Achievable Affordable

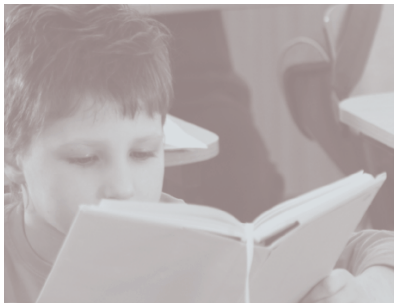
Providing Comprehensive Educational Opportunity to Low-Income Students

4

What Are the Social and Economic Returns?









Clive Belfield
Fiona Hollands
Henry Levin

October 2011

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Teachers College, Columbia University

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by Michael A. Rebell

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The Campaign for Educational Equity is a nonprofit research and policy center at Teachers College, Columbia University, that champions the right of all children to meaningful educational opportunity and works to define and secure the full range of resources, supports, and services necessary to provide this opportunity to disadvantaged children. Founded in 2005 by educational law scholar and advocate Michael A. Rebell, the Campaign pursues systems change through a dynamic, interrelated program of research, legal analysis, policy development, coalition building, curriculum development, and advocacy dedicated to developing the evidence, policy models, curricula, leadership, and collaborations necessary to advance this agenda at the federal, state, and local levels.

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The Campaign for Educational Equity

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Executive Summary

Approximately half of all New York City public school students who live in families with incomes less than 185% of the federal poverty level (FPL) do not graduate from high school. These dropouts are much less likely to achieve economic self-sufficiency in adulthood. This creates both a fiscal and social burden. Rothstein, Wilder and Allgood (2011) propose a set of publicly funded comprehensive services to supplement academic services that could effectively raise the educational attainment levels of low income children to levels associated with middle class children. This report calculates the fiscal and social impact of raising the attainment levels of these students in order to assess whether the costs of such services are justified by the benefits.

Specifically, the report estimates the economic costs and benefits attributable to a single cohort of 37,000 12th grade students from families with incomes below 185% FPL who are currently finishing up in New York City public schools. It calculates the net fiscal contributions by education level per individual. These contributions are tax revenues, minus government expenditures on healthcare, the criminal justice system, welfare programs, and school/college. The report finds that New York City and State combined spend $82,000 (in lifetime present value terms) on each high school dropout on healthcare, criminal justice, welfare and education while receiving only $45,000 in tax revenues. This results in a deficit of $37,000 for each dropout. In contrast, for students earning a BA or higher degree, the city and state expenditures amount to $55,000 while tax revenues are $143,000, resulting in a balance of $88,000 in favor of the government. The impact for the federal government is also substantial with high school dropouts costing $1,360 when federal expenditures are netted against federal tax revenues, while students earning a BA or higher degree contribute $347,460 in lifetime present value terms. Evidently dropouts create a greater fiscal burden for the state and city than for the federal government, but the federal government gains dramatically more as education levels increase.

The report also calculates the social impact of different educational attainment levels including the benefits of income gains, economic spillovers, reductions in crime, and improvements in health as education level increases. The total social benefits attributable to a student educated to the end of 11th grade amount to $360,000. For a student graduating high school, the comparable figure is $902,000, that is, over half a million dollars more per person. For a student earning a BA or higher degree, the total social benefits are estimated at $2.4 million, or more than six and a half times the contribution of a high school dropout.

Provision of the recommended supplemental programs for the 37,000 New York City students who are in families with income levels between 75%-185% FPL is estimated to cost the government $12.29 billion. From a purely fiscal perspective, the expected benefits would cover only about 60% of the government's costs. However, the total expected social benefits of $24.93 billion exceed the costs by a factor of 2.03. As a social investment, the internal rate of return is approximately 9%.

Research shows that educational, health, and other supports for low income or at-risk children, starting at an early age, can have a positive impact on their educational attainment and adult contributions to society. Cost-benefit analyses indicate that returns to the government and society, such as tax payments, economic productivity and service, over the recipients' lifetimes more than compensate for financial investments in such programs. The economic analysis provided in this report indicates that provision of all support programs in the comprehensive approach outlined by Rothstein, Wilder, and Allgood (2011) would require a significant outlay by state and local governments above and beyond what is currently expended. However, the resulting estimated 9% rate of return on investment compares favorably with existing forms of government debt, suggesting that a feasible strategy would be to finance the costs of a comprehensive support program for low-income children through the issuance of long-term municipal bonds. Philanthropic foundations could also help fund these social investments by providing grants to service providers that would be replaced by public funds if target outcomes were met.

The authors acknowledge generous support from Fiona Hollands and Ethan Berman. The authors also appreciate comments and advice from Michael Rebell and Jessica Wolff.

1. Introduction

The notion that education is a worthy investment is well established: by promoting human capital, time spent in school should yield more productive workers and more capable citizens (Belfield & Levin, 2007). The individual students gain, as do taxpayers and the broader community (Sum, Khatiwade, McLaughlin, & Palma, 2009). The key policy question, however, is how much should the government invest to help students accumulate human capital?

This paper provides a critical component to help in calculating how much should be spent on students in New York City's public schools. Specifically, in the first section of our paper we calculate the expected benefits that would accrue from a successful program of education. These benefits should then be compared with the costs of educational programs to calculate the rate of return on government investments in education. Rothstein, Wilder, and Allgood (2011) have provided a full set of calculations of the costs of comprehensive programs to boost achievement in New York City. In the second section of our paper we use these cost calculations as a natural comparison for our estimated benefits. This allows us to estimate an internal rate of return. Even where this return is positive, however, it is still necessary to secure financing to make these investments. In the final section of our paper we explore potential financial mechanisms that might facilitate these public investments.

2. The Economic Value of Human Capital for New York City

2.1 Valuing Human Capital

The definition of human capital is debatable, with increasing emphasis on measures that go beyond test scores to encompass so-called soft skills or critical thinking (Magnuson & Duncan, 2011). Here we calculate the economic value of human capital associated with high school graduation in New York City. We focus on this attainment metric for several reasons. Achievement scores may provide only a one-dimensional depiction of human capital: they fail to capture the many valuable noncognitive skills (e.g., diligence). This is illustrated by the literature on the weak value of passing the GED, for example (Cameron & Heckman, 2002). Achievement score variations are also sensitive to the grade in which they are measured (Bloom, Hill, Black, & Lipsey, 2010). In contrast, attainment metrics may encompass both cognitive skills (e.g., passing the Regents tests) and noncognitive skills (e.g., attending school). This link may be illustrated by preschool programs that show weak IQ gains but strong behavioral effects (Barnett & Belfield, 2006). Also, high school graduation is a prerequisite for a number of adult opportunities, such as college enrollment or military service. Finally, there is an equity argument for looking at high school graduation as a minimum threshold for children to ensure they have an opportunity for economic independence.

Evidence on the benefits of high school graduation—as well as the methodological challenges in causally identifying these benefits—is copious. Rouse (2007) provides a compelling case that earnings differences by education level are close approximations to causal differences. Cutler and Lleras-Muney (2009) perform a similar exercise for the link between education and health. Oreopoulos and Salvanes (2011) look at the wider benefits of education, including higher life satisfaction, with particular attention to the possibility that these wider benefits are actually income-driven. In addition, Lochner (2011) provides a full overview of the related literature on evaluations of educational interventions that yield social benefits. Broadly, these studies find steep education "gradients," that is, very strong links between education and many economic, personal, and social outcomes. Additionally, the studies indicate that the link is not attributable to higher income: controlling for income, the gradients remain steep.[1] It is therefore likely that investments in education will yield significant benefits.

[1] Specifically, controlling for income does little to the education gradients with respect to job satisfaction, health, arrests, or smoking.

Table 1. Demography of One Cohort of Children in New York City Schools				
	Terminal Educational Attainment			
	High school dropout	**High school graduate (including GED)**	**Associate degree or some college**	**BA degree or above**
>185% FPL	10,950	14,600	18,250	29,200
	15%	20%	25%	40%
75–185% FPL	18,500	11,840	3,330	3,330
	50%	32%	9%	9%

Source: Belfield and Garcia (2011) from census data.

