Investments in K-12 Education for Minnesota: What Works?*

Growth and Justice Conference,
November 12 2007
Minneapolis, Minnesota

Henry M. Levin
levin@tc.edu
Teachers College, Columbia University

Clive R. Belfield
belfield@qc.edu
Queens College, City University of New York

* The authors are grateful for guidance from Angie Eilers and support from the Growth & Justice Equity Project. Research assistance was provided by Stephanie Mischner.

Investments in K-12 Education for Minnesota: What Works?
Summary

Annually, 10,000 students leave Minnesota's schools without a high school diploma. When measured over the lifetime the economic consequences if a dropout becomes a graduate are significant. We can express these consequences as the equivalent of a certificate of deposit in terms of their values at age 20. The individual graduate gains the equivalent of a CD worth $475,900 in extra earnings. The taxpayer gains the equivalent of a CD worth $251,900 in increases in tax revenues and in lower expenditures on health, crime, and welfare. The state of Minnesota gains the equivalent of a CD worth $1,059,500 from the individual and taxpayer benefits plus lower crime victimization and faster economic growth. The economic case for raising the high school graduation rate is therefore strong.

The moral case for raising the high school graduation rate is also powerful. High school graduation rates in Minnesota are stratified by race, sex, and family background. The disparities begin in early childhood but are magnified through the K-12 years. Many of the graduates then go on to college, leaving the high school dropouts further behind. Althought Minnesota spends more on public education for disadvantaged students, the difference is not substantial.

The search for effective educational interventions in K-12 schooling should therefore be intensive. The quest should be primarily for interventions to raise the graduation rate. But there is a strong correlation between achievement and graduation: our review estimates that an increase in 8th grade achievement of one standard deviation is associated with a 48% lower probability of dropping out of high school. So, the search should also consider reforms that increase achievement.

However, the challenges to finding and selecting reforms are significant. Cost-effectiveness studies require that the alternatives have similar educational goals and comparable measurement of outcomes. Many studies claim to be educationally effective,

but they are often based upon different measures of outcomes. Even when based upon test scores, the results may be for different subjects, different grade levels, different populations, and different test domains. Few studies that make claims for positive results meet even the minimal standards for rigor in evaluation design and implementation. And, almost none provide useful information for measuring costs. These conclusions hold even if we expand our review to include interventions that raise achievement.

After an extensive review, we found only a few K-12 education reforms that have demonstrated effectiveness in raising the graduation rate and whose costs can be calculated with reasonable confidence. These reforms are:

	Unit costs per student	Extra high school graduates per 100 students	Costs per additional graduate
Increasing teacher salaries	$2,850	5	$56,850
Reducing class sizes in elementary school across all students	$12,840	11	$116,720
Reducing class sizes in elementary school for free lunch eligible students only	$12,840	18	$71,330
Success for All Elementary school reform	$3,842	4	$96,050
First Things First High school reform	$5,440	16	$33,680
Talent Development High school reform with career academy model	$2,790	8	$34,850
Check & Connect High school mentoring and monitoring program	$8,150	17	$47,930
Achievement for Latinos through Academic Success High school program monitoring behavior and academic success	$3,940	5	$78,860

When we compare the costs of these reforms to the economic benefits that flow from high school graduation, we find the benefits to the taxpayer easily exceed the costs:

	Benefits to the taxpayer divided by the costs of the intervention
Increasing teacher salaries	4.01
Reducing class sizes across all students	1.96
Reducing class sizes for free lunch students	3.21
Success for All	2.38
First Things First	6.72
Talent Development	6.56
Check & Connect	4.77
Ach. for Latinos through Academic Success	2.90

There are many other interventions with potential benefits, but either their effectiveness is not fully demonstrated or there is inadequate information on costs. Effective programs that may pass a cost-benefit test, but presently lack rigorous evaluation data and cost information, include:

- Mentoring programs (12 Together, I Have a Dream)
- College readiness programs (CAP, TEACH, Talent Search)
- Employment readiness programs (Career Academies)
- Extended hours programs (After-school, summer school)

There are other areas of reform where more knowledge is critically needed for reforming K-12 education. These include: specific programs (such as AVID, Project GRAD, KIPPS academies, ISA model); reform related to teacher quality; and the range of family interventions. (Pre-school is outside the scope of our review).

