# Cost savings of school readiness per additional at-risk child in Detroit and Michigan

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# Summary

## *Background*

Research studies have demonstrated that investing in effective early education programs that prepare young children cognitively, physically, socially, and emotionally for success in school – particularly low-income children at risk of school failure – prevents or reduces needless public spending throughout the educational, social services, and criminal justice systems for juveniles and adults. Early school readiness also increases future state revenues by lowering drop-out rates and insuring a skilled workforce that contributes to the tax base.

## *Potential lifetime cost savings of school readiness per child*

The lifetime economic value of investing in school readiness for just one more child at risk of academic failure in Detroit, Michigan, is a conservative estimate of about $100,000, and approximately $39,000 for similar investments based on population factors in Michigan as a whole. These values are present values, discounted at a 3 percent discount rate, and do not include the lifetime earnings of the at-risk child achieving school readiness.

As shown in Figure 1, about two-thirds of the value generated through investing in one at-risk child in Detroit accrues to the state and government programs.

**1. Estimated lifetime savings per additional at-risk child achieving school readiness**

| Cost category | Detroit | Michigan |
|---|---|---|
| K-12 special education | $2,304 | $1,720 |
| K-12 grade repetition | $1,072 | $654 |
| **Subtotal K-12 lifetime savings** | **$3,376** | **$2,374** |
| Criminal justice | $50,943 | $14,798 |
| Child care subsidies | $8,145 | $6,315 |
| Public assistance | $5,245 | $4,066 |
| Child welfare | $2,037 | $1,579 |
| State tax revenue | $262 | $262 |
| Unemployment insurance | $333 | $386 |
| **Subtotal state government lifetime savings** | **$66,965** | **$27,406** |
| Crime victims saving | $27,762 | $8,064 |
| Health (Alcohol abuse and drug use) | $84 | $84 |
| Productivity of employed parents | $1,545 | $1,545 |
| **Subtotal social savings** | **$29,391** | **$9,693** |
| **Total per child lifetime savings** | **$99,732** | **$39,473** |
| **Total adjusted for out-migration** | **$79,611** | **$32,075** |

## *Methods*

These estimates are based on actual school graduation and expenditure data, poverty rates, crime rates, and other data for Detroit and for Michigan as a whole and ECE program effect sizes and parameters from the existing research on effects of early childhood education. The reported values are present discounted values at a 3 percent discount rate.

To make these estimates, we relied on the best available research data from longitudinal studies of early childhood education programs in Michigan and other states. We used actual school graduation and expenditure data, poverty rates, crime rates, and other data for Detroit and for Michigan as a whole. We obtained data from the Michigan Department of Education, as well as from the Census Bureau and the National Archive of Criminal Justice Data. When current Michigan or Detroit data were limited or unavailable, we made conservative assumptions using national data.

## *Conclusions*

School readiness for more young children is critical for tackling Detroit's economic and social challenges. Investing in school readiness produces an educated and skilled workforce and social returns with substantial economic value.

Michigan has been investing in school readiness over the past 25 years and, accordingly, has reaped the benefits of more than a billion dollars in annual savings and revenues (Chase et al, 2009). Those benefits would rise exponentially as a result of increased school readiness investments in Detroit, given the potential state and public dividend for just one additional child achieving school readiness in Detroit is at least $80,000.

# Introduction

## *Purposes of this study*

This study demonstrates the economic value to state government and the public of investing in school readiness for just one more child at risk of academic failure in Detroit relative to Michigan as whole. Much of this value takes the form of savings. For example, children who attend preschool require less special education, repeat grades less, have fewer behavioral problems in school, graduate at a higher rate than others, and have less involvement in the very expensive criminal justice system as both juveniles and adults. As adults they earn higher incomes, contribute more in taxes, and are more likely to be employable and employed in the new economy. In these and other respects, school readiness saves money in the K-12 educational system, criminal justice system, and social welfare system.

If a higher proportion of children in Detroit attend comprehensive preschool in future years, moreover, the state's annual savings will grow. Conversely, by not investing more fully in the early education of young children, the annual cost burdens, lost earnings, and lost tax revenues will grow.

This study builds on models and methods used in recent studies in Minnesota, Michigan, and Illinois. It translates the best research on the returns associated with comprehensive early childhood education (ECE) into usable estimates of the actual returns for investing in one single disadvantaged child. The focus is on the economic returns to K-12 schools, state government, and the public, not on the lifetime earnings of the child participating in ECE.

## *Overview of early childhood education cost/benefit literature*

Many studies show that high-quality early learning experiences pay off in the long run (Ehrlich and Kornblatt, 2004; Karoly, Kilburn, & Cannon, 2005; Friedman, 2004; Lynch, 2007; Temple and Reynolds, 2005; Reynolds, 2007; Rolnick and Grunewald, 2003). Most of the return on investment is in reduced public costs associated with child welfare, public assistance, crime and incarceration, and benefits related to increased education and earnings.

