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Updating the Economic Impacts of the High/Scope Perry Preschool Program

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This article derives an updated cost-benefit ratio for the High/Scope Perry Preschool Program, an intensive preschool intervention delivered during the 1960s to at-risk children in Ypsilanti, Michigan. Because children were randomly assigned to the program or a control group, differences in outcomes are probably attributable to program status. Data on outcome differences is now available on participants as they reached the age of 40; outcomes include educational attainment, earnings, criminal activity, and welfare receipt. These outcomes are rendered in money terms and compared to the costs of delivering the program to calculate the net present value of the program both for participants and for society. The data show strong advantages for the treatment group in terms of higher lifetime earnings and lower criminal activity. For the general public, gains in tax revenues, lower expenditures on criminal justice, lower victim costs, and lower welfare payments easily outweigh program costs. At a 3% discount rate the program repays $12.90 for every $1 invested from the perspective of the general public; with a 7% discount rate, the repayment per dollar is $5.67. Returns are even higher if the total benefits—both public and private—are counted. However, there are strong differences by gender: a large proportion of the gains from the program come from lower criminal activity rates by the treatment group, almost all of which is undertaken by the males in the sample. The implications of these findings for public policy on early childhood education are considered.

Keywords: *cost–benefit analysis, early childhood education, economic evaluation*

THE High/Scope Perry Preschool Program was a preschool intervention during the 1960s to improve the personal and economic opportunities for a small group of 3- and 4-year-old children in Ypsilanti, Michigan. To establish causality, the intervention used random assignment to allocate children either to the program or to a control group. Evaluation of the program based on follow-up data on the treatment and control individuals—both as children and in adulthood up to age 27—concluded that it is a "social program from which everybody wins" (Barnett, 1996, 65–67). In influencing the children's educational attainments and achievements and so their future earnings, the program conveys strong benefits to the participants. In influencing income tax contributions

(via future earnings), welfare reliance, and criminal activity, the program also conveys high economic returns to society. Based on age 27 analysis, these societal gains outweighed the program costs by a factor of seven.

Data from interviews and official records are now available on the program and control group as they reached the age of 40. Therefore, it is possible to reassess the long-term benefits from participation in the program and rederive the returns on the investment. New data are available on other domains of later adult life, such as health and household circumstances and behaviors; these can be considered in a full evaluation of the program.

The structure of the article is as follows. The next section sets out the cost–benefit analysis framework, describes the program and data set, and addresses methodological issues. The benefits from the program both for participants and for society are described. The costs and benefits data are then combined to estimate the net present value of the program. Finally, the policy implications from this and other new research on the economics of preschool are discussed.

A Cost–Benefit Framework for the High/Scope Perry Preschool Program

Cost–Benefit Analysis

Cost–benefit analysis involves comparing the costs of the program to its benefits, expressed in discounted money terms. Programs with high positive net benefits are preferred over those with low or negative net benefits. Such economic appraisal is an important way to evaluate educational reforms: even programs with modest effects may be justifiable if the costs are sufficiently small (e.g., perhaps school choice); and programs with strong impacts should not be implemented if they are too expensive (e.g., perhaps class size reduction). However, although the tools of cost–benefit analysis are well developed, they are only infrequently applied to educational interventions (Levin & McEwan, 2002).

The efficacy of cost–benefit analysis depends fundamentally on three key aspects. First, it must be possible to establish a causal impact of the program on subsequent outcomes. In this case, causality is established by comparing the outcomes of treatment and control groups where group status is based on random assignment. Second, accurate information on the program costs are needed. For this program Barnett (1996) reported itemized costs, and these data are reapplied here. Finally, it must be possible to measure all program benefits (or at least the most salient) in money terms. This is the main challenge addressed here: using both individual-level data on participants and the control group of nonparticipants and national data sets, the advantages from program participation are calculated in dollar amounts up to age 40 and projected forward to age 65. The benefits are compared against the costs of the program to derive the net present value of the program, with all money values expressed in year 2000 dollars. These net present value figures are calculated both overall and by gender. Because benefits accrue to individuals and the general public (and in the aggregate to society), separate cost–benefit analyses are necessary. A range of discount rates are also applied, and sensitivity analysis is undertaken to test whether the results are robust to the assumptions made in the calculations.

The High/Scope Perry Preschool Program

The High/Scope Perry Preschool program was conducted with 123 3- and 4-year-old black children living in Ypsilanti, Michigan, in the 1960s. The children were chosen on the basis of low levels of parental education and socioeconomic status, as well as low Stanford-Binet IQ test scores. The participants were randomly assigned either to a control group or to the treatment group, allowing for causal differences to be identified. (The top panel of Table A1 in the Appendix shows that the treatment and control group were equivalent across several important characteristics relating to IQ and family background).

Because random assignment is highly infrequent as a method of research, this program has received considerable attention. Notably, policymakers, seeking to make decisions about discretionary spending on programs such as Head Start, have paid particular interest to the results. As reviewed below, the evidence on the impacts of preschool programs is robust and consistent with these findings. Consequently, this evidence has been part of a growing movement lobbying for universal pre-K. (Head Start began in 1965 and now serves 0.9 million children; state pre-K programs have grown to serve another 0.7 million).

The High/Scope Perry Preschool program was delivered to successive classes, beginning in 1962 and continuing for 3 more years. The first class received only 1 year of preschooling (at age 4),

but the remaining classes received 2 years of preschooling. The program itself was delivered from October to May of each year, with three components: (a) a center-based program for 2.5 hours each weekday morning (with a child: teacher ratio of approximately 5:1 to 6.25:1, and with teachers trained in special education and early childhood); (b) home visits by teachers for 1.5 hours per week; and (c) parent group meetings (see Schweinhart, Montie, Xiang, Barnett, Belfield, & Nores, 2004). It would be desirable to test which of these components was most important, but the smallness of the sample size does not permit this.

The costs of this program are reported in Barnett (1996, pp. 19–27). These only refer to the public expenditures (and not expenditures by the participants). Costs information was taken from school district budgets and the program administration unit; both operating costs (instructional staff, administrative and support staff, overhead, supplies, and developmental screening) and capital costs (for classrooms and facilities) are included. In undiscounted 2000 dollars, the average cost of the program (regardless of duration) was relatively high at $15,827 per participant. Currently, most state pre-K expenditures are less than $5,000 per child annually.

