The Costs and Benefits of an Excellent Education for All of America's Children

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Overview

Broad policy decisions in education can be framed around a simple question: Do the benefits to society of investing in an educational strategy outweigh the costs?

We provide an answer for those individuals who currently fail to graduate from high school. The present cohort of 20-year olds in the US today includes over 700,000 high school dropouts, many from disadvantaged backgrounds. We investigate the economic consequences of improving their education.

First, we identify five leading interventions that have been shown to raise high school graduation rates; and we calculate their costs and their effectiveness. Second, we add up the lifetime public benefits of high school graduation. These include higher tax revenues as well as lower government spending on health, crime, and welfare. (We do not include private benefits such as higher earnings). Next, we compare the costs of the interventions to the public benefits.

We find that each new high school graduate would yield a public benefit of $209,000 in higher government revenues and lower government spending for an overall investment of $82,000, divided between the costs of powerful educational interventions and additional years of school attendance leading to graduation. The net economic benefit to the public purse is therefore $127,000 per student and the benefits are 2.5 times greater than the costs.

If the number of high school dropouts in this age cohort was cut in half, the government would reap $45 billion via extra tax revenues and reduced costs of public health, of crime and justice, and in welfare payments. This lifetime saving of $45 billion for the current cohort would also accrue for subsequent cohorts of 20-year olds.

If there is any bias to our calculations, it has been to keep estimates of the benefits conservative. Sensitivity tests indicate that our main conclusions are robust: the costs to the nation of failing to ensure high school graduation for all America's children are substantial.

Educational investments to raise the high school graduation rate appear to be doubly beneficial: the quest for greater equity for all young adults would also produce greater efficiency in the use of public resources.

The Size of the Challenge

The Importance of Education

Is excellent education for all America's children a good investment? We know that education is expensive, but poor and inadequate education for substantial numbers of our young may have public and social consequences that are even more costly. This study examines not only the costs of investing in services to provide an excellent education but also the costs of not doing so.

An individual's educational attainment is one of the most important determinants of their life chances in terms of employment, income, health status, housing, and many other amenities. In the United States we share a common expectation that all citizens will have access to high quality education that will reduce considerably the likelihood of later lifetime inequalities. Yet, large differences in educational quality and attainments persist across income, race, and region. Even with similar schooling resources, educational inequalities endure because children from educationally and economically disadvantaged populations are less prepared to start school. They are unlikely to catch up without major educational interventions on their behalf.

In the U.S. we typically view educational inequality as a challenging public policy issue because of its implications for social justice. If life chances depend so heavily on education, it is important that educational inequalities be redressed so as to equalize opportunities in a democratic society. But, beyond the broader issue of fairness, such inequalities may create costly consequences for the larger society in excess of what it would take to alleviate the inequalities. An excellent education for all of America's children has benefits not only for the children themselves but also for the taxpayer and society. Poor education leads to large public and social costs in the form of lower income and economic growth, reduced tax revenues, and higher costs of such public services as health care, criminal justice, and public assistance. Therefore, we can view efforts to improve educational outcomes for at-risk populations as a public investment that yields benefits in excess of investment costs.

What is an Excellent Education?

Precisely what constitutes an excellent education differs among observers. Some would argue for high student performance on standardized achievement tests. Others would say that all students should meet meaningful levels of proficiency in key subjects. Others would emphasize the ability to solve problems and to analyze complex situations.

We adopt high school graduation as a minimal criterion for an excellent education. High school graduation captures both the cognitive and non-cognitive attributes that are important for success in adulthood. It is usually a minimum requirement for engaging in further training and higher education. It opens up a range of future possibilities that would otherwise be closed to individuals. Most importantly, we focus on high school graduation because for the population as a whole we are far from fulfilling even this educational goal. Recent data also shows the U.S. currently lags behind a number of other industrialized nations in terms of high school graduation (OECD, 2006).

High School Graduation

Much attention has recently been devoted to determining rates of high school graduation. Some students may complete high school but not graduate; others may obtain a General Educational Development (GED) diploma. And graduation standards vary considerably across states.

Even without full consensus on a high school graduation standard, there is general agreement on two facts. First, graduation rates are low in absolute terms. On-time public high school graduation rates are approximately 66%–70%, meaning that at least three out of ten students do not graduate through the regular school system within the conventional time allotted. Second, graduation rates vary by gender and race. On-time public high school graduation rates for black males are as low as 43%. This compares to 48% for Hispanic males and 71% for white males. Female rates vary similarly across races, but with higher graduation rates overall. Thus, although a large proportion of each cohort meets conventional educational expectations, a significant number have not received an 'excellent' or even 'adequate' education.

Table 1 Number of 20-year olds who are high school dropouts

	Less than 9th grade	*9–11th grade (incl. GED)*	*Cohort size*	*Dropouts (%)*
Male	*63,000*	*450,000*	*2,252,000*	*23%*
White	18,000	194,000	1,362,000	16%
Black	6,000	69,000	301,000	25%
Hispanic	38,000	168,000	358,000	58%
Other	1,000	19,000	230,000	9%
Female	*33,000*	*259,000*	*1,983,000*	*15%*
White	6,000	100,000	1,225,000	9%
Black	>1,000	71,000	296,000	24%
Hispanic	25,000	63,000	283,000	31%
Other	2,000	26,000	179,000	16%

Sources: Current Population Survey (March 2005).
Notes: Gender and race-specific adjustments are made for institutionalization and GED receipt.

To fully examine the current economic consequences, we focus on those persons who are not high school graduates at age 20 in 2005 (thereby allowing for those who graduate late). Table 1 shows the numbers of dropouts by gender and race at age 20. Our focus is on those with 9th–11th grade education and GEDs. These persons are at the margin of high school graduation and would likely be most positively impacted by educational interventions that would help them complete high school. In total, this group is over 700,000 persons. Below we calculate the economic consequences of failing to ensure that these persons become high school graduates.