Our economic analysis is based on the single age cohort of 12th graders in New York City public schools who should be graduating in 2011 (see Table 1). Each age cohort can be divided into four groups: those who will be high school dropouts, high school graduates, have some college or an associate's degree, and those who will complete at least a bachelor's degree. There are approximately 110,000 children in each age cohort in New York City. Almost half of these children (49,000) are below 185% of the federal poverty level (FPL), with 37,000 at 75-185% FPL.[2] Based on current patterns, we predict terminal attainment levels for children above 185% FPL as follows: 15% will be high school dropouts; 20% will be high school graduates; 25% will have some college; and 40% will complete at least a BA degree. For children at 75-185% FPL, attainment levels expected are 50%, high school dropouts; 32%, high school graduates; 9%, some college; and 9%, at least a BA degree.[3]

The lifetime economic consequences of being in each group are tracked. These economic consequences are fiscal—the burden taxpayers face by education level—and social—the burden society faces.[4] Table 2 illustrates some of the effects of low education based on a cross-section of adults in the Current Population Survey (New York and New Jersey). Adults who did not graduate from high school are much more likely to be out of the labor force and unemployed compared with persons with more education. They earn considerably less and receive considerably more government transfers (welfare, supplemental security income, and food stamps). Based on these cross-sectional data grouped by age, we create lifetime economic profiles by education level for earnings and tax payments, as well as government expenditures on health, crime, welfare, and education.

Using these lifetime values by education level, it is then possible to estimate the economic value of "moving" from low attainment to high attainment (e.g., from being a high school dropout to being a graduate). This modeling framework is developed for national data by Belfield and Levin (2007) and applied for

[2] An additional 12,000 are estimated to be below 75% FPL. These children face significant, cumulative disadvantages that our analysis does not fully address. Therefore we focus on the children above the 75% FPL threshold (figures from Belfield & Garcia, 2011).

[3] New York City's administrative data show lower dropout rates (schools.nyc.gov/Accountability/data/ GraduationDropoutReports/default.htm) than survey data based on actual labor market populations (on the differences between administrative and survey data, see Stillwell, 2010). On the likelihood that administrative data under-report the dropout rate, see Heckman and Lafontaine (2010). For our analysis it is not important that the graduation rate be precisely accurate: our calculations are based on assumed changes in the rate.

[4] The fiscal consequences are for the New York State taxpayer. New York City does levy taxes but these are a small proportion of the total taxes that New York City residents pay. Similarly, the benefits to the New York City treasury from any incremental education are likely to be small, as the city only pays a fraction of the costs of the criminal justice system or Medicaid. Instead, New York City residents pay most of their taxes to state and federal authorities. As discussed below, we assume that New York City residents only care about federal taxes to the extent that they are spent in New York.

Table 2. Labor Market Status: New York–New Jersey Adults (18–65)

	High school dropout		High school graduate (including GED)		Associate degree or some college		BA degree or above	
Not in labor force	45%		28%		27%		17%	
Unemployed	7%		6%		4%		3%	
In school	12%		4%		17%		1%	
Annual earnings	$12,926	(22,932)	$26,432	(34,724)	$30,383	(40,868)	$66,524	(80,987)
State tax (net of credits)	$376	(1,540)	$934	(2,484)	$1,308	(3,826)	$3,457	(7,330)
Federal tax (net of credits)	$853	(3,699)	$2,436	(6,428)	$3,376	(8,928)	$9,846	(18,044)
Social Security & Medicare taxes	$953	(1,553)	$1,842	(2,052)	$2,078	(2,394)	$4,013	(3,659)
Pension plan	13%		31%		38%		52%	
Private health insurance	37%		63%		73%		86%	
Welfare amounts	$115	(820)	$42	(552)	$28	(400)	$57	(830)
Supplemental Security Income	$502	(2,018)	$203	(1,387)	$114	(1,117)	$56	(831)
Food stamps	$610	(1,733)	$248	(1,191)	$170	(970)	$35	(354)
N	*5,814*		*12,849*		*10,865*		*13,830*	

Source: Current Population Survey, March Supplements 2006-2010 pooled.
Notes: All adults (male and female). Sample includes persons with zero earnings, tax payments, and welfare receipt. Standard errors in brackets. Dollar amounts are per year.

California by Levin and Belfield (2009) and Brady, Hout, and Stiles (2005); and for Connecticut see Sum et al., 2009. This literature follows methodological and empirical work that extends back to Levin (1972) and Haveman and Wolfe (1984) and is reviewed in detail by Lochner (2011) and by Baum and Payea (2006).

All figures are expressed in present values at 12th grade using a 3.5% discount rate.[5] All prices are adjusted to account for cost of living in New York City, and all figures are reported in 2011 dollars.[6]

[5] Present valuation means that the amounts are adjusted for the fact that money amounts that accrue later are valued less than those that accrue earlier. Different discount rates are applied as part of the sensitivity testing. The justification for a 3.5% discount rate is given in Moore et al. (2004).

[6] CPI data is from www.bls.gov/cpi/#data. New York–New Jersey prices are approximately 16% above the national average.

2.2 Earnings Gains from Education

We first calculate the lifetime earnings associated with each level of education. Gross earnings are derived directly from the New York state resident subsample of the Current Population Survey (CPS) over the five years 2006-2010. Unfortunately, the CPS does not allow us to identify New York City residents, so we must apply a weighting to get an accurate wage estimate for city residents. Gross earnings, that is, including tax payments and employer contributions, are analyzed here: the goal is to calculate the social differences in output by education level, not the net income to the individual. The full productivity of a worker—their social value—is the amount of resource that the employer has to expend on that worker, which is not the same as what that worker gets paid.

Table 3 shows the full set of calculations for earnings. Details are given in the table notes.

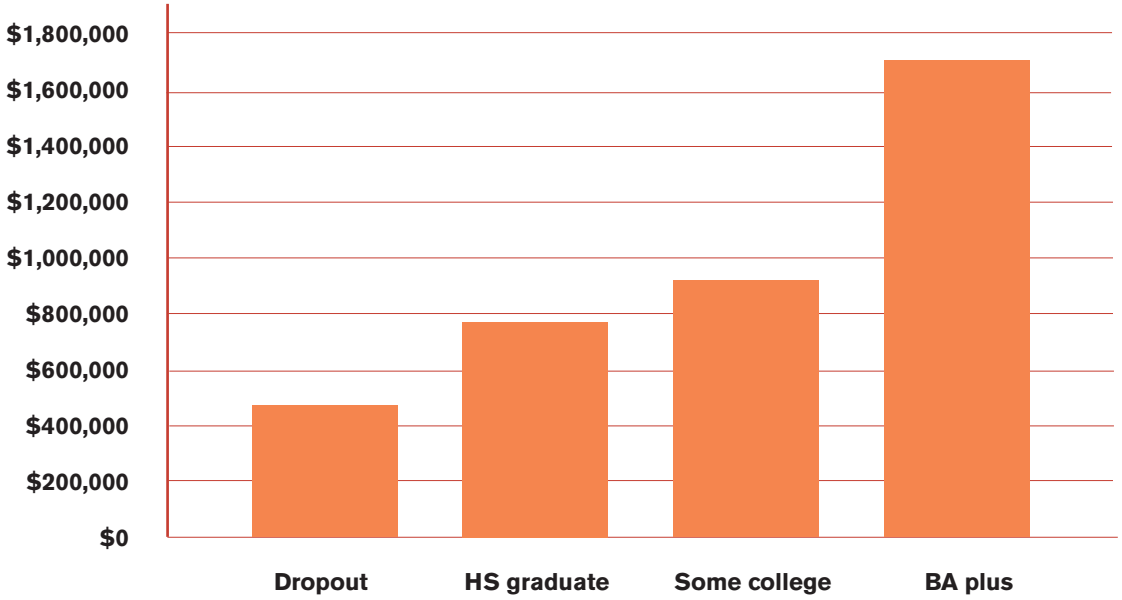
Table 3. New York City Residents: Earnings and Tax Payments (Lifetime Present Value by Education Level)

	High school dropout	High school graduate (including GED)	Associate degree or some college	BA degree or above
Earnings	$472,800	$776,230	$924,540	$1,708,620
Difference over HS dropout	—	+$303,430	+$451,740	+$1,235,820
Federal Tax	$91,180	$137,500	$185,160	$375,860
Difference over HS dropout	—	+$46,320	+$93,980	+$284,680
State/City Tax	$44,970	$68,750	$102,870	$143,420
Difference over HS dropout	—	+$23,780	+$57,900	+$98,450

Source: Current Population Survey, March Supplements 2006-2010 combined. New York State resident subsample. Includes all persons, employed or not.
Notes on earnings estimates: No adjustments are made for labor market participation, GED receipt, or incarceration rates. Labor market activity begins at age 18 (conditional on not being in college) and lasts until age 65. Average from two models, ten estimates. Models vary with assumptions about health and pension benefits (average or zero); discount rate (3.5%-7.5%); productivity growth (1%-2%).
Notes on tax estimates: Taxes calculated using two methods: (a) Self-report from CPS; (b) income taxes based on ten estimates of earnings, calculated using TAXSIM9 with other taxes applied proportionate to income tax payments.