Long-Term Benefits From Preschool

Given that prior studies found the program to be a high-yield investment with a large, positive net present value, it is legitimate to ask why further analysis is needed. (It is possible that the earlier conclusions would be overturned, but this is highly unlikely). This analysis draws on updated information about the participants up to age 40, that is, over a sizeable proportion of their productive working lives. Prior studies projected forward the likely behaviors and outcomes after age 27, relying on plausible predictions, not actualities. Using more complete, high-quality, and detailed data, it is possible to see whether the prior predictions were overly conservative or overly optimistic and across which economic behaviors. These findings impinge on the program's generality, for example, where the reductions in criminal behavior are substantiated or reinforced, this suggests directing early childhood programs to children in environments where there is a high propensity toward crime.

Economic conditions have also changed: returns to education in the labor market grew over the 1980s and 1990s and welfare reform was enacted in the 1990s. For individuals reaching 40, the new data shed light on the stability of their work and family situations, as well as on long-term health status. For individuals growing up in very poor neighborhoods, the long-term effects of crime should also be considered (for example, the stigma of a criminal record on employability).

More generally, these data address questions of program fade-out. Research on fade-out has largely focused on the cognitive impacts of preschool participation (see Barnett, 1998). Instead, a cost–benefit framework places little emphasis on cognitive impacts per se, but rather on economic and social outcomes, which are only indirectly determined by cognitive differences. That noted, it is important to establish that causation holds over this extended duration of over 35 years. Growing attention is being paid to how early cognitive development presages later life behaviors, opportunities, and experiences (Shonkoff & Phillips, 2000; Shore, 1997). Several path dependencies may be considered, and these may be mutually reinforcing.

Perhaps the strongest mediating factor for adult impacts is educational attainment. Table 1 shows attainment levels by program status and gender for the 119 individuals with complete data up to age 40. Across all individuals, attainment is low, indicative of very difficult early life circumstances. The program group has higher educational attainment: the difference is discernible at age 27, and at least maintained or even accentuated by age 40. The difference is slight for program males, who are more likely to graduate from high school, and in two cases, progress to college after age 27. For females, the differences are more striking: by age 27, the program group is one-third as likely to be a high school drop-out, with further educational attainment—of associate, bachelor's, or master's degrees—by age 40. The positive effect of attainment on earnings is well-established and persists over time (even as the strongest impacts are for college graduates, not high school completers; see Heckman, 2000). Higher attainment reflects both cognitive advantages and enhanced noncognitive attributes such as self-discipline or diligence (Carneiro & Heckman, 2003; Murnane, Willett, Duhaldeborde, & Tyler, 2000); these are associated with higher economic well-being over the long term and operate as an "insurance" against lifetime poverty (Rank & Hirschl, 2001).

TABLE 1
Educational Attainment

Educational attainment	Preschool		No preschool	
	Male	Female	Male	Female
Up to age 27:				
Less than high school	10 (32%)	5 (20%)	14 (36%)	15 (63%)
High school	21 (68%)	18 (72%)	25 (64%)	8 (33%)
Associate degree	0	1 (4%)	0	1 (4%)
College degree	0	1 (4%)	0	0
Master's degree	0	0	0	0
By age 40:				
Less than high school	9 (29%)	4 (16%)	12 (31%)	13 (54%)
High school	20 (65%)	18 (72%)	26 (67%)	9 (38%)
Associate degree	1 (3%)	1 (4%)	0	2 (8%)
College degree	1 (3%)	1 (4%)	0	0
Master's degree	0	1 (4%)	1 (3%)	0
N (Total = 119)	31	25	39	24

Note: Sample sizes vary according to mortality rates (see note 13).

A second path dependency may occur through teenage pregnancy or fatherhood (Klepinger, Lundberg, & Plotnick, 1999). Teenage parenting reduces time available either to attend school or to search for work, and the effect is persistent over time. A related path dependency is early welfare receipt, perhaps as a single parent, which may lead to chronic support (on "scarring," see Green & Warburton, 2004). Early welfare receipt may have three long-term consequences: it may convey a negative signal in the labor market, hindering job search; it may break down the social norm against welfare reliance; and it may increase awareness of welfare eligibility.

A final potential path dependency is crime. Williams & Sickles (2002) find juvenile arrests strongly predict subsequent adult arrests; this may occur either because a criminal record conveys a strong negative labor market signal, impeding opportunities for future economic betterment, or because early involvement with the criminal justice system exacerbates deviant propensities (on "labeling," see Bernburg & Krohn, 2003). Thus, where preschool programs dissuade youth from crime, they may also dissuade them from a life of crime (Farrington, 2003).

Overall, it may be plausible that a program that influences teenage behaviors in relation to schooling, family formation, welfare, and crime may then have lifetime consequences. The results from this intervention give some credence to this argument.

Benefits of Program Participation

Calculating the Benefits

The benefits of the program fall mainly into four domains for three separate agencies. These agencies are the participants themselves, the general public (i.e., taxpayers who fund the program but also reap some benefits), and society (i.e., the sum of participant and general public benefits not counting transfers). The first benefit is earnings: as the participants obtain education and human capital, they become more productive, and this translates into the private gain of higher post-tax earnings. This productivity gain generates a second benefit: higher tax contributions associated with increased earnings. These tax contributions benefit the general public. The third benefit of participation is lower criminal activity, which is also a benefit to the general public as the costs of the criminal justice system are reduced, and the costs to victims are lower. Finally, program participation is associated with changes in welfare reliance. If welfare reliance falls, there are gains to the general public. However, from the individuals' perspective, higher welfare payments raise economic well-being. From society's perspective, only the administrative costs of welfare are counted. Data for each of these domains are available.

Selected differences between treatment and control groups are reported in the lower panel of Table A1 (a much larger set of cross-tabulations are reported in Schweinhart et al., 2004). Statistical significance is also tested for, showing that—

even with a small sample—there are many statistically significant differences in favor of the control group. However, economic analysis focuses on whether any of the differences has any economic meaning. Potentially, hundreds of different statistical tests could be applied (e.g., earnings at age 30, age 31, etc.); and a statistically significant difference does not imply a significant cost saving. Thus, the lifetime cost consequences of each behavior are calculated to see whether in total there is a sizeable monetary impact.