Several studies focus specifically on measuring the effects of early childhood interventions and quality early care and education on school systems and time spent in K-12 special education and special education spending (Barnett, 1995; Belfield, 2004; Conyers, Reynolds, and Ou, 2003; Harvey, 2006; Reynolds, 2007).

Other studies focus on the impact of early childhood education programs on additional areas of government spending, including criminal justice, public assistance, Medicaid,

unemployment, child welfare, health care, and child care (Aos et al., 2004; Mann and Reynolds, 2006; Nores et al., 2005; Oppenheim and MacGregor, 2002; Reynolds et al. 2002).

Finally, some studies have illustrated the effect of early childhood education on increased tax revenues from increased earnings of participants themselves and from future generations due to higher educational attainment that can be attributed to early childhood interventions (Campbell et al., 2002; Nores et al., 2005; Oppenheim and MacGregor, 2002; Sum et al., 2008).

## *Estimates of potential cost savings from reviewed studies*

The Appendix describes the studies used in this analysis and the estimated cost savings in different categories generated per dollar of investment in school readiness.

These estimates show that the potential returns range from $2.36 to $16.14 per dollar of investment. These are present dollar values of the stream of benefits and reduced costs received over the lifetime of a student discounted at 3 percent.

## *Assumptions in the analyses*

- The analyses in this study estimate benefits and cost savings for various Michigan government systems, including K-12 education, criminal justice, welfare/public assistance, Medicaid, unemployment, child welfare, health care, and child care.
- Estimates of saved costs are based on actual rates for the various conditions or population characteristics and cost data from Detroit and Michigan whenever possible, with appropriate proxies either from national averages only when Michigan and Detroit data are not available. Figure 6 on page 13 shows the rates and costs used in the calculations.
- The study focus is on children ages 3 to 5 classified as 'at risk' who have not been served through the state's Early Childhood Block Grant (ECBG) programs.
- Estimated benefits of the ECBG programs for children ages 3 to 5 are discounted to account for differences in the level of intensity of services with respect to those impact effects found within the research literature.

# Estimated cost savings to Detroit and Michigan per additional child participating in ECE

This section estimates the lifetime cost savings for one child at risk of academic failure within the city of Detroit and for Michigan overall as a result of adequately preparing for kindergarten one more at-risk child through school readiness investments. The cost savings estimates fall into three categories:

**K-12 schools** – through reduced special education, grade repetition, and teacher turnover costs

**State government** – through reduced costs of dealing with juvenile and adult criminals; through lower welfare, Medicaid, and unemployment costs; and through higher tax revenues as successful students become productive adults.

**The public** – through reduced juvenile and adult crime victimization and costs due to injuries and property losses, reduced alcohol and drug abuse costs, and higher tax revenues from the parents of prepared children.

These estimates are based on actual school graduation and expenditure data, poverty rates, crime rates, and other data for Detroit and for Michigan as a whole and ECE program effect sizes and parameters from the existing research on effects of early childhood education (as shown in Figure 9, page 21).

## *Estimated cost savings for K-12 education*

### Special education

During 2010 and 2011 nearly 12,000 children in Detroit and more than 200,000 in Michigan received special education services. Figure 2 shows the incidence by type of non-normative primary disability; that is, those which can be improved through ECE and special education. We assume that ECE has an average impact on the incidence of the disability of 12 percent (Aos, 2004). Figure 2 also shows the reduction in the incidence of the disability due to ECE after applying that effect size.

## 2. Incidence of disability improved through ECE and special education

| | Incidence of disability | | Amount of reduced incidence due to ECE | |
|---|---|---|---|---|
| | Detroit | Michigan | Detroit | Michigan |
| Specific learning disability | 6.4% | 5.2% | 0.8% | 0.6% |
| Speech/Language | 1.8% | 2.65% | 0.2% | 0.3% |
| Emotional disturbance | 0.6% | 0.9% | 0.07% | 0.1% |
| Other health impairment | 0.8% | 1.2% | 0.09% | 0.1% |
| Developmental delay | 0.3% | 0.1% | 0.035% | 0.01% |

The annual cost savings in special education are computed applying the reduction in the incidence of each disability to the annual cost per child receiving special education. The lifetime savings are the result of assuming that the child receives at most 12 years of special education.

The per-pupil costs for each primary disability area of special education that could be prevented or ameliorated through ECE are shown in Figure 3. The costs of special education are assumed to be in addition to the cost of educating students on a regular track and do not net out potential added costs of returning the students to regular classrooms.

The estimated lifetime savings in special education amounts to $2,304 in Detroit and $1,720 for Michigan as a whole.

## 3. Lifetime costs savings of special education per additional at-risk child in ECE

| | Detroit | Michigan |
|---|---|---|
| Total students with disabilities | 12,231 | 203,728 |
| Total costs (appropriations) related to Special Ed. Grants | $198,842,183 | $2,419,516,345 |
| Cost per student with disability | $16,257 | $11,876 |
| Annual cost savings per child in the K-12 system who participated in ECE program | $192 | $143 |
| Lifetime cost savings in special education per child in the K-12 system who participated in ECE program | $2,304 | $1,720 |

## Grade repetition

Early childhood education reduces the incidence of grade repetition within a range of 6 percent to 23 percent, with an average impact of 21 percent (Anderson, 2002).