Overall, the evidence on what works – and what interventions pass a benefit-cost test – is very limited. Accurate and detailed information on resource requirements necessary to estimate costs is as sparse as rigorous evaluations on effectiveness. A major challenge is to fill these crucial gaps to provide a more comprehensive list of educational interventions by their cost-effectiveness and cost-benefit results. One method developed in this paper to expand the numbers of programs that predict increases in high school graduation is to provide a framework for converting test score increases at 8th grade or

above into impacts on high school completion. This technique will enable us to embrace a wide range of high school reforms that show improvements in student achievement, but do not follow up students to graduation to show the impact on high school completion.

1. Introduction

Social science evidence shows that a person's high school attainment and achievement plays a critical role in their adult well-being. On average, individuals who graduate from high school will earn significantly more than drop outs, will report improved health status, and will be much less likely to be involved in either the welfare system or the criminal justice system. As well as these advantages for the individual, there are significant economic benefits to the taxpayer and the general public from high school graduation. The incentive to raise the graduation rate should therefore be strong (Belfield and Levin 2007).

However, to raise the graduation rate it is necessary to find interventions that are not only demonstrated to be effective but also shown to cost less than the economic benefits they yield. On both counts this search is challenging. Few interventions have been rigorously evaluated with respect to high school graduation; instead, many interventions are proposed based on how they fit within a theory of educational attainment or a plausible proposition about how students learn. As well, most interventions are poorly described such that their ingredients – and so their costs – cannot easily be identified.[1] Consequently, the accumulated evidence that something ought to be done to raise attainment is stronger than the evidence on what to do.

In the last two years we have undertaken to identify educational interventions that will increase high school graduation and to estimate both their effectiveness and costs as well as to compare the public costs and benefits of each strategy. In some sense this is a pioneering undertaking in that there is virtually no previous literature that addresses cost-effectiveness of interventions to reduce high school dropouts. In fact, there is a paucity of reliable cost-effectiveness studies addressing any aspect of education (Clune, 2002; Levin, 2001). But, for this reason the policymaker should understand that the literature is incomplete with respect to cost-effectiveness evaluations of all of the educational interventions that might be considered, although there is a steady accumulation of recent results.

[1] Many interventions are proposed without any evidence of their effectiveness (Carneiro and Heckman 2002a, 87). Evaluations often fail to follow standard research methods (Neumark 2006, 315). Levin (2001) describes as "rhetorical" the methods used in most economic evaluations.

There are two reasons for the gaps in the literature. The first is that cost-effectiveness requires a common criterion for comparison. We have addressed high school completion as the principal goal, but many studies view improvement in test scores. Even these are found in different subjects and different grade levels, each variant making it difficult to compare results in common terms. Second, there are relatively few systematic evaluations that provide reliable estimates of effectiveness for most interventions, even the most promising ones. Such evaluations require a satisfactory design for making comparisons, either an experimental or quasi-experimental design in which threats to validity are minimized. In the absence of good evaluations, it is not possible to make reliable cost-effectiveness estimates of educational alternatives. Fortunately, more good evaluations are being produced over time. Finally, few interventions provide the solid information that is needed for determining their costs. We have found that statements of costs are often just casual guesses, with no description of which costs are measured or how. Subsequent analyses find that many costs were omitted, and others were not properly assessed. Thus, even when appropriate evaluation methods are used, there is no accompanying information that can be used to provide reliable and comparable measures of costs of alternatives.

For these reasons the reader should view the cost-effectiveness estimates an emerging activity for presenting useful information for choosing among educational alternatives. In this paper we have identified a number of alternatives for which we believe the cost-effectiveness information is useful. But, we have also added a range of other alternatives for which we believe we might obtain the data to provide additional cost-effectiveness comparisons in the future. It is important that the reader understand this overall context in reviewing the following.