Earnings and Tax Contributions

Earnings profiles are derived using self-reported data about the current job and work history from the age-40 survey.[1] Data are available across many of the years from age 18 to 40, but because many of the individuals in the sample do not have stable careers and spend time in prison, interpolating and extrapolating from these earnings data must be performed cautiously. (At age 40, more program males were employed [70% vs. 53%] and fewer were incarcerated [9% vs. 26%]; for females, employment and incarceration rates were identical across program status).[2] To complete a full earnings profile it is necessary to fill in where data are missing. (This involves imputing expected earnings based on gender, education level, past employment history, and incarceration durations; see Schweinhart et al., 2004).

The earnings profiles show clear earnings gains for both male and female participants in the program (these are net of tax but include the value of fringe benefits). Tax contributions can be estimated by applying marginal tax rates to the full lifetime gross earnings. Correspondingly, higher earnings translate into higher tax payments by the program group.

Criminal Behavior

Criminal behaviors are taken from newly updated state records information obtained from reviews of government criminal records for each person at each age point. Crime behaviors are divided into 11 categories: felonies of violent assault, rape, drugs, property, vehicle theft, and other; and misdemeanors of assault/battery, child abuse, drugs, driving, and other.[3] (The incidences of these crimes across program status and gender are reported in Table A2). Overall, there is considerably lower lifetime criminal activity by the program group. For males, this conclusion is true for 9 of the 11 categories (the exceptions being felony–other, and misdemeanor–child abuse). Correspondingly, months sentenced to probation and served in prison are lower across the program participants. For females, the criminal activity differences are trivial, in part because all females commit far fewer crimes.

However, in calculating these incidences for the purpose of assessing the impacts and costs of crimes, three important assumptions must be made. First, murder crimes are subsumed into the category felony–violent assault. This assumption reduces the likelihood that differences in murder rates dominate the overall evaluation, which is a possibility because there are program differences in murder rates (2% vs. 5%), and each murder imposes victim costs of approximately $3 million. Second, arrest incidences must be weighted according to the number of crimes committed. There are many more crimes than arrests, so using arrest data would greatly understate the actual incidence of crime: in 2002, 5.34 million violent crimes were reported by victims, but only 0.62 million arrests were made (Bureau of Justice Statistics [BJS], 2002b; Federal Bureau of Investigation [FBI], 2002). BJS and FBI data on the numbers of crimes reported by victims and the number of arrests are used to estimate these factor increases from arrests to actual crimes. Finally, assumptions about criminal behaviors beyond age 40 must be made. However, the rate of decline of criminality with age is not known with accuracy.[4] Based on arrest rates by age, criminal activity up to age 40 represents 73–92% of total lifetime criminal activity, with proportions varying by crime type.[5] These proportions are used to predict criminal activity after age 40.

These incidences of crime should be multiplied by the average cost of each crime. Differences in criminal activity have important implications for the cost–benefit analysis because of the magnitude of victims' costs and criminal justice system (CJS) costs for policing, arrest, and sentencing; and incarceration and probation costs (Anderson, 1999). The costs of crime to victims and the CJS vary according to the type of crime (e.g., murder) and its seriousness (felony or misdemeanor). The tangible and intangible costs of crime to victims are numerous, including direct expenses for medical treatments and to replace property, reduced productivity, as well as impaired quality of life. These costs vary according to the type of crime.[6] Also, there are direct expenditures on the criminal

TABLE 2
Lifetime Economic Impacts (Undiscounted)

	Preschool		No preschool	
Impact domain	Male	Female	Male	Female
Net earnings (individuals)[a]				
Totals	$1,085,219	$842,608	$973,500	$710,202
Program differentials	+$111,719	+$132,406		
Tax contributions (general public)[b]				
Totals	$311,653	$241,640	$281,507	$204,449
Program differentials	+$30,146	+$37,191		
Criminal activity (general public)[c]				
Totals	$1,075,359	$291,020	$1,808,253	$315,005
Program differentials	−$732,894	−$23,985		
Welfare payments (individuals)[d]				
Totals	$5,842	$76,276	$23,173	$64,838
Program differentials	−$17,331	+$11,438		
Welfare costs (society)[e]				
Totals	$2,220	$28,985	$8,806	$24,638
Program differentials	−$6,586	+$4,346		
Welfare expenditures (general public)[e]				
Totals	$8,063	$105,261	$31,979	$89,477
Program differentials	−$23,916	+$15,784		
N	33	25	39	26

Note. All money values expressed in 2000 dollars.
[a] Earnings calculated for each year up to age 40 based on self-reports, and projected forward to age 65; fringe benefits worth 29.2% of salary are included.
[b] Tax contributions are based on the marginal tax rate on income of 15%.
[c] For criminal activity, see Table A2.
[d] Welfare payments to individuals are based on self-reports of months on five types of welfare multiplied by state reports of monthly payments.
[e] Costs are the error rate plus administrative costs (equivalent to 38% of payment amounts); expenditures are the sum of payments to individuals plus these costs.

justice system for arrests, trials, and sentencing. In 2001, these were $110 billion, of which 34.2% was on the judicial system (not including incarceration) and 65.8% was on policing (BJS, 2001). Unit costs for the 11 crime categories are reported in Table A2.

Per crime type, victim costs are based on Miller, Cohen, and Wiersema (1996, Table 2), and CJS costs per crime type are based on Cohen (1998) and Cohen, Rust, Steen, and Tidd (2004).[7] These figures show four economically important crimes from the victims' perspectives: violent assault, rape, vehicle theft, and child abuse. In addition, probation and prison costs are taken from Bureau of Justice Statistics data (BJS, 2002a).

Welfare Payments and Expenditures

The final domain is welfare. Welfare receipt and payments to the individuals are calculated, based on self-reported and official information sources, and taking account of state and federal changes in eligibility and funding over the period.[8] Over the ages 18–27, males report similar and relatively low levels of assistance (6 months), but females report considerable reliance (27 vs. 39 months). For the ages 28 to 40, state data are available on the extent of cash, food, and medical assistance, as well as the number of months of family counseling and other welfare claims. Strong differences are apparent. Program females report the greatest reliance on welfare, at an average of 59 months (compared to 24 months for no-program females). For program males, welfare reliance is relatively low at 4 months; but no-program males report very high levels of medical assistance, drawing on welfare support for on average 28 months.[9] Finally, welfare reliance for ages 40–65 are estimated as a weighted average over the prior age period incidences. From months of incidence and estimates of per-month welfare

benefits, total amounts of funding can be derived. For the ages up to 27, calculations are based on (contemporaneous) payment schedules for welfare entitlements in Michigan. For the ages 28–40, direct statements of financial assistance in cash and food stamps are available.