The average impact on grade repetition (21%) times the probability of being retained in a given school year gives the estimated probability of a child not repeating a grade due to ECE. We estimate this probability based on retention data available for Detroit and Michigan (1st, 4th, 7th, 8th, 9th, and 11th grades). In addition, we estimate the marginal cost per additional pupil. This cost is the change in total expenses paid by the Detroit school district and the state of Michigan for one more child entering the K-12 system. Applying the reduction in the probability of being retained in the school years noted above and adding up the resulting costs, we obtain the estimated lifetime savings on grade retention per child who participates in ECE.

The estimated lifetime savings due to reduced grade repetition amounts to $1,072 in Detroit and $654 for Michigan as a whole.

**4. Lifetime costs savings of reduced grade repetition per additional at-risk child in ECE**

| | Detroit | Michigan |
|---|---|---|
| Marginal operating expense per additional Pupil Dollars of 2010 | $8,148 | $24,790 |
| Average percentage of students retained by grade | 10.4% | 1.05% |
| Reduction in grade retention rate due to ECE | 2.19% | 0.22% |
| Lifetime cost savings on grade retention due to ECE | $1,072 | $654 |

## Summary of estimated cost savings for K-12 education

The estimated potential savings to K-12 per additional at-risk child achieving school readiness reaches $3,376 for a child in Detroit and $2,374 based on a child in Michigan as a whole.

## Additional considerations and issues

We believe these cost savings estimates to be conservative for these reasons:

First, when we had a choice of effect sizes from among several studies with a range of effects, we chose the average effect or an effect size from the lower part of the range. For example, other studies have found effects of ECE on special education costs ranging from 6 percent to as high as 49 percent for the Chicago Child-Parent Centers (Reynolds, et al,

2011). Our calculations use an effect size of 12 percent computed by Aos, et al (2004) based on a meta-analysis of 23 studies.

Second, there are additional cost savings to the K-12 education system that could result from quality early childhood education that were not included in this analysis, including: 1) reduced use of achievement enhancement and remedial education programs, 2) reduced non-instructional and health costs related to special education and preventable health problems, 3) reduced costs for alternative schools, 4) increased per pupil aid from parents, and 5) reduced costs of having to provide education to students in juvenile detention. While there is reason to believe that improved school readiness through early childhood education would affect these categories of expenditures, these savings could not be included because there has been no research to measure or monetize the impact of improved school readiness in these areas. To the extent that savings might be realized in all or some of these areas, the estimates presented here understate the total savings to the K-12 system.

Third, due to the lack of sufficient data, we did not include estimates of savings due to reduced teacher absenteeism and turnover, reduced school safety spending in higher grades, and reduced costs associated with English language learners.

Finally, from the point of view of K-12 school finances, school readiness reduces the dropout rate and preserves per pupil aid. However, these savings are not included here because, from the point of view of Michigan as a whole, these dollars are transferred from taxpayers to school districts, thus netting to zero.

## *Estimated cost savings to state government programs*

### Criminal justice

The savings from crime reduction are based on the avoided marginal cost of incarcerating an additional criminal. Using a 10-year series of total expenses in prisons and the population of inmates, we adjust the marginal cost of incarceration by the probability of committing a particular type of crime at a given age (18 to 64) and an assumed probability of conviction. The resulting series of costs are transformed to net present value of one year of additional conviction. We estimate this cost to reach $27,403.

The portion of the present value cost of conviction that is reduced due to ECE has been estimated to be nearly 54 percent (average from relevant studies: Reynolds, 2006, and Aos, 2004). Consequently, in the state of Michigan, the lifetime cost savings from an additional conviction that is avoided due to ECE reaches $14,798. For Detroit, based on crime rates 3.4 times the statewide rates, the resulting savings reach $50,943 per child participating in ECE programs.

These savings refer to lifetime savings per additional ECE participant and include juvenile and adult costs. We lack sufficient data to disaggregate incarceration costs by age.

## Child care subsidies

Some families with children participating in state- or federally-funded early childhood education programs are eligible for child care subsidy payments but do not utilize the subsidy while their children are enrolled in a subsidized ECE program. Families qualify for child care subsidies in Michigan if their annual family income is at or below 185 percent of the Federal Poverty Line. We estimate that the average life cost per child in a family that utilizes child care subsidy payments in Michigan is $12,631. Because of participation in the state-funded Great Start Readiness Program (GSRP), many low-income families do not fully utilize the child care aid for which they are eligible. In Michigan, if only half of the families classified as low income in GSRP classes would otherwise require child care aid, the State saves an estimated $6,315 in care subsidy payments per child in ECE.

For the city of Detroit this number can reach $8,145 due to the higher proportion of households below poverty levels in the city.