Educational Interventions to Raise High School Graduation Rates

Possible Interventions

To raise the rate of high school graduation we need to identify effective educational interventions. From an extensive search, we found very few interventions that demonstrably increased high school graduation rates on the basis of rigorous and systematic evaluation. (We discuss other promising interventions below).

Table 2 Interventions that demonstrably raise the high school graduation rate

Intervention		*Details of the intervention*	*Extra high school graduates if intervention is given to 100 students*
PPP	Perry preschool program	1.8 years of a center-based program for 2.5 hours per weekday, child:teacher ratio of 5:1; home visits; and group meetings of parents.	19
FTF	First Things First	Comprehensive school reform of: small learning communities with dedicated teachers; family advocates; and instructional improvement efforts.	16
CSR	Class size reduction	4 years of schooling (grades K–3) with class size reduced from 25 to 15.	11
CPC	Chicago child-parent center program	Center-based pre-school program: parental involvement, outreach and health/nutrition services. Based in public schools.	11
TSI	Teacher salary increase	10% increase in teacher salaries for all years K–12.	5

Sources: Belfield et al. (2006); Quint et al. (2005); Finn et al. (2005); Reynolds et al. (2001); Loeb and Page (2000).

We identified five interventions that demonstrated improvements in high school graduation rates based on a credible evaluation. These are summarized in Table 2. Two of the interventions take place in pre-school, one is implemented in elementary school, one in high school, and one through the K–12 years. The pre-school programs involved intensive educational programs with small group sizes and parental involvement. The class size reduction intervention is based on Project STAR, a four-year randomized field trial in Tennessee. The high school intervention was First Things First, a comprehensive school reform; we base our estimates on the site where this reform was fully implemented. Finally, the teacher salary increase proposal is for a 10% increase in wages across all K–12 years. Table 2 shows the impacts of these interventions on increasing the number of high school graduates per 100 students. Although most students would graduate anyway, the effectiveness of each intervention is in the additional number of graduates it yields out of 100 students receiving the intervention. The Perry preschool program is the most effective with 19 new high school graduates; at the opposite end of the spectrum, increasing teacher salaries by 10% would yield 5 new graduates.

Cost Per Intervention

Each of the interventions costs money. Table 3 reports the costs per person receiving the intervention, based on the inputs needed in each case. These costs also account for three important factors.

First, we must compare these costs with the later educational benefits in a consistent manner. We take the perspective of the current cohort aged 20. We express all costs and benefits in present value terms for a person aged 20. As intervention costs are incurred before age 20 (in the case of pre-school, 16 years earlier), they are weighted up following standard procedure; and since benefits are obtained after age 20, they are weighted down. This process uses a discount rate of 3.5% and converts all figures into 2004 dollars to obtain present values of costs and benefits at age 20.

Second, our analysis is designed to compare the public benefits of additional high school graduates with the public costs. However, because we cannot target interventions perfectly, some students who receive the intervention would have graduated anyway. Therefore, the unit cost of delivering the intervention to each student is not the same as the amount needed to yield an additional high school graduate. Rather, the cost per new graduate will reflect the fact that delivering the interventions to 100 students will only generate between 5 and 19 new high school graduates. Therefore the cost per new graduate is much higher than the per student cost.

Third, increasing the number of high school graduates will mean extra costs from extending attendance in secondary school as well as in college for those who are newly motivated to continue their educational career. We include extra high school costs assuming two extra years are needed to graduate. Conservatively, we include extra college costs assuming that the new graduates continue on and complete college at the same rate as those of students in the lowest quartile for reading achievement.

Table 3 Present value costs per educational intervention at age 20

Interventions to raise high school graduation		*Cost per student* [a]	*Cost per expected high school graduate* [b]
FTF	First Things First	$5,500	$59,100
CPC	Chicago child-parent center program	$4,700	$67,700
TSI	Teacher salary increase	$2,900	$82,000
PPP	Perry preschool program	$12,500	$90,700
CSR	Class size reduction	$13,100	$143,600

Sources: See Table 2 and NCES (2002).
Notes: [a] The unit cost of delivering the intervention. [b] The cost of delivering the intervention to 100 students and the induced extra attainment in high school and college for the new high school graduates. Discount rate is 3.5%.

Therefore, we express our results in terms of an 'expected high school graduate', i.e. someone who graduates from high school but may also attend college. This hypothetical individual is synthesized from the probabilities: of terminating education after high school or briefly attending a two-year college (approximately three-quarters of students do this); of completing a two-year degree or attending a four-

year college (one-in-six high school graduates); and of completing a four-year degree (approximately one-in-twelve graduates). Each new 'expected high school graduate' has some probability of more education beyond high school. This imposes more costs, but it also generates more benefits because the advantages of being educated do not stop at high school graduation.

Table 3 shows the total costs per student and per new expected high school graduate. The actual cost per student ranges from $5,500 to $13,100. But only some of these students will be 'new' graduates. The cost per expected new graduate accounts for: delivering the intervention to students who would graduate regardless; extra high school costs for the new graduates; and extra college costs for those who go on to further study. These costs are considerably higher than the unit costs of delivering the intervention. The cost per new expected high school graduate ranges from $59,100 for First Things First to $143,600 for an intervention to reduce class size. These total cost figures show that a significant investment is required to generate and support each new high school graduate. At issue is whether this is an investment worth making.

The Effects on Labor Market Income and Tax Revenue

Education and the Labor Market

One of the best documented relationships in economics is the link between education and income: more highly educated people have higher incomes. Failure to graduate from high school has both private and public consequences: income is lower, which means lower tax contributions to finance public services.