Although welfare payments are a willing transfer between recipients and taxpayers, the net impact does not equal the absolute amount of transfers. The costs of administering the program, including the error rate in targeting the program, should be counted. Based on Michigan state data, the costs of administering all welfare disbursements are 29.7% of total disbursements. In addition, the average error rate in terms of overpayments and payments to ineligible families is 6.4% (Family Independence Agency [FIA], 2003, p. 8). In sum, for every dollar disbursed in welfare there is a cost to society of 38 cents. For the general public, expenditures on higher welfare payments are 1.38 times higher than any private transfer.

Empirical Estimates of the Benefits

Based on the above sources, Table 2 reports estimates of the economic impacts across each of the four domains. These estimates are undiscounted lifetime values, with separate analyses for males and females by program status. Differentials between the treatment and control group are also reported.

The top rows show the average lifetime net earnings, including fringe benefits. For program males, net lifetime earnings are $1.09 million, which compares favorably with $0.98 million for the no-program males.[10] The result is a program differential of 11% or $111,719. Similarly, program females report higher lifetime earnings ($0.84 million vs. $0.71 million), with a program differential of 19%. Given that the program conveys other benefits to participants and is delivered to them at zero fees, this amounts to a strongly positive private advantage.

These higher earnings translate into higher absolute amounts of income tax payments (and consumption tax payments); with tax progressivity, higher earnings may also lead to proportionately higher income tax payments. Over the lifetime these differences translates into a greater tax contribution of $30,146 for program males and $37,191 for program females.

The third domain is criminal activity. Here the program has a significant financial impact, both because it reduces crime and because crimes impose high costs on victims and the criminal justice system. The absolute costs are very high, easily exceeding $1 million for the males and $0.25 million for the females in the sample (similar estimates for at-risk youth are given by Cohen, 1998). However, the impact of the program is also substantial: program males impose costs that are on average $0.7 million lower than no-program males; for program females, the program impact is considerably lower, but still favorable with savings of $23,985. Clearly, the impact on criminality far supersedes the impacts in the other domains.

The final domain is welfare. The bottom panels of Table 2 show the impacts for individuals, society, and the general public. Program males rely less on welfare than no-program males; they lose out by $17,331. However, program females obtain larger welfare transfers, worth $11,438 each. These larger transfers may be obtained because of better targeting of resources and higher claimant (conditional on eligibility) rates by the program group. From society's perspective, this is a willing transfer of payments, but there is a cost of 38 cents for every dollar transferred. This administration factor means that welfare differences generate savings for males of $6,586 and costs for females of $4,346. For the general public, however, both amounts must be paid: the actual welfare payments and the administrative burden.

Additional Costs and Benefits of the Program

Measurable impacts

Additional program impacts that can be measured and should be included in the cost–benefit analysis are related to child care and education. Child care over the period of the program is a saving to parents, either in free time or lower personal expenses. Barnett (1996, p. 27) estimated this child care at $906 per participant. Education counts both in the benefit and cost column: where it allows students to progress more efficiently through the education system it yields savings; where the program promotes further educational attainment, additional costs will be incurred. The former effect is important: both lower grade retention and less frequent placement in special education classes are associated with program participation. Barnett (1996, pp. 28–35) reports the per child cost savings associated with more

efficient progression as $16,594 for program males and $7,239 for program females.

The latter effect should also be considered. With a higher on-time graduation rate, the program group had a lower rate of participation in adult schooling (to obtain a high school diploma or equivalence) up to age 27. The cost savings are not large, at $338 for males and $968 for females. For higher education, program males reported fewer semester credits, saving $916 per participant, but program females reported higher rates of college progression, increasing average program costs by $1,933. New data indicate that individuals continued to obtain education credentials after age 28.[11] These credentials can be costed out from the *Digest of education statistics* (NCES, 2002).[12] From the state's perspective, these additional costs amount to: $2,814 for the program males and $3,195 for the program females compared to $2,445 for the no-program males and $1,570 for the no-program females. The average differential is $992. For the individuals, the expenses incurred were $671 for the program males and $1,089 for the program females, compared with $755 for the no-program males and $235 for the no-program females. The average differential was $385. These educational consequences are included in the cost–benefit calculations.

Additional impacts

With new data available from the age 40 follow-up, additional impacts from the program can be considered. These impacts are summarized in Table 3. However, none of these impacts are included in the full cost–benefit analysis. Even as they show genuine differences in quality of life for the individuals, some of these are captured in differences in earnings or welfare receipt, and others

TABLE 3
Lifetime Impacts: Other Dimensions

	Preschool	No preschool
Impact domain	Males and females	Males and females
Asset possession (%)		
Home ownership	36.7	26.6
Car ownership	73.8	60.9
Savings account	75.8	50.7
Life insurance	66.5	53.8
Wealth levels by age 40[a]		
Weighted by education	$37,690	$33,916
Weighted by marital status	$47,013	$40,144
Health status (%)		
Health stopped from working	42.6	55.2
Identified health problem[b]	20.4	29.3
Smoker	41.5	55.2
Soft drug use[c]	45.3	54.4
Hard drug use[d]	22.2	29.3
Treated for drug-use/drinking	22.2	33.9
Mortality rates		
Deceased by age 40	2 (3.4%)	5 (7.7%)
Family formation (%)		
Voluntary abortion[e]	16.7	31.8
Married at age 40	37.2	24.3
Biological children (Mean)	2.50	2.33
	58	65

[a] All money values expressed in 2000 dollars.
[b] At least one of the following health problems: arthritis/rheumatism; fractures, bone or joint injury; lung or breathing problem; eye or vision problem; hypertension; diabetes; depression or anxiety; back or neck problems; walking problem; hearing problem; heart problem; stroke problem; or cancer problem.
[c] Soft drugs are marijuana or hashish.
[d] Hard drugs are cocaine, crack, free-base, LSD, hallucinogens, or heroin.
[e] Only for female sample ($N_C = 22$, $N_T = 24$).

are difficult either to measure (because the information is sensitive) or to put money values on.