Nevertheless, because the evidence on the benefits of education is so compelling, it is still important to search for effective interventions. And because states bear the heaviest burden of funding for education, this search should adopt a state perspective. Therefore, our focus is on interventions in the K-12 school years for Minnesota. This period of education is important not only because it is by far the longest but also because it mediates early childhood education and because it is integral to ensuring students are

ready for college. K-12 schooling is also important in ensuring equitable educational opportunities.

We begin with a brief description of education provision in Minnesota, highlighting key aspects that motivate our subsequent analysis. Notably, even as the state has relatively high standards, it faces many of the same challenges other states do in regard to high school graduation, especially for minority males. In the next section, we report the economic benefits of investments in high school graduation (drawing on our earlier work, Belfield and Levin 2007; Levin et al. 2007); this shows the substantial economic benefits of education. We then critically review possible interventions to raise the graduation rate. We begin with interventions that have demonstrated effectiveness; we then expand our discussion to include interventions that may have some promise of being effective. For each intervention for which we have adequate data we calculate the costs of the investment. We then compare the benefits and the costs of each intervention. Finally, we draw general policy conclusions about optimal strategies for investment in K-12 education in Minnesota.

2. Education in Minnesota

Minnesota has one of the highest graduation rates across the U.S.: 87% of students graduate within four years of starting 9th grade (compared to less than two-thirds nationally). However, the pattern of graduation is similar to that across the rest of the country. Graduation rates are lower for: boys; students in urban high schools; low-income students; limited English proficient students; and for black, Hispanic, and American Indian students. Indeed, the last group graduates at rates of 59% (black), 50% (Hispanic), and 57% (American Indian); and these rates are not much higher than nationally (the rate for whites in Minnesota is 92%). As for other states across the U.S., therefore, Minnesota has significant numbers of minority students – particularly males – who are not high school graduates.[2] In absolute numbers, each age cohort includes approximately 72,000 public school students: 9,960 will not graduate on time from high

[2] Data are from the Minnesota Education Yearbook, 2003 (email communication, Angie Eilers). There are many ways to measure the rate of graduation, but they correlate very highly (Seastrom et al., 2006).

school (of which 4,830 will be white or Asian, 2,520 will be black, 1,930 will be Hispanic, and 680 will be American Indian).[3]

Differences in attainment by race and sex emerge as students progress through each grade level. In Minnesota (as elsewhere) disparities begin early childhood: 9% of white children's literacy levels are not sufficient for kindergarten compared to 21% for non-white children; for math the respective figures are 7% and 20%. These disparities are maintained in fourth grade NAEP tests: in reading, 43% of white children are proficient compared to 10% of black and 18% of Hispanic children; in math, the rates are 54%, 15%, and 15% respectively. Eighth grade NAEP tests show further widening of the racial disparities: in reading, 42% of whites are proficient, compared to 11% for blacks and 14% for Hispanics; in math, the rates are 49%, 9%, and 10% respectively. Similarly, sex differences show up by fourth grade: 42% of girls are proficient in reading and 45% in math; for boys, 34% are proficient in reading and 50% in math. By eighth grade girls are getting further ahead in reading (44% versus 31% proficient) with the boy's advantage in math decreasing slightly (45% versus 41% proficient).

The high overall rate of graduation translates into high rates of college enrollment. Moreover, Minnesota has a relatively high rate of college enrollment conditional on high school graduation: 65% of graduates enroll in college directly after high school (compared to 55% nationally).[4] Given relatively high proportions of students who can attend college and relatively high rates of college participation among those who can, Minnesota's labor force is highly educated: 35% of persons aged 25-34 have at least a BA degree and an additional 12% have an Associate's degree.

Importantly, the higher education system exhibits less stratification by race once we condition on high school graduation. For those who are high school graduates, college participation rates are 66% for whites compared to 57% for blacks and 47% for Hispanics (not accounting for college quality). For those who are high school graduates, Bachelor's degree completion rates within six years are 60% for whites, but 42% for blacks and 48% for Hispanics; for Associate's degree completion within 3 years the rates are 42%, 24%, and 28% respectively. Thus, although there are racial disparities across

[3] Non-public school enrollment is 4,390 private school students and 900 home-schoolers.
[4] This rate includes out of state enrollments.

the college system, the larger disparity by far in Minnesota is in high school graduation performance.