Many studies using various methods have tested whether the education to earnings correlations indicate causation. This body of evidence is generally consistent: the economic return generated by schooling is not an omitted correlation between schooling and other personal characteristics (such as ability). And there is not clear evidence that the effect of schooling on earnings is associated solely with receipt of the credential; higher earnings genuinely reflect the skills learnt in school. There is no strong evidence that this general conclusion varies according to race, gender, or ability level. Thus, wage comparisons across education and age levels are likely to yield reliable estimates of the benefits of schooling.

We use national survey data from the Current Population Survey (CPS) to estimate the differences in earnings by education level. These data report on hourly wages, salaries, and time spent working. We can therefore account for both higher pay and the increased likelihood of being employed for those with a high school diploma. With data on incomes, we then apply a tax simulation model (TAXSIM) to calculate federal and state income taxes.

Table 4 shows the differences in labor market outcomes by education level by gender and race for all adults over 20. Dropouts are less likely to be employed, and they earn much less. (They are also more likely to be unemployed or out of the labor force). Lower earnings reflect both lower wages and a lower probability of being in

Table 4 Labor market outcomes by educational attainment (aged 21–64)

	High school dropout	*High school graduate*	*Some college*	*BA degree or more*
Employment (%):				
Male: white	71	79	81	89
Male: black	49	66	70	83
Male: Hispanic	70	78	69	85
Male: other	71	79	77	88
Female: white	46	65	72	78
Female: black	46	63	70	84
Female: Hispanic	51	57	64	65
Female: other	48	62	69	73
Average annual earnings:				
Male: white	$22,800	$33,900	$40,300	$79,100
Male: black	$13,500	$21,800	$29,600	$53,800
Male: Hispanic	$21,400	$24,000	$26,000	$54,200
Male: other	$22,300	$30,100	$34,900	$69,700
Female: white	$7,800	$16,500	$20,400	$35,600
Female: black	$10,000	$14,200	$19,500	$40,600
Female: Hispanic	$9,900	$14,500	$17,300	$39,000
Female: other	$8,600	$15,700	$19,200	$36,900

Source: Current Population Survey (March 2003 and 2004).
Notes: Employment rates are based on populations, not labor force size. Annual earnings include those with zero earnings. No adjustment is made for incarceration rates.

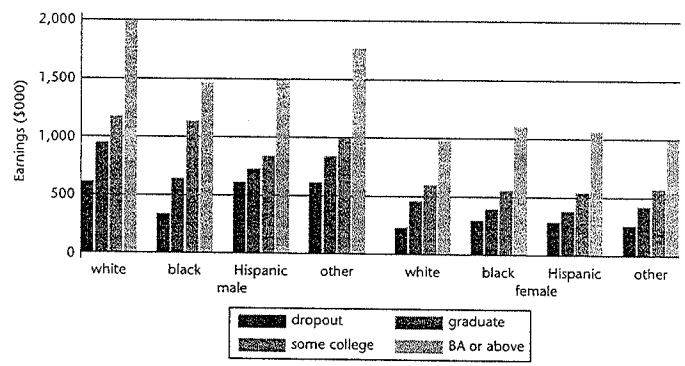
work. For example, at $10,000 per year, black female dropouts' incomes are 40% less than those of black female graduates, roughly half as much as those with some college, and one-quarter of those with a college degree. Similarly strong effects hold for all subgroups. These income differences translate into differences in tax revenues.

Lifetime Income and Tax Benefits from Graduation

We calculate earnings and tax payments across an individual's working life expressed in present values. To account for additional payments in property taxes and sales taxes, we add 5% to total income tax payments. The two charts below show extra lifetime earnings and additional lifetime tax payments after age 20 from finishing high school and going on to college.

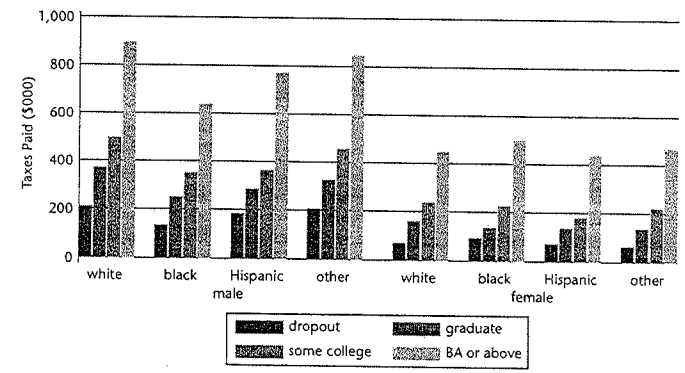
The extra lifetime earnings from graduation are substantial. As shown in Chart 1, male high school graduates earn $117,000–$322,000 more than dropouts; those with some college earn significantly more; and the difference in lifetime earnings between a high school dropout and a college graduate is $950,000–$1,387,000. Similarly, female high school graduates earn $120,000–$244,000 more than dropouts. Female college graduates also do well, earning roughly $800,000 more than high school dropouts.

Chart 1 Lifetime earnings by education level



Sources: Current Population Survey (March 2003 and 2004).
Notes: Earnings figures include all persons, i.e., persons with positive or zero income. Figures are adjusted for differences in incarceration rates by education level (but not GED status). Productivity growth is assumed at 1.5% per year. Discount rate is 3.5%.

Chart 2 Lifetime tax payments by education level



Sources: Current Population Survey (March 2003 and 2004); TAXSIM (NBER, Version 6).
Notes: Figures are adjusted for differences in incarceration rates by education level (but not GED status). Income tax payments are calculated as the average of assuming all males are single and all males are household heads. Sales and property taxes are 5% of income tax payments. Discount rate is 3.5%.

TABLE 5 LIFETIME TOTAL TAX PAYMENTS PER EXPECTED HIGH SCHOOL GRADUATE

	Tax payment *Extra lifetime contribution per expected high school graduate*	
	Male	*Female*
White	$202,700	$109,100
Black	$157,600	$94,300
Hispanic	$119,000	$85,000
Other	$168,600	$96,700
Average	*$139,100*	

NOTES: An expected high school graduate is one who probabilistically either: terminates education after graduation; completes some college; or completes a BA Degree. Discount rate is 3.5%.