First, given the differences in incomes and education, it may be expected that, by age 40, differences in wealth and asset possession may have accumulated. The first rows of Table 1 show higher rates of asset possession by the program group, which is suggestive of greater wealth accumulation. The program group is more likely to own a home (value undeclared), as well as other assets (car, savings account, and life insurance).

Money amounts of wealth accumulation are not directly available for each individual, so wealth status is predicted based on each individual's characteristics. Gittleman and Wolff (2004), using the 1994 wave of the PSID, identify three key factors: greater wealth accumulation is associated with higher incomes, higher education levels, and being married. Therefore, individual-specific data on incomes and education levels are linked to the mean amounts reported in Gittleman and Wolff (2004). These show absolute wealth levels by age 40 of under $50,000; but with the program group having an advantage of between $3,500 and $7,000 (e.g., 11–17% in wealth accumulation).

Second, there are health status differences across the groups. Cross-tabulations show the program group is less likely to report that they: had stopped working for health reasons; had a health problem; smoked; used drugs; and needed treatment for drug use or drinking. These differences are suggestive of better health status for the program participants. These differences gain salience when comparing mortality rates: of the initial 58 program participants, one female and one male were deceased by age 40; for the 65 participants in the no-program group, two females and three males were deceased. These mortality differences may be causal: low wealth and mortality are strongly correlated (Attanosio & Hoynes, 2000); and life expectancies vary significantly across family backgrounds and education levels.[13]

The cost consequences of these health differences can be estimated, although these estimates are only illustrative. Imputing the mortality costs is difficult (because of discounting); but they may influence the results substantially. From a meta-analysis of 33 studies, Mrozek and Taylor (2002) estimate the value of a statistical life at $1.58–$2.64 million. Based on the relative probabilities across the program and no-program groups, the mortality impacts may be valued at $74,000–$93,000 per person (undiscounted). Health status differences may also be costed. One approach is to focus on specific conditions, and price these out. For example, Hodgson (1992) estimates that smokers spend an extra 20% on their health care. With average health care spending per person p.a. in the United States at $2,500 (Cutler, 2002), and applying the differential smoking rates in Table 3, the lifetime additional health care cost of smoking is approximately $2,000 (undiscounted). Some of this expenditure is incurred by the state and some by the individual. A second approach is to model the health-related consequences of low educational attainment fully. Muennig and Fahs (2001) derive such a model for comparing graduates to nongraduates, reporting a reduction in health expenditures of $9,370–$21,715 per new graduate annually (undiscounted). Given the higher graduation rate of the program participants, this would represent a lifetime gain of $8,000–$18,500 per participant. (Again, this is very conservative as it assumes no health gains for nongraduates).

Finally, there may be intergenerational program effects. These impacts gain salience in a cost–benefit framework, where impacts on the child of a teenage parent are discounted at a much lower rate than the participants' own earnings at age 40, for example. The data do show program differences in family formation and behaviors, such as abortions, family size, and two-parent family rates; these may have intergenerational consequences. However, the consequences of these intergenerational differences for society are complex and so are not modeled here.

Cost–Benefit Analysis Results

Results for Participants and the General Public

The above analyses show considerable advantages to participation in the program, and these should be compared to the program costs to produce a full cost–benefit calculation for the participants and for the general public. The participants stand to gain a lot because the program is provided at no charge to them, so any economic benefit is worthwhile. For the general public, the key is whether money invested early will reap rewards later, in terms of lower public expenditures or adverse effects (these expenditures may either be directly through government transfers

or indirectly through being at risk of being a victim of crime). If there is a high rate of return to the general public, there should be political support for preschool. A third calculation is made for the overall societal benefits. This is the return that a social planner would adopt, and it is the rate typically reported in policy documents. (However, widespread political support for preschooling is unlikely to depend on evidence that the private participants gain: taxpayers will want to know if they gain).

For each agency, sensitivity analysis is performed, with variations in the discount rate and manipulations of the underlying assumptions about the benefits obtained across each domain. In each case, tabulations are separated by gender and then averaged to derive the overall cost–benefit ratios. The top panel of each table shows the program benefits, the middle panel the program costs, and the final row reports benefits minus costs.

Table 4 reports the full cost–benefit analyses for participants, using discount rates of 3% and 7%, respectively (the latter rate being very conservative, see Moore, Boardman, Vining, Weimer, & Greenberg, 2004). On average, the program group incurred some small educational costs and posted considerably higher earnings over the entire working life, but received somewhat lower welfare payments. They incurred no crime costs or program costs. Applying a 3% discount rate, the overall gains from participation in the program amount to $49,190 (i.e., around 6% of expected lifetime net earnings). The gains are 42% greater for the females ($58,554 compared to $39,825 for the males), with a greater advantage in lifetime earnings and with positive welfare receipts. Applying a 7% discount rate, the benefits to participants remain positive, at $17,370 on average.

Table 5 reports the benefits to the general public. There are no child care benefits. The K–12 education savings (lower grade retention and special education placement) outweigh the educational subsidies for further education accumulation, meaning that pressure on educational budgets is lessened overall. There are higher tax contributions and lower welfare payments by the program group. However, the most important impact is the reduction in crime costs. Using a 3% discount rate, the program costs $15,166, the benefits are $195,261 per participant, and the net benefits are, therefore, $180,455. At this discount rate, the program repays $12.90 for every $1 invested. However, almost all these net benefits derive from reductions in crime by the male participants, a result that is compounded by the greater welfare receipt of program females after age 28. Applying a 7% discount rate, the net benefits to the general public are $81,395. For each $1 investment, the yield is $5.67. The overall effect for society is strongly positive, although the returns to females become negative at this discount rate.

Finally, Table 6 shows the overall impact on society, taking both the participants' and the general public benefits into account. This result is important for an overall assessment of the impact of the program. These affirm that the program yields high returns at both 3% and 7% discount rates.