The lifetime present value earnings of New York City public school students are depicted in Figure 1. The estimates are averages, based on multiple different calculations from two methods. In the first method, lifetime earnings profiles are smoothed from the average earnings across eight age bands from age 18 to 64. Because of sample size restrictions, this smoothing is applied across both sexes and all racial groupings. In the second method, we use incomes only and then adjust for benefits using statewide incidences; this larger sample allows for estimates by race and gender separately, which can then be weighted according to the demographics of New York City school children.

Figure 1. Lifetime Earnings by Education Level: New York City High School Student in 2011 (Present Value at Age 18)



A current student in the New York City public school system is predicted to have the following present values of lifetime earnings at age 18: $473,000 if a high school dropout; $776,000 if a high school graduate; $925,000 if they attend college for some period; and $1,709,000 if they graduate with a four-year degree. Relative to dropouts, there are substantial lifetime earnings gains of over $300,000 for a high school graduate and more than $1.2 million for persons with at least a college degree. For the individual student, there is a very large monetary pay-off to more education.

2.3 Other Benefits from Education

2.3.1 Tax Payments

These substantial differences in earnings by education level translate into differences in tax payments and other government expenditures. However, most taxes are paid to the federal government such that New York City only gains to the extent that federal expenditures are made in the city. At the state level, New York is one of the heaviest subsidizers of the federal government: for every $1 paid into the federal government, the state receives only $0.79 in spending (Tax Foundation, 2007). The proportion is likely to be even lower for New York City.

Differences by education in state tax payments are also significant. The state sales tax is 4% and the state income tax varies from 4% to 9%. The state also levies selective sales taxes, corporate tax, and other taxes.[7] In total, approximately 12% of per capita income is paid in state and local taxes (the highest rate in the nation). There is also a city income tax of 3.5%.[8]

[7] Tax revenues for New York State government are: 56% from income taxes; 17% from sales tax; 14% from selective excise taxes; 7% from corporate tax; and 5% from other taxes. Therefore, state sales, excise, and corporate tax revenues are almost equal to state income tax revenues. Data retrieved March 13, 2011, from www.taxadmin.org/fta/rate/tax_stru.html.

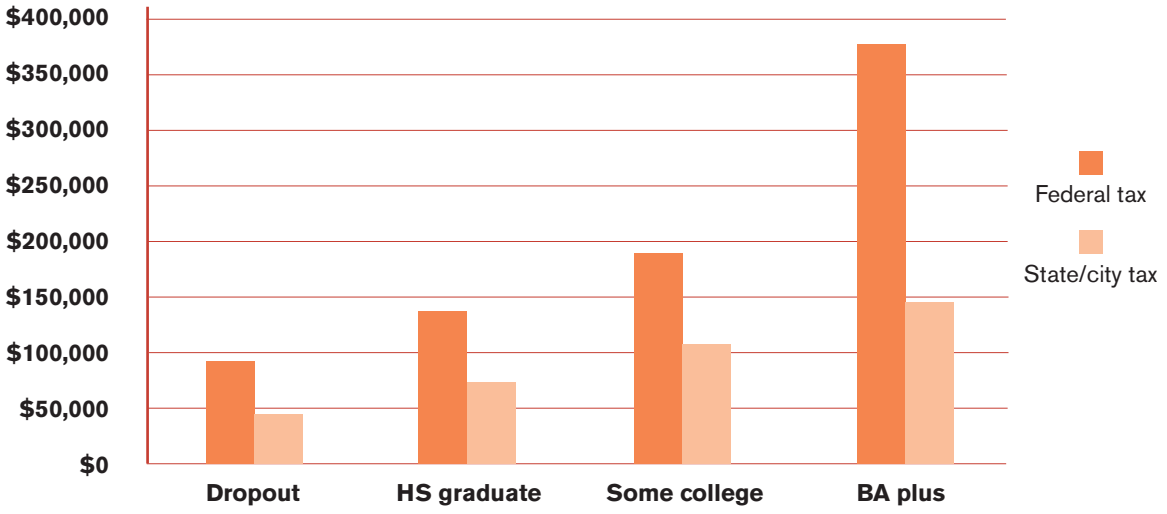
[8] http://www.nyc.gov/html/dof/html/pdf/05pdf/pit_rates.pdf. There are also city sales taxes but these cannot easily be derived from income data.

As tax payments are the biggest single element of the fiscal analysis, we apply two calculation methods. The first method uses the direct federal and state tax payments (net of credits) as reported by the New York State subsample of the Current Population Survey, March 2006-2010. These lifetime tax payments are calculated using smoothed, annual averages from the eight age bands (as per the earnings estimates); again a range of models is generated. The second method puts the earnings estimates directly into the National Bureau of Economic Research tax calculator, TAXSIM9.[9] For each income level, the federal income tax payments for a household in New York are calculated and summed into a present value. Sales, excise, and corporate taxes are calculated separately.[10] All these taxes are summed to get a more complete estimate of the additional taxes paid as incomes rise.

Clearly, those with more education pay higher amounts of tax. The amounts are given in Table 3 and are depicted in Figure 2. The average high school dropout will pay $91,000 in federal taxes and $45,000 in state/city taxes (expressed as present values). By comparison, high school graduates pay $138,000 in federal taxes and $69,000 in state/city taxes. Tax payments are higher for those who attend college and significantly higher for those who complete college.

These differences in federal tax payments over a high school dropout amount to $46,000 for a high school graduate, $94,000 for an individual with some college, and $285,000 for a college graduate. The differences in state/city tax payments are also significant, at $24,000, $58,000, and $98,000 respectively.

Figure 2. Lifetime Tax Payments by Education Level: New York City (Present Value at Age 18)



2.3.2 Direct Government Expenditures by Education Level

We now examine other influences of education on lifetime economic well-being. We focus on those most salient to the fiscal burden of education—health, crime, and welfare—but we also include additional expenditures on public education. For each domain we calculate the lifetime profiles by education level; this allows us to calculate the differences relative to the baseline level of being a high school dropout.

[9] TAXSIM calculations are not fully precise: they exclude expense exemptions, mortgage interest tax relief, and employer tax contributions. To be conservative, individuals are assumed to file taxes singly.

[10] These additional taxes are calculated as a function of state income tax payments, based on the proportions of revenues that each tax generates (see note above). This implies that persons contribute to sales and excise taxes to the same extent as they pay state income tax. Conservatively, only 75% of non-income taxes are assumed to be paid by in-state residents.

There is a clear link between education and both health behaviors and health status (Cutler & Lleras-Muney, 2009).[11] Moreover, these gradients appear to be growing over time (Adler & Stewart, 2010). Differences in health status, coupled with differences in incomes, translate into different amounts of government health expenditures, consonant with a given health status.