As shown in Chart 2, persons educated to high school and beyond pay considerably more in taxes. Male dropouts pay approximately $200,000 in taxes over the lifetime. Male high school graduates pay an additional $76,000–$153,000 and those who graduate from college pay an extra $503,000–$674,000. Female dropouts pay under $100,000 in taxes. Female high school graduates pay $66,000–$84,000 extra and female college graduates contribute $348,000–$407,000 extra.

The additional tax revenue per expected high school graduate is given in Table 5. Most graduates will terminate their education after high school, but some will progress onto college and a smaller fraction will complete college. Therefore, we calculate the average benefit based on the full amount of education each new graduate attains. The average lifetime benefit in terms of additional taxes per expected high school graduate is $139,100. The amounts vary by race and gender, but for each subgroup they are significant.

The Effects on Health Status and Expenditures

Education and Health

High school graduates have improved health status and lower rates of mortality than high school dropouts (Cutler and Lleras-Muney, 2006). Those with college education fare even better. One might therefore anticipate significant savings to the public health care system as education levels increase.

Those with higher educational attainment are less likely to use public programs such as Medicaid and they typically have higher quality jobs that provide health insurance. Because Medicaid eligibility is based on wages rather than health status, those with more education are less likely to qualify. But lower morbidity and mortality rates do not necessarily translate into lower medical costs: those with more education use more preventive care and tend to visit doctors more when they have less severe ailments. This offsets the cost savings from improved overall health. Moreover,

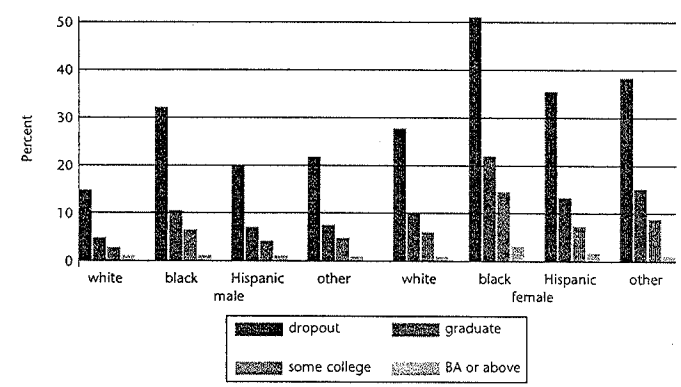
sicker people are more likely to die young, thus reducing Medicaid rolls. Therefore, improving educational attainment may produce little net change in per enrollee expenditures for those already enrolled in public programs.

All citizens are eligible for Medicare at age 65. However, because these effects are 45 years in the future for our cohort of 20-year olds, they are not economically significant. But, persons under 65 who are on social security disability income also qualify for Medicare, and their per enrollee costs are three times those of non-disabled enrollees. So, to the extent that education reduces the probability of disability, it should also proportionately reduce Medicare enrollment, and therefore reduce public costs.

In sum, increasing educational attainment will likely produce the following effects. First, given the causal link between educational attainment and income, the public sector will save money by reducing enrollment in Medicaid and other means-tested programs. Second, if there is a causal link between educational attainment and disability, the public sector will save money by reducing enrollment in Medicare among persons under the age of 65. It may also reduce expenditures among Medicaid beneficiaries by reducing the number of severely ill enrollees.

We use data from a nationally representative sample of over 40,000 non-institutionalized civilian subjects, the Medical Expenditure Panel Survey (2004). Information is available on health-related quality of life scores and public insurance enrollments. Public sector costs data are from the National Health Accounts.

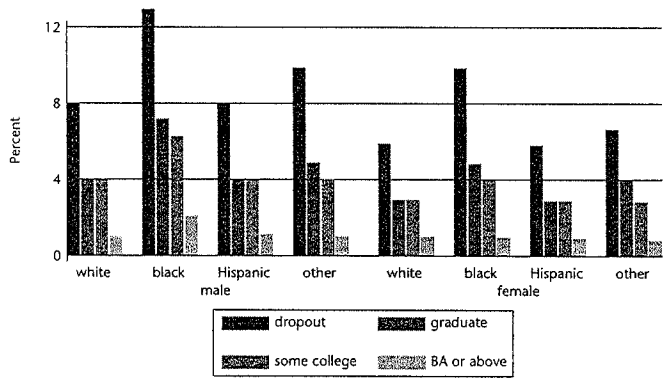
CHART 3 MEDICAID COVERAGE



SOURCES: Medical Expenditure Panel Survey (2004); National Health Accounts.

Charts 3 and 4 show Medicaid and Medicare coverage by education level. There are significant differences in coverage across education levels: graduates enroll at half the rate of dropouts; and those with college degrees enroll at very low rates. These enrollment differences reflect differences in health status as measured by quality-adjusted life years (QALYs): for example, for those aged 18–24, a high school dropout's health status is 0.89 QALYs, a high school graduate's is 0.91, and a college graduate's is 0.96. These health status differences and coverage disparities persist over the lifetime.

CHART 4 MEDICARE COVERAGE



SOURCES: Medical Expenditure Panel Survey (2004); National Health Accounts.

Lifetime Health Benefits from Graduation

These differences in coverage rates—reflecting genuine differences in health—translate into differences in annual per capita costs and so into lifetime costs. Table 6 shows the predicted total present value lifetime costs per capita (not per enrollee). High school dropouts will use public health system resources at much greater rates than graduates. The costs vary by gender and race, but the educational impacts are significant. For white females, for example, a dropout will receive $60,800 in Medicaid and Medicare payments or services over the lifetime up to 65. A high school graduate will receive $23,200 and a college graduate $3,600.