## Public assistance (state portion of TANF)

Based on an average annual savings in Michigan welfare costs of $134 per ECE participant, lifetime savings can reach an estimated $4,066 per child in Michigan (Nores, et al, 2005). To estimate the potential savings for Detroit, we assume welfare benefits are correlated with the poverty rate, which in Detroit (33.2%) is 2.3 times the rate of Michigan (14.5%), representing a relative change of 1.29. The lifetime savings in Detroit, then, reaches an estimated $5,245.

## Child welfare (abuse, neglect, and out-of-home placements)

Comprehensive early childhood education programs that promote school readiness also have been shown to contribute to reductions in child abuse and neglect. The studies we analyzed all showed significant savings in costs associated with child abuse and neglect, averaging $1,579 per child participant in the programs in Michigan. Savings within Detroit, estimated based on differences in poverty levels between the city and the state, amount to $2,037 per additional child prepared for school.

## Michigan tax receipts

According to Sum et al. (2008), the difference in annual savings between high school graduates and dropouts is approximately $11,500 (2010 dollars). The net present value of this amount for a productive life is nearly $327,037 dollars. Early childhood education can increase the likelihood of high school graduation by almost 4 percent (Nores, et al, 2005). We estimate, then, that an at-risk child in Detroit with ECE will have lifetime earnings of $13,081 more than an at-risk child without ECE.

Using a 2 percent tax rate for Michigan, the additional income of participants in ECE translates to an additional $262 in tax revenues for Michigan.

## Unemployment insurance savings

As we noted before, every child who participates in early childhood education is more likely to graduate from high school, and, consequently, more likely to be employed more often and less likely to receive unemployment insurance (UI). The Bureau of Labor Statistics estimates that high school graduates have 3.3 fewer spells of unemployment between ages 18-45. The average weekly UI is close to $240, which implies an estimated cost per unemployment spell of nearly $2,900. The lifetime savings due to high school graduation reaches $9,646 (Cost per spell x difference in number of spells between HS graduates and dropouts). As we have noted before, ECE improves graduation rates by nearly 4 percent. Thus, Michigan can save at least 4 percent of the lifetime costs associated with unemployment insurance payments. This amount can reach $386.

On the other hand, students in Detroit are nearly 14 percent less likely to graduate from high school than a typical student in the state. Thus, the savings from unemployment insurance must be reduced by this proportion to account for lower graduation rates, amounting to $333 lifetime savings per additional at-risk child becoming ready for school in Detroit.

## Summary of estimated Michigan state government savings and revenue due to increased school readiness of at-risk child

The estimated potential savings to state government per additional at-risk child achieving school readiness reaches $66,965 for a child in Detroit and $27,406 based on a child in Michigan as a whole.

## *Estimated current social cost savings in Michigan*

This section estimates current social costs savings based on actual expenditures in Michigan and program effect sizes and parameters from research literature.

### Crime victimization

Crime victims suffer tangible losses that constitute social costs. ECE has been shown to reduce criminal behavior of participants and thus reduce victims' costs by $8,064 in Michigan (Reynolds et al, 2002). Based on the higher crime rates in Detroit (on average, 3.4 times higher than in Michigan overall), we estimate that lifetime savings for crime victims in Detroit can reach nearly $28,000 per child who receives ECE.

### Health (alcohol abuse and drug use)

Children who participate in comprehensive early education programs are less likely to present problems of alcohol and illicit drugs abuse (Aos, et al. 2002). The savings for Michigan taxpayers can reach up to $84 per participant. However, these savings are difficult to disaggregate at the city level since there are not specific parameters to make this distinction.

### Productivity of employed parents

As a result of children receiving early childhood education, parents see their earnings increase. Research has shown that parents with children who participate in comprehensive early education programs are more likely to participate in the labor force, establish more stable work-related relationships, and spend more quality time with their children during non-work hours. Previous research has demonstrated that these additional earnings may reach $909 per participant per year of program. We assume an average participation in ECE of about 2 years, and then discount this amount by 15 percent to account for mothers who have more than one child in ECE. We estimate that the gains in maternal productivity per participant may reach approximately $1,545.

### Summary of estimated social savings and revenue due to increased school readiness of at-risk child

The estimated potential social savings per additional at-risk child achieving school readiness reaches $29,391 for a child in Detroit and $9,693 based on a child in Michigan as a whole.

## *Summary of total lifetime value in Detroit and Michigan due to school readiness for one additional at-risk child*

The total lifetime value of gaining school readiness for one at-risk child is about $99,732 in Detroit and about $39,473 based on Michigan as a whole. As shown in Figure 5, more than 60 percent of the value generated through investing in one at-risk child in Detroit accrues to the state and government programs.

**5. Estimated total lifetime value of school readiness for one additional at-risk child**

| Cost savings category | Detroit | Michigan |
|---|---|---|
| K-12 education | $3,376 | $2,374 |
| Michigan state government | $66,965 | $27,406 |
| Social | $29,391 | $9,693 |
| **Total potential lifetime savings per at-risk child** | **$99,732** | **$39,473** |
| **Adjusting for out-migration** | **$79,611** | **$32,075** |

## Adjusting for effects of out-migration

Families moving out of Detroit and Michigan reduce the lifetime value of gaining school readiness in Detroit and Michigan. According to Bartik (2009), savings that accrue during childhood such as savings in school costs, child care subsidies, child welfare spending, and parental productivity are reduced by 9 percent and other lifetime savings are reduced by about 28 percent. Accordingly, the total lifetime value of gaining school readiness for one at-risk child, adjusted for out-migration, is about $80,000 in Detroit and about $32,000 based on Michigan as a whole

# Study methods and underpinning research

## *Rates and cost data used in the study calculations*

Figure 6 shows the rates for the various conditions or population characteristics and the cost data used in the study calculations for Detroit and Michigan. The data sources are also shown.