TABLE 4
Lifetime Cost–Benefit Analysis of the High/Scope Perry Preschool Program for Participants

	Discount rate of 3%			Discount rate of 7%		
Benefit/cost	Full sample	Male	Female	Full sample	Male	Female
Program benefits						
Child care[a]	906	906	906	862	862	862
Education fees[b]	(160)	35	(354)	(64)	(11)	(116)
Earnings	50,449	45,889	55,007	17,712	15,205	20,218
Crime	0	0	0	0	0	0
Welfare receipt[c]	(2,005)	(7,005)	2,995	(1,140)	(2,631)	352
Total	$49,190	$39,825	$58,554	$17,370	$13,425	$21,316
Program costs[d]	0	0	0	0	0	0
Net benefits	$49,190	$39,825	$58,554	$17,370	$13,425	$21,316

Notes. All money values expressed in 2000 dollars. Program benefits do not include items in Table 3. Discounting begins after first year of program.
Sources: Table 2 above, in combination with Barnett (1996): [a]p. 28; [b]Table 13; [c]pp. 36–38, Table 27; [d]Table 4.

TABLE 5
Lifetime Cost–Benefit Analysis of the High/Scope Perry Preschool Program for the General Public

	Discount rate of 3%			Discount rate of 7%		
Benefit/cost	Full sample	Male	Female	Full sample	Male	Female
Program benefits						
Child care[a]	0	0	0	0	0	0
Education costs[b]	7,304	12,247	2,360	5,037	7,745	2,331
Tax contributions	14,078	12,547	15,608	5,027	4,253	5,801
Crime	171,472	330,474	12,470	69,758	133,867	5,647
Welfare expendc	2,768	9,668	(4,133)	1,573	3,632	(485)
Total	$195,621	$364,936	$26,305	$81,395	$149,497	$13,294
Program costs[d]	$15,166	$15,166	$15,166	$14,367	$14,367	$14,367
Net benefits	$180,455	$349,770	$11,139	$67,028	$135,130	($1,073)

Notes. All money values expressed in 2000 dollars. Program benefits do not include items in Table 3. Discounting begins after first year of program.
Sources: Table 2 above, in combination with Barnett (1996): [a]p. 28; [b]Table 13; [c]pp. 36–38, Table 27; [d]Table 4.

Sensitivity analysis

To test for the robustness of the results, a full sensitivity analysis is performed. (Full details are given in Schweinhart et al., 2004.) Given that the program yields strongly positive benefits to participants, attention here is on how the net benefits to society vary. Table 6 shows the main determinant of the cost–benefit ratio is the crime differential by program status, but the income streams and welfare receipt patterns are also recalibrated. To motivate the sensitivity analysis, new assumptions are applied deliberately to understate and enhance the economic impact of the preschool program, providing brackets for the net present value. However, the main results are already based on conservative assumptions, so the lower level estimates may be better described as "highly conservative" and the upper level estimates as "less conservative" (but not a measure of the maximum possible returns to the program).

To estimate the lower range for the net present value, earnings, tax impacts, crime, and welfare receipts were recalculated.[14] In each case, either a data source was identified that would yield lower figures or the model was respecified to generate lower figures. These lower-bound estimates were applied to both the program and no-program groups. The primary effect is to lower the overall lifetime money streams. This does not necessarily reduce the program differentials directly, but reducing the absolute money streams does reduce the net present value when program

TABLE 6
Lifetime Cost–Benefit Analysis of the High/Scope Perry Preschool Program for Society

	Discount rate of 3%			Discount rate of 7%		
Benefit/cost	Full sample	Male	Female	Full sample	Male	Female
Program benefits						
Child care[a]	906	906	906	862	862	862
Education[b]	7,144	12,282	2,006	4,973	7,734	2,215
Earnings	64,526	58,436	70,615	22,739	19,458	26,019
Crime	171,472	330,474	12,470	69,758	133,867	5,647
Welfarec	763	2,663	(1,138)	433	1,001	(133)
Total	$244,811	$404,761	$84,859	$98,765	$162,922	$34,610
Program costs[d]	$15,166	$15,166	$15,166	$14,367	$14,367	$14,367
Net benefits	$229,645	$389,595	$69,693	$84,398	$148,555	$20,243

Notes. All money values expressed in 2000 dollars. Program benefits do not include items in Table 3. Discounting begins after first year of program.
Sources: Table 2 above, in combination with Barnett (1996): [a]p. 28; [b]Table 13; [c]pp. 36–38, Table 27; [d]Table 4.

costs are accounted for. Even with overly conservative assumptions and a discount rate of 7%, the benefits to the male participants, to the general public, and to society remain strongly positive. For the general public, for every $1 invested, the yield is $3.24. However, net benefits to the general public from the program females cannot be guaranteed. At discount rates of 3% or higher, and applying these very conservative assumptions, there is a net loss to the general public; at its maximum, this loss is $5,524 per female participant.

A similar approach was adopted to estimate the upper range for the net present value. Earnings, welfare, crime, and tax impacts were recalculated using new data sources. Even with a 7% discount rate, the benefits to the general public are $7.14 per $1 invested; using a 3% discount rate, the yield is $17.53, which is 36% greater than the yield reported in Table 5.

Conclusions and Policy Implications

The cost–benefit analysis performed here shows strong positive impacts from participation in the program and strong positive gains for the general public in providing this program. Only under very restrictive assumptions (or high discount rates) do the returns become negative and only then for the female subsample. Overall, this conclusion is robust to the choice of discount rate and to variations in assumptions about earnings profiles, the costs of crime, and the burden of welfare support offered to participants.

These results correspond to a growing body of evidence showing the economic advantages of investing in early childhood education. (They also conform to the prior analysis by Barnett [1996].) There is copious literature on the private returns to education, and so participation in publicly funded programs would be high. From society's perspective, moreover, there are also economic gains; the results from full economic evaluations are summarized in Table 7. Each of these studies has used a high-quality research method to identify the impact of preschooling. The studies vary as to which economic impacts are important: for this program, the crime effects are strongest; for the Abecedarian intervention, the crime effects are very small, with parent and child labor market effects dominating. The Chicago study finds gains spread across the range of outcomes. Nevertheless, each study shows strong economic returns from the investment; collectively, they offer a compelling motive for investment in educational provision at an early age for at-risk children. This has fueled the growth of policy interest with respect to early education.

However, it is important to consider whether the impacts summarized above would continue to apply either under current economic conditions or for groups other than children from low-income families at-risk of school failure.