We adapt Muennig's (2007) model of health expenditures to derive lifetime profiles of government spending on health care by education level. We divide this spending across federal and state/city responsibilities (see the top panel of Table 4). Education levels are strongly correlated with criminal activity. The link is both direct—education causes lower criminal activity—and indirect—higher incomes reduce criminal activity (Farrington & Welsh, 2007; Lochner & Moretti, 2004; Oreopoulos & Salvanes, 2011). Being a high school dropout is associated with more crime, more arrests, and a greater probability of being incarcerated.[12] Where crime is lower, the pressure for spending on policing, the criminal justice system, and incarceration is lessened. Annually, the New York City Police Department spends $4.8 billion and the Department of Corrections spends $1.1 billion (Belfield & Garcia, 2011).[13]

A number of studies have calculated the lifetime economic consequences of being either an offender or a chronic offender as a function of education levels (Cohen & Piquero, 2009; DeLisi & Gatling, 2003; DeLisi, Kosloski, Sween, Hachmeister, Moore, & Drury, 2010). We adjust their estimates for New York City-specific incarceration costs and inflation, and we divide the expenditure into federal and New York State/City responsibilities (see the second panel of Table 4).[14]

Similarly, the link between education and welfare reliance is well documented (Waldfogel, Garfinkel, & Kelly, 2007). There is both a behavioral effect and, because welfare programs are means tested, an income effect. However, the lifetime present value amounts are not large because welfare assistance is often time limited and tied to the presence of children in the household.

We calculate welfare reliance based on New York City incidences and education gradients reported by Chernick and Reimers (2004).[15] We adapt these to account for welfare spending in New York. Even with the substantial constraints on welfare reliance, there is still a significant difference in welfare payments by education level (see panel 3 of Table 4).

The lifetime economic consequences in terms of health, crime, and welfare expenditures are shown in Table 4. We report the differences relative to being a high school dropout, split by federal and state/city responsibilities. For health, a high school graduate saves the federal government $30,100 and the state/city government $26,000 as compared with a high school dropout. For crime, the federal savings per incremental high school graduate are $7,200 and the state/city savings are $14,600. For welfare, the savings are $11,300 and $3,800. The savings are significantly higher as a person's education level increases.

[11] More educated persons follow healthier diets, undertake fewer risky behaviors, and appear to internalize health-related and medical information more efficiently. As shown in Table 4, they are more likely to have jobs with private health insurance. Strong education-health gradients are also found for obesity, work limitations, and smoking (Kimbro, Bzostek, Goldman, & Rodriguez, 2008).

[12] Neither the state nor the city publishes rates of incarceration by education level. National data show that 68% of state prison inmates do not have a high school diploma and that only 12% have any postsecondary education (Wolf Harlow, 2003).

[13] This does not include spending on juvenile justice or crime-related public programs in other departments (e.g., domestic violence).

[14] These are conservative estimates in two respects. First, only criminal activity up to age 32 is modeled: this covers the peak years of offending but it does not fully cover all incarceration and parole costs. The cut-off at age 32 is used because of data limitations. Second, juvenile crimes are excluded because they occur before high school graduation (and they are often prosecuted differently from adult crimes).

[15] Chernick and Reimers (2004) report very high rates of welfare reliance across New York City households: 8% on public assistance; 14% on food stamps; 9% on supplemental security income; and 25% on Medicaid. They also find steep gradients, with 58% of black single mothers who are dropouts receiving public assistance compared to 30% of black single mothers who are high school graduates and 15% of all black households (and similar gradients across other racial groups).

Table 4. Federal and New York State Expenditures on Health Care, Crime, Welfare, and Education (Lifetime Present Values by Education Level)				
	High school dropout	**High school graduate (including GED)**	**Associate degree or some college**	**BA degree or above**
Health care				
Federal expenditures	$56,020	$25,960	$15,770	$4,540
Difference of HS dropout		($30,060)	($40,250)	($51,480)
State/city expenditures	$47,990	$21,950	$13,390	$3,700
Difference over HS dropout		($26,040)	($34,600)	($44,290)
Crime				
Federal expenditures	$20,440	$13,260	$6,090	$2,410
Difference over HS dropout		($7,180)	($14,350)	($18,030)
State/city expenditures	$41,490	$26,930	$12,360	$4,900
Difference over HS dropout		($14,560)	($29,130)	($36,590)
Welfare				
Federal expenditures	$17,560	$6,290	$3,540	$720
Difference over HS dropout		($11,270)	($14,020)	($16,840)
State/city expenditures	$5,850	$2,100	$1,180	$240
Difference over HS dropout		($3,750)	($4,670)	($5,610)
Education				
Federal expenditures	($1,480)	$0	$580	$20,730
Difference over HS dropout		$1,480	$2,060	$22,210
State/city expenditures	($13,350)	$0	$7,760	$46,140
Difference over HS dropout		$13, 350	$21,110	$59,490
Total (G)				
Federal expenditures	$92,540	$45,510	$25,980	$28,400
Difference over HS dropout		($47,030)	($66,560)	($64,140)
State/city expenditures	$81,980	$50,980	$34,690	$54,980
Difference over HS dropout		($31,000)	($47,290)	($27,000)

Notes: Present values with 3.5% discount rate. Estimates are the average of models derived from Sum et al. (2009) and Muennig (2007). Medicaid payments per enrollee: www.statehealthfacts.org/profileind.*; federal/state Medicaid spending shares:* www.statehealthfacts.org/profileind.jsp *Federal expenditures on crime and incarceration from the Bureau of Justice Expenditure and Employment Extracts, 2006 (December 2008, NCJ224394). Per student school expenditures:* www.nycenet.edu/offices/d_chanc_oper/budget*; college spending per student:* www.fiscalpolicy.org/FPI_Underinvestment*;* www.sheeo.org/finance/shef *To be conservative, we assume dropouts exit school at the end of 11th grade.*

Finally, we account for the public subsidies that persons with more education receive either because they stay in school for longer or because they attend college. We calculate these subsidies relative to a high school graduate (see the Education section of Table 4). These are "savings" associated with not educating students up to high school level and so should be subtracted from the amounts spent. (Of course, these are only savings in the very short run.)

2.3.3 Fiscal Impact by Education Level

We now summarize the full tax and expenditure impact across education levels. These show significantly greater tax payments by persons with more education and significantly lower government expenditures. The estimated figures over a lifetime are given in Table 5.

Table 5. Total Fiscal Impact (Lifetime Present Values by Education Level)

	High school dropout	High school graduate (including GED)	Associate degree or some college	BA degree or above
State/city government				
Tax revenues (T)	$44,970	$68,750	$102,870	$143,420
Government expenditures (G)	$81,890	$50,980	$34,690	$54,980
Balance (T-G)	($37,010)	$17,770	$68,180	$88,440
Difference over HS dropout		+$54,780	+$105,190	+$125,450
Federal government				
Tax revenues (T)	$91,180	$137,500	$185,160	$375,860
Government expenditures (G)	$92,540	$45,510	$25,980	$28,400
Balance (T-G)	($1,360)	$91,990	$159,180	$347,460
Difference over HS dropout		+$93,350	+$160,540	+$348,820

Sources: Tables 3 and 4.
Notes: 2011 dollars. Discount rate of 3.5%.

The top panel of Table 5 shows the state/city government impact in present value terms. For dropouts, the state/city accrues $45,000 in tax revenues but pays out $82,000 in government expenditures; the result is a present value *deficit* of $37,000. In contrast, the balance of taxes minus expenditures is $17,800 for high school graduates; $68,200 for persons with some college; and $88,400 for college graduates. The net differences are therefore very large: New York taxpayers gain +$54,800 for each high school dropout who becomes a high school graduate; if each high school dropout became a four-year college graduate, New York taxpayers would gain +$125,500.

As shown in the bottom panel of Table 5, the impact for the federal government is also substantial. A New York City high school dropout pays almost exactly the same amount in federal taxes ($91,200) as he or she receives in federal expenditures ($92,500). In contrast, persons with more education are net contributors to the federal government, with high school graduates paying $92,000 more in taxes than they cost in expenditures. The impact increases with education such that a college graduate contributes a net amount to the federal government of $347,500. Therefore, the federal government gains +$93,400 as each New York

City student becomes a high school graduate, rising to +$348,800 if a high school dropout were instead to become a four-year college graduate.