**6. Rates, costs, and sources used in the study calculations**

| Elements | Detroit | Michigan | Source |
|---|---|---|---|
| ECE effect on reducing disabilities | 2% | 2% | Michigan Department of Education |
| Special Education costs (appropriations) | $198 million | $2,419 million | Michigan Department of Education |
| Number of students retained | 11% | 1% | Michigan Department of Education |
| K-12 marginal operational expenses | $8,148 | $24,790 | Michigan Department of Education |
| Average cost of teacher salaries | $60,400 | $56,973 | Michigan Department of Education |
| Crime rates (per 100,000) | | | FBI, Uniform Crime Reports, prepared by the National Archive of Criminal Justice Data |
| Violent crimes | 1,967 | 497 | |
| Robbery | 651 | 124 | |
| Aggravated assault | 1,239 | 322 | |
| Property crimes | 5,568 | 2,838 | |
| Burglary | 2,091 | 761 | |
| Larceny theft | 2,045 | 1,783 | |
| Motor vehicle theft | 1,432 | 295 | |
| Murder | 40 | 6 | |
| Individuals below poverty level | 33.2% | 14.5% | Census Bureau |
| High school graduation rate | 62.3% | 75.9% | Census Bureau |

*Note: The high marginal operating expense for Michigan is due to expenditures exceeding $20 billion per year with relatively high increases in expenditures per year relative to declining enrollments.*

## *Background research on potential cost savings and benefits*

The research literature on school readiness investments documents potential savings in K-12 spending; crime-related costs; and government health, public assistance, and child care programs. Cost-benefit studies of comprehensive early education programs have also documented potential benefits to society in increased personal earnings and tax revenues.

## K-12 cost savings

According to the research literature, the largest potential savings to K-12 educational systems due to improved school readiness is in special education spending. A portion of these costs could be reduced or prevented if more low-income 3- and 4 year-olds participated in early education and were fully prepared for kindergarten.

Nationally, approximately 20 percent of children are identified as having special educational needs (High, 2008). Two percent have normative disabilities – blindness, deafness, autism, moderate/profound mental retardation, or significant language impairment. Eighteen percent have non-normative disabilities such as learning disabilities, speech and language delays, mild hearing loss, mild mental retardation, and social/emotional/behavioral maladjustments that are preventable or ameliorated with early intervention.

Of those with non-normative disabilities (90% of the students in special education), research shows that anticipatory guidance, such as parenting education provides, can reduce social and emotional risks and build protective factors in young children (Edwall, 2008) and quality early care and education can reduce the amount of time spent in K-12 special education (Reynolds, 2007). In addition, research on children with mild hearing loss shows they have more academic difficulties and are more likely to repeat a grade than their peers with normal hearing, which could be prevented with earlier detection and treatment (Tharpe, 2006).

Figures 7 and 8 summarize the estimated effects and net benefits of early childhood education with regard to special education and grade repetition. Based on the outcomes of three major early childhood education studies (HighScope Perry Preschool, The Abecedarian Project, and Chicago Child-Parent Centers) and a meta-analysis of 48 other studies, the return to each K-12 dollar invested in early childhood education ranges from 4 cents to 73 cents.

This study also looks at other possible benefits within the K-12 system in addition to the actual costs of non-normative special education and grade repetition. Using data from the Early Childhood Longitudinal Study, Belfield (2004) finds that children who participate in preschool programs nationally have significant behavioral and cognitive gains over those who do not participate in early childhood education. He estimates that when 40 percent more students attend pre-K:

- Teacher turnover is reduced 24 percent.
- Math and reading achievement scores increase by .3 standard deviation.
- Student behavior improves by 32 percentage points on a comprehensive index of student behavior.

Belfield further finds that a .3 standard deviation increase in student achievement leads to a 19 percent reduction in physical attacks on teachers. The 32-point improvement in student behavior raises the probability that the kindergarten teacher will report "really enjoys current job" or "would choose teaching again." This point is made even more clearly by a 2009 survey of kindergarten teachers in Michigan, which showed that 68 percent of those surveyed agreed that they had "experienced significant frustration as a direct result of needing to address the physical, social-emotional, language, cultural, cognitive, and/or special needs of a kindergarten student or students," and 18 percent said they had "experienced a desire to change professions" based on the same factors.