TABLE 7
Economic Evaluations of the Impacts of Early Childhood Education for Society

Program	Economic returns for society
High/Scope Perry Preschool Program[a]	Using age 27 data: For every $1 investment, $2.54–$8.74 was recouped in terms of benefits over the entire time frame. Using age 40 data: For every $1 investment, $6.87–$16.14 was recouped in terms of benefits over the entire time frame.
Chicago Child–Parent Preschool Center Program[b]	For every $1 investment, $7.14 was recouped in benefits.
Abecedarian Early Childhood Intervention[c]	For every $1 investment, between $2–$3.66 was recouped in terms of benefits over the entire period. The internal rate of return ≈ 7%.
Head Start[d]	Costing exercises for a large-scale version of this program have focused on the short-term and medium-term benefits. These benefits alone offset 40–60% of the total costs.

[a] Schweinhart et al. (1993); Barnett (1996).
[b] Reynolds et al. (2001, 2002).
[c] Masse and Barnett (2002).
[d] Currie (2001).

Extrapolating the returns to early childhood education delivered now requires predictions in relation to education, earnings, crime, and welfare. Broadly, each domain is unlikely to change in ways that would undermine the yield of the program. First, educational costs (including special education) have risen sharply above the rate of inflation over the last two decades (NCES, 2002). Preschool programs that raise school efficiency are, therefore, likely to remain cost effective. Second, wages are increasingly being determined by education and human capital (Carneiro & Heckman, 2004). Third, the costs of the CJS have been rising beyond the rate of inflation within the last two decades (BJS, 2002a; Stephan, 1999). Programs that reduce future crime rates should, therefore, be high yield. Finally, welfare costs are unlikely to have an adverse impact on the future yield because recent reforms have reduced entitlements and tightened time limits (Blank & Ellwood, 2002).

The second policy question relates to generalizability.[15] Although the program was targeted at at-risk children, this designation may include a sizeable proportion of children. So, one interpretation of at-risk is failure to complete high school; as shown in Table 1, many of the sample did not do this. Thus, the program may be regarded as yielding advantages typically associated with graduation and as being appropriate for all children at risk of being high school drop-outs. Presently, 10.7% of all persons aged 16–24 are high school dropouts, and estimates on-time school completion rates suggest a target population of around 30% of the age cohort (Swanson, 2004). These individuals would likely benefit from a preschool program, and the individual and social benefits could be substantial.

Furthermore, whereas targeted programs require smaller public outlays and may be able to ensure high quality in delivery, there are important benefits from expanded programs (see National Institute for Early Education Research [NIEER], 2004). Notably, imperfectly targeted programs may not deliver ECE to the most at-risk children, as families select into provision (rather than select out), and universal programs may be regarded as more fair, allowing all children an opportunity to progress at an early age; political support may be easier to obtain as a consequence. Also, universal programs may be more efficient and better quality, as standards and accountability regulations can be established.

Notes

[1]Lifetime differences in earnings are calculated for three age periods: up to age 27; ages 28–40; and ages 41–65. Barnett (1996) reported actual earnings profiles up to age 27 and projected earnings beyond that age. The profile up to age 27 is re-applied here (although it is slightly revised in light of new self-reported information). Data are newly available on earnings for the age period 28–40; data for these years are also used to extrapolate forward for earnings over the age period 41–65.

[2]To bound estimates of lifetime earnings and to exploit different items in the data set, two additional earnings profiles were constructed for each gender and by program status (see Schweinhart et al., 2004). These define conservative lower and upper bounds.

[3]Ideally, the categorization should be as fine as possible, down to each crime. However, categorization is driven by the availability for each crime type of data in three domains: incidences; victim costs; and criminal justice system costs.

[4]Most crime is committed during adolescence and the 20s (Brame & Piquero, 2003). Arrest rates decline with age: fewer than 8% of the state prison population is aged over 44; and for African American males and females who have not been incarcerated before the age of 40, the chances of ever going to prison are low, at 3.6% and 0.6%, respectively (Bonczar & Beck, 1997).

[5]Age- and gender-specific arrest rates for each crime type are taken from the 2002 Uniform Crime Reports (Tables 39 and 40, www.fbi.gov/ucr/02cius.htm). A deterministic model of crime based on individual characteristics is unlikely to yield greater accuracy because "little is known about the risk factors . . . for persistence or desistance of offending after age 20" (Farrington, 2003, p. 227).

[6]Intangible losses (pain and suffering) are calculated from amounts generally spent on avoiding these eventualities or, for nonfatal injuries, on awards by juries. Miller et al. (1996) use awards from 1,106 assault cases and 361 rape cases (counting only the compensatory awards).

[7]The contingent valuation study by Cohen et al. (2004), combining victim and CJS costs, reports considerably higher values.

[8]The Food Assistance Program is funded by the U.S. Department of Agriculture. Amounts for the other three welfare services are taken from state records and eligibility rulings. Medical assistance and family counseling is administered through the Family Independence Agency (FIA) and the Michigan Department of Community Health.

[9]Family characteristics and household size influence welfare receipt (e.g., AFDC). Importantly, the program group seems to delay child-rearing: by age 27, program group females had 1.8 children under age 18, as compared to 2.04 for the no-program group (for males, the figures are 1.06 and 1.21, respectively); but by age 40, program females had 1.4 children under age 18, as compared to 0.73 children (for males, the figures are 0.85 and 1.13). Over this later age period, the program females, therefore, became eligible for welfare to a greater extent than the no-program group.

[10]Although derived independently, these estimates correspond with lifetime earnings taken directly from the March 2002 CPS for all African Americans: undiscounted lifetime gross earnings average around $1.06 million for high school graduates and $1.78 million for college graduates.

[11]There was some educational attainment after age 27. The program males obtained one high school diploma, one associate degree, and one college degree. The no-program males obtained two high school diplomas, one college degree, and one master's degree. The program females obtained one high school diploma, one college degree, and one master's degree. The no-program females obtained two high school diplomas, and one associate degree. In addition, 11 males and 10 females in the program obtained some college credits; the respective numbers for the no-program group were 14 and 6. No educational attainment after age 40 is assumed.