The figures in Table 5 illustrate how education policies and fiscal policies are imperfectly integrated. The primary responsibility for funding education is the state/city; yet the primary fiscal beneficiary from having an educated populace is the federal government. Indeed, it is debatable whether to add the state/city and federal amounts to derive an overall fiscal amount. New York residents should be concerned about the state/city fiscal implications of varying education levels, but they may also be concerned about the federal implications insofar as they pay federal taxes for federal programs delivered within the state. However, New York is a net contributor to the federal government: it receives only 79 cents for every dollar it pays into the federal government.[16] Conservatively, New York residents might therefore value the federal savings from increases in attainment, but only at 79% of their face value.

2.3.4 Other Effects of Education

The above model is constructed to look at the economic consequences of differing levels of educational attainment after the age of 18. This allows us to compare these consequences with any educational reforms that are successful in raising attainment by that age. However, many reforms that are effective in raising the high school graduation rate also generate benefits during the school years before graduation. For example, preschool programs have been found to reduce the rate of grade retention and special educational placement, as well as increase the probability of high school graduation (see below). Thus, it is appropriate to calculate the pre-graduation resource savings associated with higher levels of attainment. We call these "developmental" benefits of attainment.

Four such developmental benefits are salient to our model. For each one, we calculate the economic value of moving from the current rate down by 10%.[17] This illustrates the magnitude of possible savings, even as such savings will depend critically on the nature of public investments in education.

First, high school dropouts are disproportionately in special education programs. The rate of placement in special education in New York City public schools is 16.5%.[18] The fiscal costs of special education vary across disabilities, individual children, and localities so we apply a basic funding weight. As cited by Parrish (2000), the least restrictive environment for disability is weighted at 0.9 above per-student funding for general education; that is, the student receives on average 90% more in resources than the average student. In our framework, therefore, each student in special education represents a fiscal cost of $62,630.[19] Hence, the savings would amount to $1,030 per student.[20] If we use a NYC Department of Education estimate of special education spending per student, which is approximately 400% (not 90%) more, the savings would amount to $4,130 per student. The average of these two estimates is therefore $2,580.

Second, dropouts are more likely to have been retained in grade. This is equivalent to retaking a year of school. Rates of grade retention vary by grade, such that a single aggregate estimate of how many students have been retained is difficult to estimate. Based on NYC Department of Education data, we assume that 8% of students have been retained over the period up to high school. The present value effect of a 10%

[16] www.taxfoundation.org/files/fedspend_per_taxesbystate-20071009.pdf

[17] This reduction is assumed somewhat arbitrarily. At this level of generality, our framework does not allow for a specific relationship between additional investments and these developmental factors. Moreover, data on these factors across education levels are not available.

[18] http://schools.nyc.gov/AboutUs/data/stats/default.htm

[19] Conservatively, we assume each special education student is placed in this environment for four years prior to high school graduation. Four years of special education costing an additional ($15,610*90%) is $62,630 in present value terms at age 18 at a discount rate of 3.5%. No social burden is calculated.

[20] This calculation is $62,630*0.165*10%.

reduction in grade retention would therefore be $130 per student.

Third, juvenile crime is associated with less educational attainment. Belfield and Levin (2007, Table 6) estimated the economic burden of juvenile crime in California. We adjust their estimates to apply to New York City and estimate that the total economic burden of juvenile crime per student is $19,640 (present value at age 18).[21] Straightforwardly, a 10% reduction in this rate would yield savings of $1,970 per student.

Finally, female dropouts are more likely to be teenage mothers. For the mothers, teenage pregnancy is associated with adverse educational, employment, earnings, and marriage outcomes, as well as greater reliance on welfare programs. There are also similar adverse consequences for the child. The incidence of teenage pregnancy in New York City is 94 per 1,000.[22] At the national level, the fiscal and social costs of teenage pregnancy have been fully catalogued by Maynard and Hoffman (2008, Tables 10-4, 10-5). Adapting these estimates to be comparable to our estimates, the fiscal cost per teenage pregnancy is $22,920.[23] Per student, the savings are $220.

Our framework does not allow us simply to add these four benefits onto those described above: they occur before graduation and so we cannot determine if they cause high school dropout and they may not improve with every proposed education reform. Therefore we include these four benefits as a separate item in our cost calculations. They amount to $4,900 as an average across every student, regardless of their terminal education level. They are smaller than might be expected because only small proportions of a given student body have such status (e.g., juvenile criminal). Thus, the total savings are divided across a large population. However, we note here that all we have calculated are the fiscal consequences of these factors, not their social valuations.

2.3.5 The Social Impact by Education Level

Even the fiscal and developmental effects described above provide an incomplete accounting of the economic value of education. There are many social benefits also. In relation to our model, we consider three possible social benefits. Unfortunately, these social benefits are estimated with far less precision than the fiscal benefits: both the impact of education and the economic value of this impact are not easily calculable such that the economic figures should be treated with caution.

The primary social benefit of education is the positive economic spillovers from having a more educated workforce. Workers learn skills from each other, and firms are more likely to locate in areas with larger pools of skilled workers (Florida, 2002). In a review, McMahon (2006) estimated the spillovers to be worth at least 37% of the private earnings gains, but more recent evidence suggests that the relationship is sensitive to model assumptions and the type of human capital (Abel, Dey, & Gabe 2010; Iranzo & Peri, 2009; Moretti, 2004). However, it is possible that New York City, because of its density, will accrue relatively large productivity spillovers for workers with a concomitant effect on tax revenues.

Second, there are also savings to society beyond fiscal costs from reductions in crime. The fiscal consequences are a function of the spending by the criminal justice system, but victims of crime bear a bigger loss in terms of reduced quality of life and monetary losses (e.g., time off work) and all persons pay to prevent being the victim of crime. However, these social costs of crime are much harder than fiscal costs to estimate with precision. Notably, these cost savings are almost certainly underestimates of the true benefits of crime reduction. They do not include the psychic costs to criminals—and their families—of incarceration.

[21] We adjust for the relative price level in California versus New York. We note that this is per youth, not per criminal.

[22] http://www.nyc.gov/html/doh/html/pr2007/pr075-07.shtml.

[23] There is also a social cost of $87,260. We adjust for inflation, for New York City cost of living, and subtract the wage effects of teenage pregnancy. The costs are in present values for the first 18 years of a teenage pregnancy, beginning in 11th grade. To calculate the per student cost we assume a 10% fall in the 94 per 1000 teenage pregnancies over two years.

Indeed, more recent calculations of the burden of crime yield much higher estimates than earlier studies. We use estimates by Miller, Cohen, & Wiersema (1996) that the social burden of crime is at least 2.5 times the size of the fiscal burden.[24]

Finally, raising revenue for government programs imposes an economic distortion ("deadweight loss"). This distortion is called the marginal excess tax burden (METB): a higher tax rate reduces workers' labor effort and raises the prices of goods. This distortion may be as much as 28% of total government spending, that is, to collect one dollar in tax revenue will distort other transactions by 28 cents (Allgood & Snow, 1998). METB values are context specific—depending on the level of government at which taxes are collected and the price elasticity of demand of the taxed good. To be conservative, we assume that the economic distortion of taxation is 13 cents on each dollar of government spending (the lower estimate from Allgood and Snow, 1998).

In addition, the value of better health is far greater than the amount that the government spends to alleviate poor health. Two recent studies have calculated this broader, social value associated with better health.[25] Using the most plausible conservative assumptions, the present value of the change in health status as each dropout becomes a high school graduate is perhaps between $120,000 and $200,000. However, as this is not a very precise estimate of the social value of health, and there are some methodological concerns about interpreting health gains in this way, we do not include this valuation here.