TABLE 6 TOTAL PRESENT VALUE LIFETIME PUBLIC HEALTH COSTS PER CAPITA

	High school dropout	*High school graduate*	*Some college*	*BA degree or above*
Male:				
White	$43,500	$17,000	$12,900	$3,100
Black	$82,400	$34,200	$25,100	$6,000
Hispanic	$59,000	$23,300	$16,700	$4,000
Other	$61,600	$24,800	$18,200	$4,400
Female:				
White	$60,800	$23,200	$15,900	$3,600
Black	$107,200	$48,500	$33,500	$7,800
Hispanic	$73,700	$29,200	$19,600	$4,400
Other	$80,500	$33,600	$23,000	$5,300

NOTES: Costs include Medicaid and Medicare. Discount rate is 3.5%.

Educational interventions that help students to graduate from high school (and in some cases progress on to college) should therefore yield savings to the public health system. Table 7 shows the lifetime economic benefit from raising the high school graduation rate.

TABLE 7 LIFETIME TOTAL PUBLIC HEALTH SAVINGS PER EXPECTED HIGH SCHOOL GRADUATE

	Public health expenditures Extra lifetime saving per expected high school graduate	
	Male	*Female*
White	$27,900	$39,600
Black	$52,100	$62,700
Hispanic	$37,800	$46,500
Other	$39,000	$49,200
Average	*$40,500*	

NOTES: An expected high school graduate is one who probabilistically either: terminates education after graduation; completes some college; or completes a BA Degree. Discount rate is 3.5%.

Over the lifetime, the average saving to the public health system per expected high school graduate is $40,500. The savings are greater for females but they are also substantial for males.

The Effects on Crime Behavior and Expenditures

Education and Crime

Broadly, crime research finds that higher educational attainment reduces crime both by juveniles and adults. The causal mechanism may be either behavioral or financial. Higher educational attainment may directly influence criminal predispositions. Alternatively, by raising earnings and earnings potential, higher educational attainment reduces the pressure to commit crime and raises the opportunity cost. The relationship is clearest when looking at dropout status and incarceration: although they constitute less than 20% of the overall population, dropouts make up over 50% of the state prison inmate population (Bonczar, 2003). Moreover, disadvantaged groups—particularly black males—are disproportionately represented in the prison system.

The economic cost of crime is high. Victims bear most of the costs of crime, but these are not (directly) counted in the public's balance sheet. From the public perspective, there are four main costs: criminal justice system costs for policing and for trials and sentencing; incarceration costs (including parole and probation); state-funded victim costs (medical care and from lost tax revenues); and expenditures of government crime prevention agencies.

Table 8 Annual criminal activity by dropouts aged 20

	Per 1,000 high school dropouts		*Impact from expected high school graduation*
	Arrests	*Crimes*	
Murder	0.48	0.82	–19.6%
Rape	0.69	2.43	–19.6%
Violent crime	14.02	32.24	–19.6%
Property crime	42.95	279.17	–10.4%
Drugs offenses	60.04	600.43	–11.5%

Sources: UCR (2004) adjusted for undersurvey; Wolf and Harlow (2003); Lochner and Moretti (2004).
Notes: Violent crime includes robbery and aggravated assault. Property crime includes burglary, larceny-theft, arson, and motor vehicle theft. The share of total arrests by high school dropouts is based on incarceration rates.

We focus specifically on high cost crimes: murder, rape/sexual assault, violent crime, property crime, and drugs offenses. Table 8 shows the annual criminal activity for the cohort of 20 year olds who are dropouts. It shows high numbers of arrests and crimes for these five crime types. The final column shows the impact of high school graduation (adjusted for college progression) on the commission of these crimes. Overall crime rates are reduced by 10-20%. This reduction in crime is assumed to have a corresponding effect on incarceration rates.

Lifetime Criminal Activity and Graduation

Using Bureau of Justice Statistics data and survey information we calculate the public cost per crime and per arrest for each of these five crime types. Each crime imposes costs in terms of policing, government programs to combat crime, and state-funded victim costs. Each arrest also imposes costs in terms of trials, sentencing, and incarceration. The costs per crime and arrest vary according to the type of crime (mainly because of differences in prison sentences).

Table 9 Total present value lifetime cost-savings from reduced criminal activity

	Criminal justice system expenditures Extra lifetime saving per expected high school graduate	
	Male	*Female*
White	$30,200	$8,300
Black	$55,500	$8,600
Hispanic	$38,300	$8,300
Other	$30,200	$8,300
Average	*$26,600*	

Notes: An expected high school graduate is one who probabilistically either: terminates education after graduation; completes some college; or completes a BA degree. Annual criminal activity is assumed to decay to zero by age 65. The decay rate is based on the actual incidence of crime for each age group (UCR, 2004, Table 1). Discount rate is 3.5%.

To estimate the lifetime cost-saving from increased rates of high school graduation, we multiply the unit cost by the reduction in crime. The resulting lifetime cost-savings to the criminal justice system are reported in Table 9. The average saving per new high school graduate is $26,600. However, this amount is significantly higher for males than females, reflecting the big difference in criminal activity. Most of these savings are from lower incarceration costs, although there are also substantial savings from lower criminal justice system costs.

The Effects on Welfare and Expenditures

Education and Welfare

Greater educational attainment is associated with lower receipt of public assistance payments or subsidies. The relationship may be caused directly by lower rates of single motherhood or teenage pregnancy associated with high school graduation. Additionally, more education produces higher incomes which reduce eligibility for means-tested programs. However, more educated persons are better able to navigate the welfare system and claim benefits to which they are entitled. This offsets somewhat the gains from reducing welfare entitlements through increased educational attainment.