Data on school funding is also salient. Operating expenditures across each year of K-12 schooling per student are $7,796 in Minnesota (AY2002, nominal dollars). Adjusting for relative costs, this amount is close to the median for states across the U.S.[5] However, Minnesota is a relatively affluent state: as of 2004, median household income is $56,100 in Minnesota compared to $48,000 nationally (Census figures).

Typically, across the U.S. public investments are *lower* for disadvantaged students (Education Trust, 2006). In Minnesota, per student expenditures are higher in districts with higher concentrations of disadvantage. But is questionable whether these differences adequately reflect educational need. Funding in districts with over 50% poverty is 18% higher than in districts with less than 20% poverty; and funding in districts with over 10% limited English proficiency (LEP) is only 4% higher than those with no LEP students. In their review of funding for at-risk students, Duncombe and Yinger (2005) report that Minnesota's per pupil state aid for high poverty districts is 1.35 times that for the average district. Although this ranks as the tenth highest across the U.S., the authors conclude that "no state has an effective poverty weight as high as the estimated weight in the scholarly literature" (p.515). Therefore, given the relative affluence of the state, Minnesota may also be under-investing in programs for at-risk students. Finally, we note that schools in Minnesota receive the bulk of their funding from the state government: 73% of revenues are from the state, with 20% from local government, and 5% from the federal government (with 2% from other sources).[6]

In summary, compared to the rest of the US, the Minnesota education system is one of the highest performing in terms of absolute outcomes. However, it exhibits the same pattern of performance as other states, with minority males starting behind and getting further behind through the school years. College participation and performance in college is less racially stratified; this is the case across the U.S., but Minnesota's higher

[5] Of these expenditures, only 47% are allocated directly for regular instruction; administrative support and student support account for 16%; maintenance 8%; and other 11% (with 16% allocated for special education).

[6] However, this does not mean that all districts would be equally affected by changes in state aid. The percentage of total revenue sourced from each level of government varies dramatically across districts: 2%-44% from local government; 50%-90% from state government; and 1%-44% from the federal government.

education system is a particularly notable example. Redistributive funding in K-12 schooling for disadvantaged groups is probably below what is needed to ensure opportunities for graduation. Finally, more than other states, the burden of education funding is skewed toward the state. Together, these facts suggest that a key area for improvement – both on efficiency and equity grounds – is the state's K-12 education system.

3. The economic benefits of education

3.1 Methodology

Belfield and Levin (2007) have formalized the method of calculating the lifetime economic benefits of high school graduation. First, it is necessary to identify the causal impact of education on outcomes such as labor market activities, health status, criminal behavior and welfare receipt. These outcomes are selected because they impact on the total tax bill for the state and on economic activity across Minnesota. Second, these impacts must be translated into monetary benefits using a consistent accounting framework over the lifetime (up to age 65). This method examines the economic benefits expressed in present values for an 'expected high school graduate' at age 20. (An 'expected high school graduate' is a graduate who also has some probability of going on to college.) Because of differences in lifetime behaviors, these analyses are performed separately for males and females and by race. We adjust for Minnesota prices and for the distribution of dropouts by race across the state. We express all money amounts in present values and use a discount rate of 3.5% as recommended by Moore et al. (2003).[7] We summarize the calculations from this method and then report their economic magnitudes. For brevity, we report only average figures and by sex.

[7] Present value refers to the fact that a benefit received in the future has less value than one received at present. Therefore future benefits are discounted by a rate of interest to obtain a comparable present value. This is precisely why a lottery winner of $ 1,000,000 can get annual payments of $50,000 for 20 years adding to one million dollars in future payments or can elect to get a flat amount immediately that is more on the order of $650,000, the present value of a stream of $50,000 a year for 20 years. That is, the lottery winner can ask for the present value of the future payout. Bear in mind that if $ 650,000 is invested at an appropriate interest rate for 20 years, it will add up to $1,000,000. What we have done is converted future benefits received over many years to their present value to society for each person at age 20. For a more detailed explanation on present value, see Levin & McEwan (2001), pp. 88-94.