These findings suggest there are additional teacher-, school-, and school-system-related benefits, beyond the scope of this analysis, which can be produced by improving school readiness through early childhood education. Belfield (2004) identifies four areas that could potentially be affected by increases in early childhood education enrollment:

- Teacher turnover due to behavior problems, low achievement, or lack of preparation for K-12 education among students
- Teacher absenteeism due to student behavior problems
- Low achievement or lack of preparation for K-12 education among students
- School safety programs (child or adolescent delinquent or criminal behavior increasing the need for spending on school safety programs)

Other potentially avoidable costs to K-12 systems include costs associated with English language learner programs. Research indicates that quality early education may improve the English abilities of English language learners, which could reduce the need for future spending in this area (Barnett, 2007; Gormley, 2007; and Magnuson, Lahaie, and Waldfogel, 2006).

## Crime-related cost savings

The relationship between participation in early childhood education (ECE) programs and reduction in crime appears to be direct. Children in ECE programs learn to control their behavior better than their peers who do not receive early education opportunities. ECE and lower crime rates also have an indirect link. ECE contributes to better academic achievement, reduced special education placements, and reduced child maltreatment, which are all associated with a reduction in crime (Mann and Reynolds, 2006). In addition to the negative economic effects that crime has on others, having a criminal history has negative implications for individuals, since a criminal background may affect employability and/or career mobility (Nores et al., 2005).

Crime-related cost savings attributable to ECE interventions result from juvenile justice system savings, adult criminal justice savings, and savings for crime victims. In fact, some believe that "[t]he greatest economic benefit of providing high-quality preschool education to disadvantaged children is a dramatic reduction in crime" (Oppenheim and MacGregor, 2002). Of the studies included in this analysis, only the Abecedarian program in North Carolina has not produced any statistically significant cost savings due to reduced crime. That exception has been attributed to the fact that the Abecedarian program was located in an area with relatively low crime rates compared with the communities served by other well-studied ECE programs, and could also be due to the small sample sizes which reduce statistical power (Campbell et al., 2002).

It appears that the largest cost savings due to crime reduction that ECE programs achieve is in the area of crime victims' savings. Oppenheim and MacGregor (2002) reported that every dollar invested in ECE yields a national average savings of $5.86 to crime victims. Reynolds et al. (2002) reported 90 cents saved by crime victims for every dollar invested in the Chicago Child-Parent Centers ECE program. In addition to victims' outcomes, the costs of administering the juvenile justice system fall between 68 cents and 90 cents for every dollar invested in ECE. Adult criminal justice system cost savings are about 40 cents for every dollar invested.

When including all types of cost savings from crime reduction, a meta-analysis of 58 ECE programs found an average cost savings of nearly 69 cents for every dollar invested (Aos et al., 2004). The Chicago Child-Parent Centers program results indicated a savings of $1.98 due to reduced crime for every dollar invested (Reynolds et al., 2002). Even more significant, the HighScope Perry Preschool program produced savings in the range of $4.85 to $11.30 of savings for every dollar invested in ECE (for discount rates of 7 percent and 3 percent respectively). For this program, there was a much more significant effect for male program participants than females (Nores et al., 2005). As previously mentioned, the Abecedarian program did not produce savings in the area of crime. Therefore, the total benefit-to-cost ratio with regard to crime reduction outcomes of ECE programs is $0 up to $11.30 for every dollar invested.

## Cost savings for public assistance programs

Unemployment is reduced by ECE program participation indirectly via impacts on educational attainment. In 2000, individuals with high school degrees recorded an overall unemployment rate of 3.8 percent compared with 7.9 percent for high school dropouts (according to U.S. Census data cited in Oppenheim and MacGregor, 2002).

Nores et al. (2005) found that the cost of administering public assistance is nearly 30 percent of total disbursements. In addition, overpayment and payment to ineligible families is 6 percent of total disbursements. Therefore, for every dollar disbursed in public assistance to individuals, there is an additional cost to society of 38 cents.

Overall, cost savings for public assistance programs (TANF/AFDC) are not large compared with the benefits to other systems (K-12 education and criminal justice system). Most studies found only 1 to 2 cents per dollar invested in terms of cost savings to these programs.

## Cost savings for the child welfare system

The literature reviewed here does not explicitly state the causal mechanisms by which ECE programs contribute to a reduction in child maltreatment (also called child abuse and neglect). The national review by Oppenheim and MacGregor (2002) found that 15 cents in cost savings accrue for every dollar invested in ECE. The Chicago Child-Parent Centers produced 12 cents of cost savings for every dollar invested (Reynolds et al., 2002). These cost savings benefit the child welfare system and also the individual children who do not suffer from abuse and neglect.

## Cost savings for health care

Cost savings in the area of health care can be attributed to reduced incidence of tobacco use and reduced need for treatment for alcohol or other drug abuse. Citing a 2001 U.S. Department of Education report, Oppenheim and MacGregor (2002) assert that high-quality ECE programs contribute to lower public (i.e., Medicaid) and private health care costs by improving educational attainment, which leads to better health directly and indirectly through higher earnings. Specifically, high school graduates are 50 percent more likely to be in excellent or very good health than those who do not graduate from high school (with rates of 57.8% to 38.7%, respectively).