The impact of education on welfare payments may be significant. Annually, the federal government spends $168 billion and state governments spend $25 billion on the following need-tested benefit programs: cash aid, food benefits, housing aid, training, and energy aid (CRS, 2004). As incomes rise with education, eligibility for these payments will be reduced.

To estimate welfare costs we adopt a model derived by Waldfogel et al. (2005) for analysis of single mothers. First, we identify the impact of education in reducing non-elderly welfare receipt from three sources: Temporary Assistance for Needy Families (TANF); food stamps; and housing assistance. We also include state-level payments on a proportionate basis. Second, we calculate the monetary savings from reductions in welfare receipt over the lifetime for those who are new high school graduates.

Table 10 Welfare receipt by education level

	Less than high school	*High school graduate*	*Some college or above*
Temporary Assistance for Needy Families (ages 21–64)	553,000	623,700	40,100
Housing assistance (ages 21–64)	745,000	841,800	54,100
Food Stamps (age 20)	95,700	226,000	

Sources: DHHS (2005); Census (2003); Barrett and Poikolainen (2006); Rank and Hirschl (2005).
Notes: Distribution by education for housing assistance based on TANF distribution. Food stamp receipt for high school graduates includes those with higher education.

Table 10 shows significant differences in TANF receipt by education level. Almost half of all recipients have less than a high school education, a proportion much higher than their representation in the population. Those with any college education are highly unlikely to receive welfare. TANF caseloads are predominantly female (approximately by a factor of ten), with black and other race groups disproportionately represented. Similarly, of the 1.6 million persons annually receiving housing assistance, a disproportionate number are high school dropouts. Finally, the most extensive program is food stamps, in which 9.6 million non-elderly adults participated in 2004. Again, education is important, with receipt rates for dropouts almost double those for high school graduates. These differences add up: over a lifetime 64% of adult dropouts will have ever used food stamps, compared to 38% of high school graduates (Rank and Hirschl, 2005, 142).

We apply CPS data to calculate the relationship between education and welfare receipt. Being a high school graduate is associated with a lower probability of TANF receipt by 40%, of housing assistance by 1%, and food stamps by 19%. For those with some college or above, welfare receipt is even more sharply reduced: by 62% for TANF, by 35% for housing assistance, and by 54% for food stamps. Overall, there are likely to be significant cost-savings from reducing welfare caseloads by raising high school graduation across all three programs.

Welfare Receipt and High School Graduation

We now apply these impacts to the unit costs of welfare. For TANF, the average monthly benefit is approximately $355 and for food stamps it is $85 (DHHS, 2005; Barrett and Poikolainen, 2006). We add administrative costs to these figures to assess the full fiscal burden. For housing assistance, we calculate spending of $3,100 per person annually based on reported total expenditures in 2002 (CRS, 2004). Total costs per year are calculated as the impact times the unit cost.

Table 11 Welfare cost-saving per expected high school graduate

	Welfare expenditures Extra lifetime saving per expected high school graduate	
	Male	*Female*
White	$1,200	$5,000
Black	$3,300	$9,000
Hispanic	$1,200	$3,100
Other	$1,200	$3,100
Average	*$3,000*	

Notes: Expected high school graduate status adjusts for progression on to college. Lifetime welfare cost-savings adjust for the decline in these forms of welfare receipt with age. Welfare programs are TANF, housing assistance, food stamps, and state-level programs on a proportionate basis. Discount rate is 3.5%.

Annual figures can be extrapolated to calculate lifetime effects of increasing educational attainment. Lifetime figures are present values from the perspective of an individual currently aged 20. These are reported in Table 11. The average cost-saving per expected new graduate is $3,000 over the lifetime. The largest proportion of the savings comes from reductions in TANF payments although there are non-trivial savings in housing assistance and food stamps as well. The total figure is relatively low (compared to the other domains) for the following reasons: welfare is time-limited; children and the elderly receive high proportions of welfare funds; and males do not receive much welfare (but they constitute a large proportion of all dropouts). Also, we have omitted benefits for other welfare programs (mostly at the federal level) where we have insufficient evidence. Nevertheless, the cost savings are still significant, particularly for female dropouts.

The Aggregate Consequences of High School Graduation

The Cost and Benefits of High School Graduation

High school graduation is associated with higher incomes, better health, lower criminal activity and lower welfare receipt. This has private benefits, but it also produces significant public benefits. When we calculate these benefits in a consistent form, their magnitudes are substantial (see also Heckman, 2000).

Table 12 Present value lifetime public economic benefits

	Total lifetime economic benefit per expected high school graduate	
	Male	*Female*
White	$262,100	$162,000
Black	$268,500	$174,600
Hispanic	$196,300	$143,000
Other	$239,000	$157,300
Average	*$209,100*	

Notes: Benefits are gross, i.e. they do not account for the costs of additional educational attainment. An expected high school graduate is one who probabilistically either: terminates education after graduation; completes some college; or completes a BA degree. Discount rate is 3.5%.

Table 12 shows the lifetime economic benefits per expected high school graduate. Each new graduate will, on average, generate economic benefits to the public sector of $209,100. These are gross benefits and do not account for what it costs for the necessary educational interventions to raise the graduation rate or fund college progression contingent on graduation. The amounts vary by gender and race, with high school graduation providing a gross public saving of $196,300–$268,500 for males and $143,000–$174,600 for females.

It is important to state that we are not proposing that policy should be based crudely on net present values across subgroups (not least because an alternative criterion—the rate of return—yields a different ranking). We present disaggregated figures to show that the conclusions are not in fact driven by one group and that population-wide interventions are easily justified. A broader perspective must be adopted to decide where the most urgent investments should be made, taking into account the causes of any fiscal differences. These causes might include the potency of education's effects based on the quality of available schools, the progression rates to college, the extent of involvement in the labor market, and the receipt of public services. Other important considerations are the extent of labor market discrimination within and across education groups and the value society places on work outside the labor market. Investigation of all these factors is beyond our scope and so we emphasise that the gross public benefits from graduation are very large for all cases.