[12]High school diplomas are equivalent to the cost of 6 months of high school (i.e., $3,827) (NCES, 2002, Table 166). For associate and college degrees, the per full-time equivalent median student expenditures in 1999–2000 were $8,924 at 2-year colleges and $13,517 at 4-year colleges; offsetting this are average tuition of $1,721 and $3,314, respectively (NCES, 2002, Tables 312, 314, 334). For the master's degrees, student expenditures are assumed to equal those at 4-year colleges, with the individual's contribution to tuition of $8,429 (NCES, 2002, Table 315). Each individual with course credits is assumed to have incurred one-fifth of the costs for a 2-year degree, with a commensurate expenditure by the state. (All figures exclude room and board expenditures).

[13]Mortality complicates the analysis somewhat. First, it means that data are available on individuals for different time periods. The working assumption here is to use all information where available, but this means that the sample sizes are not consistent over time. Second, for these deceased individuals their levels of earnings, criminal activity, and welfare receipt were given zero values across the age profiles. This approach introduces a conservative bias into the analysis. A final concern relates to the value of life itself: here no calculation is made of the cost of loss of life (e.g., to family).

[14]For the earnings profile, only small differences in labor market participation and a relatively low fringe benefit rate are applied. Consequently, this profile yields relatively low tax revenues (based on a standard deduction and a marginal tax rate of 15%), but it also reduces private earnings gains. For the crime burden calculations, CJS costs were only applied to the number of arrests, and not the number of crimes (an alternative approach—which generates similar results—is to use the FBI arrest:crime ratios, FBI, 2002, Table 25). For welfare, female welfare receipt after age 40 was assumed to be a linear extrapolation of receipt during ages 28–40.

[15]General equilibrium effects may impinge on these results if the program was extended to a large proportion of children. As the proportion of the labor force with college degrees increases, the returns to such education should fall. However, evidence on how the returns to education vary with population-wide increases in education levels is not conclusive: despite substantial educational upgrading in the 1990s, the returns to education rose (Ashenfelter & Rouse, 1998). General equilibrium effects for crime are similarly difficult to predict.

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Appendix

TABLE A1
Background Information and Program Impacts

Characteristic	Preschool	No preschool	Statistical significance test for preschool versus no preschool
Background information			
Stanford-Binet IQ at study entry	79.6	78.5	ns[a]
Mother's years of schooling	9.5	9.4	ns[a]
Mother's age in years at study entry	29.6	28.7	ns[a]
Children in family	4.9	4.8	ns[a]
Social services			
Received any by age 40	71%	86%	0.41[b]
Received any aged 33–40	54%	56%	1.11[b]
Received any aged 17–27	59%	80%	0.32**[b]
Schooling completed by age 40			
Associate or higher degree	9%	5%	2.25*[b]
Graduated from high school	68%	55%	
Did not graduate from high school	23%	40%	
Arrests by age 40 (males only)			
Zero arrests in total	18%	5%	0.45*[b]
Zero arrests for violent crime	49%	38%	0.47[b]
Zero arrests for property crime	52%	28%	0.43*[b]
Zero arrests for drug crimes	82%	51%	0.34*[b]
N	58	65	

Note: ns, not statistically significant.
[a]Two-tailed *t*-test.
[b]Odds ratios: Statistical tests are one-tailed, based on ordinal regression analysis, adjusted for the effects of participants' gender, Stanford–Binet IQ at study entry, mother's schooling, mother's employment, father at home, father's occupation status, and household rooms per person.
*$p < .05$; **$p < .01$.
Source: Schweinhart et al. (2004).

TABLE A2
Lifetime Average Number of Arrests and Unit Costs per Crime

Arrests by type of crime	Preschool		No preschool		Unit costs per crime		
	Male	Female	Male	Female	Victim	Criminal justice system	Total
Felony							
Violent assault	0.780	0.150	0.825	0.048	$26,860	$19,319	$46,179
Rape	0.187	0.000	0.411	0.000	$97,368	$57,299	$154,667
Drugs	0.758	0.249	0.825	0.085	$2,238	$8,393	$10,631
Property	0.610	0.231	2.152	0.338	$8,953	$18,452	$27,405
Vehicle theft	0.000	0.000	0.141	0.000	$41,409	$8,393	$49,802
Other	0.851	0.192	0.622	0.046	$8,953	$8,393	$17,346
Misdemeanor							
Assault/battery	0.462	0.050	1.368	0.635	$10,520	$4,360	$14,880
Child abuse	0.041	0.000	0.000	0.000	$30,218	$8,393	$38,611
Drugs	0.231	0.149	0.521	0.239	$2,238	$4,360	$6,598
Driving	2.848	1.942	4.429	1.772	$3,022	$4,360	$7,382
Other	1.770	0.498	2.996	1.389	$1,567	$4,360	$5,927
Months sentenced to probation	15.768	4.531	22.243	4.909	na	$141	$141
Months served in prison	31.681	9.251	53.311	4.311	na	$2,282	$2,282
N	33	25	39	26			

Notes. All money values expressed in 2000 dollars. Cost figures reported are for age 40. Victim costs for ages 28–40 taken from Miller et al. (1996); CJS costs for ages 28–40 are averages of estimates from Cohen (1998) and the low estimates of Cohen et al. (2004). Per month probation and incarceration costs are taken from BJS databases (BJS, 2001, 2002a). Victim costs, CJS costs, probation costs and incarceration costs for ages 40–65 are extrapolated based on the growth trend in criminal justice costs, 1960s–1990s. For the age period 18–27, Barnett's (1996) unit cost figures are re-applied. For ages beyond 28, new unit cost figures are calculated; these reflect increases in the economic burden of crime, new methods of estimating its costs, and finer levels of disaggregating among crime types. For periods beyond age 40, growth in real per unit costs is assumed at 0.6% p.a., i.e., the real growth rate in costs over the 1960s–1990s (BJS, 2001). Probation costs are calculated as: total direct expenditures for state non-institutional correctional activities in 1999 divided by number of adults on probation under state jurisdiction (BJS, 2002a, Tables 1.8, 6.1). Incarceration costs are calculated from: total direct expenditures for state institutional correctional activities in 1999 divided by number of persons in state prisons in 1999 (BJS, 2002a, Tables 1.8, 6.12). For periods beyond age 40, growth in real per unit costs is assumed at 1.7% p.a., the rate of growth in costs over the period 1984–1996 (Stephan, 1999).