Table 6. Total Social Impact (Lifetime Present Values by Education Level)

	High school dropout	High school graduate (including GED)	Associate degree or some college	BA degree or above
Income gains + productivity spillovers (Y)	$647,740	$1,063,440	$1,266,620	$2,340,810
Health burden (H)	$104,010	$47,910	$29,160	$8,240
Crime burden (C)	$216,760	$140,670	$64,580	$25,590
Education burden (E)	($14,830)	$0	$8,340	$66,870
Marginal Excess Tax Burden (T)	$17,700	$26,810	$37,440	$67,510
Totals (=Y–H–C–E+T)	**$359,500**	**$901,670**	**$1,201,990**	**$2,307,620**
Difference over dropout		+$542,170	+$842,490	+$1,948,120

Sources: Tables 3 and 4.
Notes: 2011 dollars. Discount rate of 3.5%. Social benefits exclude welfare transfers and count gross earnings. Crime burden includes both fiscal and victim burdens. Health burden does not include QALYs. Marginal excess tax burden is applied to tax revenues.

[24] Also, there are tax losses from crime when victims of crime are unable to work.

[25] Muennig, Fiscella, Tancredi, and Franks (2010) calculate the remaining quality-adjusted life years (QALYs) of persons aged 18. A QALY is a scale to measure health status, with perfect health given a score of 1 and specific conditions translating into QALYs of less than 1. For dropouts, these QALYs amount to 37.8 and for high school graduates they are 40.2. In effect, a high school graduate reaps an extra 2.4 years of life in full health. Schoeni, Dow, Miller, and Pamuk (2011) estimate annual education-driven differences in health-related quality of life. Relative to a high school dropout, they find that a high school graduate experiences 0.03 extra QALYs each year and a person with a college degree experiences 0.062 QALYs more.

Adding in these social costs greatly magnifies the differences by education level (see Table 6).[26] The total social benefit of a high school graduate over a dropout easily exceeds half a million dollars ($542,200). If an individual progresses from being a dropout to attending and completing a four-year degree, the lifetime social benefits are almost $2 million. These social benefits make an extremely compelling case for further investments in education.

2.3.6 Sensitivity Analysis

Our calculations of the economic burdens of inadequate education rely on many different research studies and modeling assumptions. Although these studies are the best available, it is important to consider how sensitive our calculations are to alternative assumptions.[27]

We believe that the full economic burden is significantly above our estimates. This is so for a number of reasons:

- We use conservative assumptions.[28]
- In some models we use a discount rate above that recommended by Moore, Boardman, Vining, Weimer, and Greenberg (2004); this reduces the present value of any benefits of education.
- We omit some important effects, such as the social repercussions of mass incarceration.
- We assume that the benefits of education that exist today will be perpetuated for current cohorts of graduates. Potentially, this could mean we have overstated or understated the burden depending on whether the gains from education decrease or increase. Most evidence suggests that the gains will actually increase, however.[29]

Two arguments may be made that we have overstated the benefits, but neither has much merit. The first is that increasing the number of high school graduates will simply mean that they have to take jobs that dropouts used to take. Most studies of the labor market find "skill-biased technological change": as the education levels of the workforce increase, firms use a more technologically complex production that draws on those skills. The second is that high school students may be educated in New York City but then leave the city to find work. This is very unlikely: cities are powerful magnets for attracting college-educated persons.[30] The sizes of the fiscal and social burdens of inadequate education are therefore in all probability larger than our estimates.

3. Comparing the Benefits with the Costs

3.1 Net Present Value of Human Capital Investments

Given the very large benefits of education, it would seem straightforward to find education reforms that would pass a cost–benefit test. Unfortunately, the technology of human capital formation is not precisely

[26] We include all resource use in this social accounting, regardless of who pays for them.

[27] For each domain (earnings, taxes, crime, health, and welfare) we have used a range of estimates. Thus, some sensitivity testing is implicitly incorporated in our framework.

[28] These are detailed in the above notes. Perhaps the most critical of these is that we are assuming that the valuation of nonwork time is zero. That is, if dropouts choose not to work, we assume that their nonwork time is worth the same as college graduates who choose not to work. But the latter are giving up more income by not working than the former. Hence we are almost certainly undervaluing the full income gains from education as well as underadjusting for the gains from finding a job.

[29] The earnings gains from education have increased over recent decades (not least because of the decline in routine, noncognitive jobs that are typically open to dropouts). Future demographic and labor market changes are likely to amplify these trends (Kirsch, Braun, Yamamoto, & Sum, 2007). Finally, the costs of health care and of incarceration have been growing at rates much faster than general inflation.

[30] Census data from www.census.gov/prod/2003pubs/censr-12.pdf, retrieved April 9, 2011.

understood: finding educational interventions that are clearly effective in raising attainment has been a challenge. This is not only because of the critical role that families play in their children's education (Belfield & Levin, 2002; Heckman, 2011) but also because the effectiveness of a given program depends on students' prior skills. Nevertheless, it is possible to provide estimates of the costs of educational and education-related programs that have been found to boost human capital. This is the approach taken by Levin and Belfield (2009) for California. By comparing the costs of these programs with their financial benefits it is possible to obtain a "return on investment."

Here, we follow an alternative approach that links with recent research that is directly relevant to New York City. In their recent work, Rothstein, Wilder, and Allgood (2011) provide a full itemization of the costs of desirable programs for New York City children. These programs, which include prenatal care, early education, and out-of-school supports, are specifically designed to "bring disadvantaged children closer to the cognitive and noncognitive achievement levels presently reached by typical middle class children" (Wilder, Allgood, & Rothstein, 2008, p. 18). The program costs are estimated for children in families with income levels between 75% and 185% of the federal poverty level; this group excludes the most disadvantaged children, for whom further expenditures would be required. We take these estimates at face value, recognizing the assumptions and conditions as documented by Rothstein, Wilder, and Allgood (2011), and translate them into present values comparable to our fiscal, developmental, and social benefits.[31]

According to Rothstein, Wilder, and Allgood (2011) the present value total expenditure necessary to bring a disadvantaged child up to the achievement level of a "typical middle class" child is $450,500 (see Table 7, column 2). However, this is the total amount: a sizeable proportion of these expenditures are already being made. Based on analysis for New York City by Belfield and Garcia (2011), supplemental expenditures on disadvantaged children are $5,940 annually or $156,600 in present values. These should be subtracted from the requirements set down by Rothstein, Wilder, and Allgood (2011). The net present value amount of incremental expenditure required per disadvantaged child from birth to 18 is $294,000 (Table 7, column 4). If the recommended support programs are provided for the 37,000 New York City students who are in families with income levels between 75-185% FPL, the total present value expenditure would be $10.88 billion.[32] If we include the marginal excess tax burden associated with raising revenue, the total amount is $12.29 billion.

We now relate this expenditure to its predicted benefits. In order to do so, we need to specify what extra educational outcomes it will "buy." As noted above, human capital outcomes are most appropriately

Table 7. Compensatory Expenditures for Disadvantaged Childen in New York City (Present Values)

	[1]	[2]	[3]	[4]
	Total spending per 75-185% FPL NYC child	**PV of [1] at 12th grade**	**Extra already spent per 75-185% NYC child**	**PV of [1]-[3] at 12th grade**
Total expenditures from ages 0-18	$294,240	$450,540	$156,560	$293,980

Sources: Column [1] from Rothstein et al. (2011, Table 12a); Column [3] from Belfield and Garcia (2011).
Notes: 2011 dollars. Discount rate of 3.5%.

[31] Because of data limitations, in some cases we are only able to compare children in families with income levels between 75-185%FPL with the average child and not strictly with the average child in those in families with income levels above 185%FPL. These comparisons make our calculations even more conservative.

[32] This is the product of 37,000 times $293,975. It assumes that the average costs of the programs remain flat as output expands.

expressed in terms of attainment gains. One assumption is that the expenditures will ensure that disadvantaged children have the same attainment levels as middle class children (as reported in Table 1).[33] That is, instead of a high school dropout rate of 50%, these children would now graduate at a rate of 85% and progress on to college at a rate of 65%.[34] (The next section of the paper addresses the evidence that such an improvement might be feasible.) The benefits would accrue according to the fiscal implications of this new distribution of attainment. We also include (see section 2.3.4) illustrative figures for a 10% reduction in rates of special education, grade retention, juvenile crime, and teenage pregnancy.