Table 13 Net public investment returns

	Interventions to raise high school graduation rates				
Per additional expected high school graduate	*First Things First*	*Chicago Parent-Child Center*	*Teacher salary increase*	*Perry Preschool*	*Class size reduction*
Costs (C)	$59,100	$67,700	$82,000	$90,700	$143,600
Benefits (B)	$209,100	$209,100	$209,100	$209,100	$209,100
Benefit/cost ratio (B/C)	3.54	3.09	2.55	2.31	1.46
Net present value (B-C)	$150,100	$141,400	$127,100	$118,400	$65,500

Notes: Numbers are rounded to nearest $100. Costs include delivering the intervention and any subsequent public subsidies for high school and college. Discount rate is 3.5%.

The net public benefits of high school graduation are also substantial. Table 13 shows that the benefits easily exceed the costs for each intervention. The first row shows the educational cost per new graduate, i.e. the sum of intervention and attainment costs for each of the five interventions which have been proven to raise graduation rates. These costs range between $59,100 and $143,600. The second row shows the average economic benefits per high school graduate of $209,100. These are lifetime benefits, discounted back to age 20. The last two rows show the benefit–cost ratio, i.e. the factor by which the benefits exceed the costs, and the net present value, i.e. the difference between the benefits and the costs. Taking the median intervention—teacher salary increase—the benefits are 2.55 times greater than the costs and the net present value from this investment is $127,100. For the upper bound intervention—First Things First—the benefits exceed the costs by a factor of 3.54. For the lower bound intervention—class size reduction—the benefits exceed costs by a factor of 1.46.

The aggregate consequences of raising the high school graduation rate for each age cohort are economically significant. Each cohort of 20-year olds includes over 700,000 high school dropouts. The fiscal consequence is $148 billion in lost tax revenues and additional public expenditures over the lifetime. If this number was reduced by half through successful implementation of the median educational intervention, the net present value economic benefit would be $45 billion. This figure is an annual one because each cohort includes the same number of dropouts. And it does not count the private benefits of improved economic well-being that accrue directly to the new graduates themselves. If the interventions only reduced the number of dropouts by one-fifth, the net economic benefit would be $18 billion.

Sensitivity Tests

The net economic benefits of investments to raise high school graduation rates appear to be very large. This conclusion is unlikely to change if alternative assumptions are applied. Our economic analysis, based on the best available evidence, has used conservative assumptions. Clearly, if we can identify more effective interventions or if these interventions are less effective when scaled up, net benefits will be affected. But, these influences are not easily measured. Also important are demographic changes, which are likely to raise the need for educational investments (Tienda, 2005). The main assumptions—and how they affect the results—are given in Box 1.

Box 1 Key Assumptions and Their Consequences

Assumptions	*Effect on net economic benefits*
Educational interventions can be accurately targeted to at-risk groups	+++
Inclusion of juvenile benefits (crime, teenage pregnancy)	++
Higher taxes impose economic distortion (deadweight loss) on taxpayers	++
Inclusion of intergenerational, family, and civic benefits from graduation	++
Undercounting of persons in poverty	+
Fall in wages with more graduates in the labor market	−
Increase in the costs of delivering each intervention	−−
No college progression by high school graduates	−−
Higher discount rate	−−

Notes: Number of plus or minus signs indicates the approximate strength of the effect.

The net benefits would increase significantly if the educational interventions could be targetted more accurately to at-risk individuals. (The results given above assume that interventions have to be given to all students, regardless of whether they would drop out). The net benefits would also go up if we counted other effects of education, such as lower juvenile crime or teenage pregnancy, improved civic engagement (NCOC, 2006), and the deadweight loss in collecting taxes. As well, because sample surveys undercount those in poverty, benefits would likely increase if more accurate data was available. In contrast, factors which would reduce the return include: a fall in market wages as more graduates enter the labor market; an increase in the cost of delivering each intervention; no progression on to college by new high school completers; and a higher discount rate. We test the two most conservative assumptions (no college progression and a discount rate of 5%) and find that the net economic benefits are still strongly positive.

In summary, it seems unlikely that sensitivity tests using alternative assumptions would overturn the fundamental conclusion of this analysis, namely that the net present value of public investments to ensure high school graduation is significantly positive across all subgroups of the population.

Moving Forward

Educational Interventions for Future Generations

In this study we have found that the monetary value of the public benefits of reducing high school dropouts exceeds considerably the public costs of getting results through demonstratively successful educational interventions.

Notably, we selected only those interventions for which rigorous and credible evaluations were available and which showed positive impacts on reducing high school dropouts. Although this process is supported by mainstream authorities in evaluation (Mervis, 2004), only five interventions met these criteria. However, there are new and promising interventions which should be considered. These interventions were not included in our calculations because of a lack of reliable information on their effectiveness. It is our hope that over time we will obtain excellent evaluations of their impact and that they will show even more powerful results.

New Ways to Raise the High School Graduation Rate

A number of potential candidates for increasing high school graduation may have even more powerful effects than the interventions that were the focus of this study. These new interventions reflect a convergence of agreement on a common set of features that lead to increased high school graduation rates and educational success. These features are: (1) small school size; (2) high levels of personalization; (3) high academic expectations; (4) strong counseling; (5) parental engagement; (6) extended-time school sessions; and (7) competent and appropriate personnel.

Small size describes a small school or a small program within a school in which students and staff are known to each other and accountable. *Personalization* refers to a caring environment in which every student is perceived as an important member of the community by both staff and other students and in which individual personal and academic needs are addressed. *High academic expectations* call for a demanding level of academic work that each student is expected to meet if given appropriate assistance. *Strong counseling* refers to the ready availability of personnel who can provide guidance and advice to students facing considerable personal challenges. *Parental engagement* enlists the efforts of the parent in support of the educational aspirations and accomplishments of their child and the school. *Extended time* refers to longer school days, weeks (Saturday classes) and school years to allow sufficient time for instruction and other activities designed to enable students to succeed. *Competent and appropriate personnel* refer not only to teaching qualifications of personnel, but also to their commitment to the mission of the school.