Masse and Barnett (2002) attribute all differences in health behavior for ECE program participants vs. non-participants to the increased educational attainment among participants and to the better job opportunities that arise when one has more education:

> "Education increases the ability to be an effective consumer of health care services and producer of personal health. Education also increases earning power, the ability to command wages, fringe benefits, vacation time, and the ability to avoid working conditions that may be detrimental to personal health. Education also increases income that allows one to purchase higher quality and quantity of health services and to establish living conditions that are conducive to good health" (p. 22).

These researchers also describe how the tendency to have concern for the future is represented by people who are willing both to invest in more education and engage in behavior that promotes future good health.

In their meta-analysis of benefit-cost research for 58 ECE programs, Aos et al. (2004) reported a cost savings of 4 cents for every dollar invested in terms of a reduction in alcohol and drug abuse. The Abecedarian program participants were 16 percent less likely than control group individuals to be tobacco users, which increased the lifespan of program participants an average of 6.5 years at an estimated value of $161,000 per year, so the return on investment is $3.91 for every dollar invested.

## Cost savings for child care

In some states, child care cost savings – which mainly accrue to the parents of participants but can also accrue to the general public in cases in which the participant is eligible for child care subsidy – can be attributed to a reduced need for child care services during the hours in which the child is participating in the ECE program. Oppenheim and MacGregor (2002) reported cost savings related to child care expenses of 19 cents for every dollar invested. Reynolds et al. (2002) found the Chicago Child-Parent Centers program saved 25 cents on child care expenses for every dollar invested.

## Increased earnings resulting in increased income tax revenue

Increased income tax revenue due to increased earnings is derived from three sources: increased income for mothers of children who participate in ECE, due to their ability to work more hours while their child is participating in early education; increased income for participants, due to increased educational attainment that can be attributed to ECE enrollment; and increased income for future generations (children and grandchildren of participants), due to the increased educational attainment of participants that is associated with higher educational attainment for their offspring. Therefore, the primary way in which ECE intervention results in increased earnings and tax revenue is via increased educational attainment among ECE participants. Increased earnings by participants are a benefit of ECE programs that accrue to individual participants and also generate increased income tax revenue, which is a benefit that accrues to the general public (taxpayers).

Cost-benefit studies of the Abecedarian program are the only research reviewed here that included increased maternal earnings and earnings of future generations in calculations of benefits of ECE programs. Campbell et al. (2002) reported that 44 cents in increased income tax revenue for mothers of participating children was obtained for every dollar invested in the program. The same authors reported 13 cents in increased earnings of future generations (children through great-grandchildren, projected) for every dollar invested.

In terms of participant lifetime earnings, the return on investment ranges from $1.23 for every dollar invested (Oppenheim and MacGregor, 2002) to $3.32 for every dollar invested (Nores et al., 2005). In terms of income taxes paid by participants, the return on investment ranges from 17 cents for every dollar invested (Oppenheim and MacGregor, 2002) to $1.08 for every dollar invested (Nores et al., 2005). Results from the HighScope Perry Preschool benefit-cost analyses show that increased participant earnings and increased participant income taxes are more significant for female participants than for male participants (Nores et al., 2005).

Overall, increased earnings and taxes that can be attributed to ECE program participation produce a benefit that exceeds program costs from $1.40 to $4.38 for every dollar invested.

## Estimates of potential cost savings from reviewed studies

Figure 9 summarizes the cost savings in different categories generated per dollar of investment in school readiness through ECE estimated in different studies. In each line the numbers indicate the present value of the dollars and cents saved for each dollar invested.

These estimates show that the range of potential returns estimated in different studies to be from $2.36 per dollar of investment to $16.14. These are present values of the stream of benefits and reduced costs received over the lifetime of a student.

## 7. K-12 effects of early childhood education programs

| Outcome | HighScope Perry Preschool Percent difference | | Abecedarian Percent difference | | Chicago CPC Percent difference | | Aos et al. (2004) meta-analysis of ECE Programs Effect Size |
|---|---|---|---|---|---|---|---|
| Special Education | -12%* | (of years by age 19) | -23.2%* | (by age 15) | -10.2%*** | (by age 18) | -0.13 |
| Emotional or behavioral disorder | - | | - | | 0%a | (grades 1 to 8) | - |
| Mental retardation | - | | - | | -0.9%a | (grades 1 to 8) | - |
| Specific learning disability placement | - | | - | | -3.5%*a | (grades 1 to 8) | - |
| Speech and language impairment placement | - | | - | | -1.7%a | (grades 1 to 8) | - |
| Grade Retention | -0.2 | (years by age 27) | -23.3%* | (by age 15) | -15.4%*** | (by age 15) | -0.18 |

***Source:*** *Karoly and Cannon (2005) Table 3.5. Conyers, Ou, and Reynolds (2003); Aos (2004) Table C1.a.*

***Notes:*** *Percent difference refers to the experimental group's figure subtracted from that of the comparison/control group. Statistical significance is indicated by asterisks: * p < 0.05, ** p < 0.01, *** p < 0.001.*