The benefit-cost comparison from the fiscal and social perspectives is given in Table 8. Set against the expenditures of $10.88 billion, there would be corresponding present value fiscal benefits of $1.82 billion to the state/city and $4.54 billion to the federal government, plus $181 million in developmental benefits. The net present value would be –$4.34 billion. The fiscal benefits would then cover 60% of the costs of the interventions proposed by Rothstein et al. (2011). The net cost per student would be $117,320.

Table 8. Net Present Value of Investments in Disadvantaged New York City School Children ($ millions)

	Fiscal Perspective	Social Perspective
Disadvantaged children cohort size (S)	**37,000**	
Additional expenditures to ensure "middle class development" (E)	$10,877	$12,291
Benefits of "middle class" development (B)		
Fiscal benefits		
State/city benefits	$1,819	–
Federal benefits	$4,537	–
Developmental benefits	$181	–
Social benefits	–	$24,925
Net present value per cohort (NPV=B–E)	–$4,341	$12,634
Benefit-cost ratio (B/E)	0.60	2.03
Net present value per child (NPV/S)	–$117,320	$341,470

Sources: Cohort size from Table 1. Fiscal estimates from Table 5. Social estimates from Table 6. Additional expenditures from Table 7.
Notes: 2011 dollars. Discount rate of 3.5%.

Finally, Table 8 shows the social perspective of investments in education for New York City public school children (as derived from Table 7). Set against the expenditures of $12.29 billion (including the METB), there

[33] Alternatively, we may express what these expenditures might buy in terms of achievement equivalent to that of middle class children. The challenge here is to translate attainment benefits into achievement benefits (for an example, see Levin and Belfield, 2009).

[34] This would mean 12,950 fewer dropouts and 4,440 fewer high school graduates, but 9,250 more persons with some college and 11,470 college graduates. An alternative assumption would be that these new high school graduates would progress on to college at the rate equal to those in the lowest tercile of socioeconomic status (80% stay as high school graduates, 12% get some college, and 8% complete a BA degree).

are social benefits of $24.93 billion. The net present value is $12.63 billion per cohort and the benefit-cost ratio is 2.03. On a per student basis, the net social benefit of bringing all public school students up to "middle class" development is $341,470. As a social investment, the internal rate of return is approximately 9%.

3.2 Reviewing the Possible Improvement in the Graduation Rate

Although we apply the assumptions of Rothstein, Wilder, and Allgood (2011), there is no comparable program of comprehensive services covering the age 0-18 time-span that has reliably documented an impact on graduation and college attendance rates. As such there is no existing exemplar that allows us to determine whether the postulated 35 percentage point increase in the graduation rate (albeit one that would occur gradually over 18 years) is reasonable. In the absence of this information, we can review the evidence from more modest interventions that provide some of the services for some period of time. These include intensive early childhood programs and the provision of school-based health clinics. These interventions are less comprehensive, so they would have lower benefits and lower costs, but they are equally illustrative of the potential returns.

The well-known High Scope/Perry Preschool program that operated in Michigan in the early 1960s provided part-day, daily preschool and weekly home visits for low income, low IQ children for one-two years, starting at age three or four and exiting at age five (Karoly, Kilburn, & Cannon, 2005). A randomized controlled trial that followed the trajectory of 121 children indicated that 67% of those attending the program had graduated from high school by age 19 while this was the case for only 49% of the comparison group (Berrueta-Clement, Schweinhart, Barnett, Epstein, & Weikart, 1984). This represents an 18% increase in the graduation rate for a program operating for only one or two years. The effect was particularly marked for females: by age 27, 84% of the program females had graduated from high school compared with 35% of the comparison females, a 49% difference (Schweinhart, 2003).

In 1965, an experimental program in Chicago under Title I provided service to several hundred, low income and primarily African-American children in six Child Parent Centers (CPCs). They provided four to six years of early childhood education starting at age three. The programs involved a significant element of parental involvement and training. Of the children attending a CPC, 62% graduated from high school (n=683) as compared with 49% of the controls (n=676), a 13% difference (Fuerst & Fuerst, 1993). However, this difference was primarily attributable to the girls in the group: 74% of the program girls graduated from high school compared with 57% of the controls (a 17% difference) and 65% of girls in the Chicago system as a whole. (For boys the comparison was 49% vs. 40%, which was not significant). In one CPC that provided seven to nine years of intervention, 70% of the 25 boys and 85% of the 25 girls graduated. This significant increase in graduation rate as years of service were extended suggests that a program spanning 18 years and providing significantly more wide-ranging services might be expected to have even more positive results.

The Carolina Abecedarian Program, which began in 1972, provided intensive preschool services, targeting children (and their parents) deemed high risk for developmental delays and school failure, starting at six weeks to three months of age and ending between five and eight years of age. By age 19, 67% of the program group had graduated (n=54) compared with 51% of the comparison group (n=51), a 16% difference (Masse & Barnett, 2002). By age 21, 36% of the program group had enrolled in a four-year college while only 13% of the comparison group had done so.

Turning to provision of health services, a recent quasi-experimental longitudinal study involving over 3,000 high school students in Washington State investigated the effect of use of school-based health-centers on the dropout rate (Kerns, Pullmann, Cusworth Walker, Lyon, Cosgrove, & Bruns, 2011). Tracking the students over four years, it was discovered that low to moderate use of the clinics (defined as 0.125-2.5 visits per semester) was associated with a 33% reduction in the dropout rate compared with nonusers. Students visiting the clinics more than 2.5 times per semester did not have dropout rates that

differed from nonusers. McCord, Klein, Foy, and Fothergill (1993) found that the use of a school-based clinic at an alternative middle/high school for high-risk students in North Carolina led to higher promotion and graduation rates for African-American students registered with the clinic. The evaluation took place during the clinic's fourth year of operation. Thirty-three percent of registered African-American students were promoted or graduated vs. 19% of the nonregistered African Americans. No such difference was recorded for the white students.

More recent examples of programs that provide extended multiple services to students (e.g., Harlem Children's Zone) do not have long term studies associated with them or even graduation rates to report as yet. However, less extended evaluation studies of some current fairly comprehensive programs offer an indication of potential impact of these services on student attainment. Communities in Schools (CIS) is a large federated organization that aims to support students in 3,400 schools in 25 states and the District of Columbia by providing services that include mentors, tutors, health services, family counseling, a food bank, job shadowing, college visits, and service learning. A recent quasi-experimental study by ICF International (2011) compared student outcomes for children attending CIS schools with those attending matched non-CIS schools. For the approximately 285 schools that were deemed high implementers of the CIS model, the graduation rate for students after three years of model implementation was 4.8% higher than for students attending non-CIS schools. While clearly this falls far below the 35% gain we postulate through provision of Rothstein, Wilder, and Allgood's (2011) panoply of services, investment in the CIS model, estimated by ICF International, is less than $200 per student compared with the $15,700 per annum estimated for the Rothstein services. Additionally, the graduation rate reported for the CIS schools includes students who receive only a fraction of the total array of services, as well as those who receive a more intensive level of services.

In conclusion, while there is no long term evaluation of an existing comprehensive services program that allows us to judge whether a 35% increase in graduation rate is likely for students in families with income levels in the 75%-185% FPL band, the foregoing examples indicate that with substantially fewer services and lower financial investment, over far shorter periods of time, major gains in high school graduation have been achieved. Given this evidence, we feel that the by the end of 18 years of receiving the intensive services described by Rothstein, Wilder, and Allgood, it would not be unreasonable to expect such a large gain. It is also worth noting that cost-benefit analyses of a number of the preschool programs described above show positive cost-benefit ratios, indicating that the long and short term benefits far outweigh the costs. The High Scope/Perry Preschool Program was estimated to provide benefits of $6.89–$16.14 for every dollar invested, the Chicago Child–Parent Preschool Center Program returned $7.14 for every dollar invested and the Abecedarian program returned $2–$3.66 in benefits per dollar invested, yielding a 7% internal rate of return (Nores, Belfield, Barnett, & Schweinhart, 2005).

