbudget.org/mcas-low-scoring-student-support>

⁸ 2010 figure: http://www.sheeo.org/sites/default/files/publications/SHEE_FY10.pdf pg 29.

Home Visiting Programs

Nurse-Family Partnership

Several cost-benefit analyses of Nurse Family Partnership have been conducted in recent years. Isaacs (2007) estimated that the overall benefit of the program is \$5.68 per dollar invested for high risk children (under 100 percent Federal Poverty Level (FPL)) and \$1.26 for low risk children (over 100 percent FPL) children (Isaacs, 2007). Miller (2013) estimated a benefit of \$6.20 per dollar invested, averaged over all children. Aos (2011) estimated an average return to state taxpayers in Washington of \$30,325. This represents an average return to federal taxpayers of 1.03 per dollar invested for high risk children (under 100 percent FPL) and 0.21 for low risk children (over 100 percent FPL) (Isaacs, 2007).

We used the Isaacs estimates of \$5.68 for high risk children and \$1.26 for low risk children, representing the middle ground across analyses.

HIPPY

The return is estimated at \$1.80 per dollar invested (Aos, 2004).

Parents as Teachers

The return is estimated at \$7,236 per child (Aos, 2011).

Early Head Start

AOS (2011) estimated the return for Washington state at \$13,793 per child (Aos, 2011).

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