There is wide agreement that these types of changes should not be done on an individual basis, but should be done in combination to comprise a different school and schooling experience (Quint, 2006). For example, although there is a vigorous "small school" movement in the U.S., the evidence suggests that shrinking school size is unlikely to be adequate to improve educational outcomes in the absence of other changes. More generally, learning is a cumulative process such that youth interventions will not be effective for those students without basic literacy and numeracy skills (see Cunha and Heckman, 2006). It is also necessary to have institutional support so that interventions are implemented properly.

Among the five interventions reviewed in our cost-benefit analysis, First Things First (FTF) has components that draw upon the features set out above. Perhaps it is not a coincidence that FTF also has the largest economic benefits relative to costs. (Because FTF represents an investment in high school, there is a shorter period of time before the investment pays off relative to pre-school and elementary school investments.) Even so, FTF includes class size reduction, and it is conceivable that it could be even more effective if its students had a strong pre-school experience and a more selective draw of teachers through higher salaries. In this respect we believe that the overall model represented by the FTF results is one that should be evaluated further in its different forms.

One of the most complete versions of the model is that of the Institute for Student Achievement (ISA) which includes all the features set out above (www.studentachievement.org). The model includes a college-preparatory curriculum with counseling, professional staff, and parental involvement. ISA has developed its approach in schools for more than a decade and served about 8,000 students in 32 partner schools in 2005. Early evaluation information is promising (AED, 2006), including advantages in student attendance and behavior as well as teacher reports of student support. But there is a pressing need for evaluations using experimental and quasi-experimental methods to validate ISA's educational effects.

Other models that show promise along some educational dimensions are Talent Development High Schools and career academies (such as those following the model of the National Academy Foundation, which partners with over 600 academies nationally). Both have been subjected to rigorous evaluations and have shown positive results but they have not yet been validated in terms of high school completion (Quint, 2006). One promising model of reform that operates in existing size high schools is Achievement Via Individual Determination (AVID) which was started in 1980 and is now found in more than 1,000 schools in 40 states (www.avidonline.org). AVID seeks out students in the middle of the academic distribution who are not doing the quality work that they are capable of and provides dedicated teachers and rigorous educational experiences for students willing to take on the AVID commitment. Intensive support is also received from college tutors. It, too, requires tighter evaluation studies before conclusions can be drawn on its effects, although less formal studies have found strong results.

A good case can also be made for accelerating the middle school and secondary curriculum to insure that all students experience a similar set of challenging courses with workshops and other instructional supports to support those students with particular learning needs. A rigorous, longitudinal evaluation of this reform in mathematics showed that even the most advanced students benefit, and those who entered middle schools with the poorest records are brought into a productive mainstream in which they take more advanced mathematics courses and improve substantially their mathematics achievement (Burris et al., 2006). Finally, the Knowledge is Power Program (KIPP) may be another middle school reform with longer term benefits. It too emphasizes high expectations as well as committed principals and parents. Again, evaluation shows achievement gains in the early grades (EPI, 2005).

Of course not all educational interventions need to be initiated in the schools. A substantial amount of the variance in educational performance is associated with influences in the home, school, and community (Rothstein, 2004). Studies of high school dropouts also confirm the importance of differences in conditions outside of the school. These findings suggest that the strongest programs for increasing high school graduation rates and subsequent college participation will combine interventions in the school with those in the family, neighborhood, and community. Ferguson (2005) describes in detail the possible options and their consequences.

Clearly, there are a large number of potential approaches that have promising evaluation support, even if such support falls short of what is needed for a rigorous cost-benefit analysis. Thus, our conclusions do not need to be narrowly tied to the smaller set of interventions that were included in our calculations. Indeed, it is highly unlikely that there is 'one best intervention'. Instead, given the total number of dropouts and the varations in their circumstances and educational needs, a variety of interventions—possibly in combination—should be implemented. Nevertheless, there should be strong evaluations for all those reforms that show promise in order to include them in future cost-benefit studies.

Raising Benefits and Reducing Costs

As mentioned above, we view our estimates as conservative assessments of the public returns to public investments in raising high school graduation rates. Even so, the returns are substantial and could be higher if benefits were increased and costs were reduced. Clearly the most direct way of raising benefits is to establish more powerful methods of improving high school graduation rates. More recent approaches may have even more potent impacts on improving educational results. If so, we can raise benefits by shifting to those that are shown to be most productive according to evaluation methods based upon high standards of validity.

But, one effective strategy that could cut the cost considerably would be if the intervention could be targeted to those students most likely to drop out or most likely to benefit from it. When the intervention is targeted to the entire school (including those students who would have graduated anyway), it requires more resources than if it were targeted to a particular group of vulnerable students. Thus, targeting the intervention or portions of the intervention, if possible, represents a way of reducing the cost for each additional student that graduates.

More Than Money

This study has shown that by focusing resources on students who are receiving inadequate education, it is possible to obtain benefits far in excess of the costs of those investments. Increases in tax revenues and reductions in taxes paid into public health, criminal justice, and public assistance would amount to many billions of dollars a year in excess of the costs of educational programs that could achieve these results. But, it is important to note that this is more than just good public investment policy with monetary returns. A society that provides fairer access to opportunities, that is more productive and with higher employment, and that has better health and less crime is a better society in itself. It is simply an added incentive that the attainment of such a society is also profoundly good economics.

Further Information

Full information on the calculations in this document is available in a Technical Appendix from levin@tc.edu.

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