3.3 Sensitivity Testing of the Net Benefits

Given the imprecision of the relationship between educational investments and subsequent benefits, we now discuss areas of concern in relation to the return on investment. Under almost all assumptions, the social benefits of investments in education for New York City's school children make economic sense. The key issue is whether the fiscal benefits are sufficiently large.

The first issue is the take-up rate of programs. Above we have assumed all students take up all services offered to them. This is unlikely to be realistic: many families will not want the services, and many may be unable to access them in a convenient and consistent way. However, a lower take-up rate affects the general results only in a linear way: if there is lower take-up, the costs are lower but so are the benefits. Thus, if the interventions have a take-up rate of 75%, the total costs will be $8.16 billion and the total fiscal benefits will be $4.90 billion; the social costs will be $9.22 billion and the social benefits will be $18.69 billion. The net social gain per high school graduate will be $256,100.

A second issue is the developmental benefits. These will depend on the specific interventions and—because they happen early in a child's life—may be economically valuable. Our assumption of a 10% improvement in special education, teenage pregnancy, grade retention, and juvenile crime might be overly conservative. However, even if the improvement were 50%, that would still only mean an additional fiscal benefit of $905 million. This is not enough to overturn the finding that the fiscal costs exceed the benefits.

Finally, the interventions to raise the graduation rate may not be as completely effective as we have assumed. However, the services proposed by Rothstein and colleagues (2011) are much more comprehensive than individual interventions. Two alternatives are possible. First, we can interpret each one of the individual interventions as therefore a very conservative lower bound on what might result from the full set of services. As these individual interventions yield significant reductions in the dropout rate, it is likely that there will still be large benefits (and the costs would be much lower).

The second alternative is to express a break-even point for the social benefits of the interventions, that is, what effect would the interventions need to produce in order for the benefits to equal the costs? Based on the expected social benefits reported in Table 8, the services proposed by Rothstein, Wilder, and Allgood (2011) would break even if they reduced the dropout rate to the middle class level (to 15% from 50%) and doubled the college population of those students in the 75-185% FPL group.[35] Given the scale of the services proposed, this is certainly a possible eventuality.

4. Human Capital Investments in New York City: Implementation and Finance

In the foregoing we have illustrated the economic consequences of failing adequately to educate students who are at-risk. This literature concludes that not only can appropriate educational and health interventions have a beneficial impact on educational outcomes and health status; but they also provide other benefits to both the individual who is the direct recipient of these programs and the larger society. In fact, the benefits to society of higher productivity and income and the savings from lower rates of crime, welfare dependency, and public health far exceed the costs of investing in these programs. We believe that the more comprehensive approach from ages 0-18 recommended by Rothstein and colleagues (2011) will have an even larger impact on student well-being and development than what has been documented for less intensive support programs.

However, two important questions arise with respect to these investments. The first is how we should get started in shifting to a more integrated and comprehensive approach and how we can learn from it to gain constant improvement. The second is how it should be financed. As the first question is beyond our scope, we focus on the issue of financing.

4.1 Financing

Clearly the financing of this comprehensive approach will need careful planning based on diligent analysis of its costs and the required schedule of expenditures. Once the concrete components of each program have been set, it will be possible to evaluate their costs. For this purpose we suggest the use of the ingredients or resource cost approach (Levin & McEwan 2001). This approach will enable cost estimates for different combinations of programs and different levels of scale. Belfield and Garcia (2011), in their analysis of fiscal allocations by New York City to programs devoted to low-income children, have shown that the city already expends considerable resources in this area. To determine net costs or additional funding required beyond the current provision, an analysis is needed of the extent to which the new comprehensive programs should

[35] That is, instead of 3,330 college and BA graduates, the interventions produced 6,660 such individuals.

be substituted for existing activities already financed by budgetary allocations.

Investments in human populations designed to improve their health, productivity, and other present and future outcomes are at the heart of human capital theory. According to this widely accepted theory, when one is investing in human resources to raise their future prospects, this is an investment in human capital that has a number of parallels to investment in machinery, equipment, factories, and infrastructure that we refer to as physical capital. In each case one invests not for an immediate payoff, but to obtain higher gains in future periods or over the lifetime of the capital. To the degree that investments in education, nutrition, health, and communities improve the knowledge, health, and productive capacities of low-income children, there are two social payoffs. Improved functioning raises economic productivity as well as civic participation, incomes and tax revenues; it also reduces social burdens for public health, criminal justice, and public assistance. But, in addition, by making these investments in the poor, we create a fairer society in which equity is improved. Both sets of benefits are desirable in a democratic and capitalist society.

Investments in capital, whether in human capital or physical capital, are often evaluated by a rate of return on the investment. The main concern is that the rate of return on the investment equals or exceeds that on other investments with similar attributes and exceeds the cost of capital that is allocated to the investment. In terms of the returns to educational and related investments in children from low-income backgrounds in the previous section, we estimate the social rate of return at about 9%. This rate of return is highly competitive with rates in other economic sectors. Given a rate of return of this magnitude, it is highly feasible to fund the investment through municipal borrowing. Municipal bond rates vary substantially according to the credit of the borrower as well as the state of the economy.[36] Nevertheless, even the highest municipal bond rates are currently considerably below a level of 8% meaning that the economic return over time will exceed the cost of servicing the bonds. With current yields of about 4.5% for 30-year municipal bonds, the estimated 9% rate of return on an investment in a comprehensive support program for low-income children more than covers both interest and principal at redemption.

Another financing option to consider is a modified version of “social impact” bonds, an idea developed recently in Great Britain and being adopted in the United States as “Pay for Success bonds” ("Who Succeeds Gets Paid," 2011). In the original model, private investors provide financing for social service projects, such as reducing the recidivism rate for criminal offenders. The services are provided by charities or other third parties who enter into a contract with a government entity. Returns to the investor are paid by the government entity based on whether outcomes of the project meet specific predetermined benchmarks of effectiveness. If there is no improvement in the target outcomes, investors are not reimbursed. Consequently the private investors are highly vested in ensuring that the programs are effective while the government takes no financial risks. This form of financing is currently being considered in the United Kingdom to help improve outcomes for vulnerable children and Liebman (2011) proposes a strategy for testing this financing concept in the United States. In reality, given the trial and error that is necessary in establishing effective social programs and scaling them up, such investments are likely to be risky in the short term so that private investor funding may be hard to attract. A more feasible option is for philanthropic foundations to provide the initial funding with the idea that, if program outcomes are successful, the government will take over the financing at a set date in the future. While foundations are not reimbursed, the initial foundation grants would effectively be matched by the government, albeit with a time delay. This strategy would not be a drastic departure from current foundation funding whereby initial grants are often renewed based on performance of the funded project.

[36] http://www.bloomberg.com/markets/rates-bonds/government-bonds/us/

5. Conclusion

There is plenty of evidence in the social science literature that provision of educational, health, and other supports for low income or at-risk children, starting at an early age, can have a significant positive impact on their educational attainment and adult contributions to society. Moreover, cost-benefit analyses of these programs indicate that returns to the government and society over the recipients' lifetimes more than compensate for financial investments in such programs. The economic analysis provided in this paper indicates that provision of all support programs in the comprehensive approach outlined by Rothstein, Wilder, and Allgood (2011) would require a significant outlay by state and local governments above and beyond what is currently expended. While benefits to the government alone would cover only about 60% of the expenditures required, benefits to society are estimated to exceed costs by a factor of two. The resulting estimated 9% rate of return on investment compares favorably with existing forms of government debt, suggesting that a feasible strategy would be to finance the costs of a comprehensive support program for low-income children through the issuance of long-term municipal bonds. Philanthropic foundations could also help fund these social investments by providing grants to service providers that would be renewed by the government if target outcomes were met. In practice, a comprehensive approach to supporting low-income children would need to be built up gradually in order to evolve from the existing piecemeal service landscape and to develop the capacity to deliver at scale. Diligent evaluation of new approaches will be necessary to document effectiveness, costs and benefits in order to ensure that government expenditures are justified and will indeed be returned.

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