## 8. K-12 costs and benefits of early childhood education (2008 $)

| | Perry | Head Start | Chicago CPC | Abecedarian | Aos et al. (2004 ) meta-analysis of ECE Programs |
|---|---|---|---|---|---|
| Special education (SE) | No data | $2,211.33 | $5,498.85 | No data | $138.68 |
| Grade retention (GR) | No data | $207.57 | $910.34 | No data | $223.75 |
| Grade retention and special education | $16,706.12 | $2,418.90 | $6,409.19 | $8,790.52 | $362.43 |
| Cost of program | $17,282.51 | $14,750.75 | $8,056.24 | $49,960.79 | $7,785.87 |
| Ratio of GR and SE benefits to program cost | 0.38 | 0.17 | 0.73 | 0.21 | 0.04 |

***Source:*** *Karoly and Cannon (2005) Table 4.4; Aos (2004) Appendix E; Masse and Barnett (2002) Table 8.2 ; Reynolds et al. (2002) Table 5A; Currie (2001) Table 3; Isaacs (2007) Table 2; Barnett (1985) Table 3.*

***Notes:*** *K-12 Benefits include grade retention and special education. Values are adjusted using the Consumer Price Index for All Urban Consumers. na=not applicable/available. Benefits and costs are per participant.*

## 9. Areas of potential benefits or reduced spending due to school readiness through ECE investment

| | Estimated ranges of returns on investment (ROI) | Programs/Studies |
|---|---|---|
| K-12 spending total | 0.09 to 0.93 | Aos (2004), Belfield (2004), Lynch (2007), Magnuson (2006) |
| Special education and grade repetition | 0.04 to 0.73 | HighScope Perry Preschool, Chicago CPC, Abecedarian Project, Aos et al. (2004) meta-analysis. |
| Dropouts and increased high school usage (state aid/revenue) | No estimates | Lynch (2007) |
| Teacher turnover | 0.02 to 0.09 | Belfield (2004) |
| Teacher absenteeism | 0.01 to 0.04 | Belfield (2004) |
| School safety programs | 0.02 to 0.07 | Belfield (2004) |
| English Language Learner Program usage | No estimates | Magnuson (2006) |
| Crime | 0.00 to 11.30 | See below plus HighScope Perry Preschool data and meta-analysis from Aos et al. (2004) |
| Juvenile crime | 0.68 to 0.90 | Reynolds et al. (2002) Chicago CPC, and national average from Oppenheim and MacGregor (2002) |
| Adult crime | 0.39 to 0.40 | Reynolds et al. (2002) Chicago CPC, and national average from Oppenheim and MacGregor (2002) |
| Crime victims | 0.92 to 5.68 | Reynolds et al. (2002) Chicago CPC, and national average from Oppenheim and MacGregor (2002) |
| Public assistance programs | 0.00 to 0.03 | Aos et al. (2004) meta-analysis, Masse and Barnett Abecedarian, national average from Oppenheim and MacGregor (2002), and Nores et al. (2005) HighScope Perry Preschool |
| TANF/AFDC | Negative ROI to 0.18 | National average from Oppenheim and MacGregor (2002), Nores et al. (2005) HighScope Perry Preschool, and Masse and Barnett Abecedarian |
| Unemployment benefits | 0.01 | National average from Oppenheim and MacGregor (2002) |
| Medicaid | No estimates | |
| Child abuse & neglect | 0.12 to 0.15 | National average from Oppenheim and MacGregor (2002) and Reynolds et al. (2002) Chicago CPC |
| Health | No estimates | |
| Alcohol and drug use | 0.04 | Aos et al. (2004) meta-analysis |
| Tobacco use | 3.91 | Masse and Barnett Abecedarian |

## 9. Areas of potential benefits or reduced spending due to school readiness through ECE investment (continued)

| | Estimated ranges of returns on investment (ROI) | Programs/Studies |
|---|---|---|
| Child care | 0.19 to 0.25 | National average from Oppenheim and MacGregor (2002) and Reynolds et al. (2002) Chicago CPC |
| Increased earnings & income tax revenues | 1.40 to 4.38 | See below |
| Maternal earnings | 0.44 | Masse and Barnett Abecedarian |
| Participant earnings | 0.87 to 3.32 | Masse and Barnett Abecedarian, Reynolds et al. (2002) Chicago CPC, national average from Oppenheim and MacGregor (2002), and Nores et al. (2005) HighScope Perry Preschool |
| Participant taxes | 0.17 to 0.93 | Reynolds et al. (2002) Chicago CPC, national average from Oppenheim and MacGregor (2002), and Nores et al. (2005) HighScope Perry Preschool |
| Earnings of future generations | 0.13 | Masse and Barnett Abecedarian |
| TOTAL PROGRAM IMPACT | 2.36 to 16.14 | National average from Oppenheim and MacGregor (2002), Nores et al. (2005) HighScope Perry Preschool, Reynolds et al. (2002) Chicago CPC, Abecedarian Project, Aos et al. (2004) meta-analysis |

***Sources:*** *Isaacs (2007); Belfield (2006).*

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