We should note at the outset that our analysis considers the economic consequences if high school dropouts become graduates as opposed to, say, the consequences if high school graduates go to college. In terms of economic gains, the income benefits of education are not especially concentrated in high school. In fact they are similar across each additional year of education (Rouse, 2007). In other words, if we imagine one extra year of education has been created, the increase in income would not be significantly different if the year was one more year of high school or one more year of college. Hence, focus on the high school graduation rate is as much a moral claim – raising the economic status of those at the lower end of the educational distribution – as much as it is an economic one – investing in educational supports that will yield the highest rate of return.[8]

The overall results for the fiscal and the social benefits of each marginal high school graduate are summarized in Table 1.

3.2 Fiscal benefits of education

The main causal impact of high school graduation is on incomes (Rouse, 2007). The large volume of evidence has established that the income gains from extra schooling are not driven by an omitted correlation between schooling and other personal characteristics (such as ability). There is also very little 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. Thus, wage comparisons across education and age levels are likely to yield reliable estimates of the benefits of schooling. From these it is possible to calculate differences in tax payments by education level.

Based on calculations from the Current Population Survey (CPS), high school graduates earn on average $475,900 more than dropouts over the lifetime ($550,400 for males and $364,600 for females). Applying TAXSIM, the NBER's tax simulation model, the additional federal and state income taxes paid by graduates amounts to $167,000 ($200,900 for males and $116,400 for females).[9]

[8] The economic benefits in other domains are probably not linear in years of education: high school graduates and college graduates do not differ significantly in their rates of criminality compared to the rates for high school graduates and dropouts.

[9] To account for additional payments in property taxes and sales taxes, we add 5% to total income tax payments.

The second significant causal impact of high school graduation is improved health status and lower rates of mortality (Cutler and Lleras-Muney, 2006). From the fiscal perspective, those with higher educational attainment are less likely to use public programs such as Medicaid and Medicare (for those under 65 with disabilities), and they typically have jobs that provide health insurance. Indeed, as Medicaid eligibility is based on wages, even the simple income effect of education will reduce government spending on health.

Based on data from the Medical Expenditure Panel Survey (2004), high school graduates have much lower enrollment rates in these government health programs. These differences in coverage rates – reflecting genuine differences in health – translate into differences in annual per capita costs and so into lifetime costs. The costs vary by gender and race, but the educational impacts are significant. Over the lifetime, the average saving to the public health system per expected high school graduate in Minnesota is $48,900 ($43,900 for males and $56,500 for females).

The third impact of graduation is on criminal activity (Farrington, 2003), which in turn is reflected in differences in incarceration rates by education level. The economic cost of crime is high. From the government perspective, there are: 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. The societal cost of crime is borne by the victims in reduced quality of life.

The quality of data for analysis of how education reduces crime is not high, so it is necessary to calculate the number of crimes committed by education level on a per crime basis. Focusing only on high cost crimes (murder, rape/sexual assault, violent crime, property crime, and drugs offenses), high school graduation will reduce their incidence by 10-20% (Lochner and Moretti, 2004). This reduction in crime is assumed to have a corresponding effect on incarceration rates. Using Bureau of Justice Statistics data and survey information we estimate the lifetime cost savings attributable to lower

crime rates at $31,800 per new high school graduate ($46,600 for males and $9,800 for females).[10]

The final impact of education is on welfare receipt (e.g. cash aid, food benefits, housing aid, training, and energy aid). Greater educational attainment is associated with lower receipt of public assistance payments or subsidies (Rank and Hirschl, 2005; Waldfogel et al., 2007). Indeed many welfare programs are means-tested and so eligibility will fall automatically as income rises. Again because of data availability, this analysis is restricted to a few sources of welfare receipt: Temporary Assistance for Needy Families (TANF); food stamps; and housing assistance (with state-level payments for these benefits applied on a proportionate basis).

Based on CPS data, it is possible to calculate the lifetime incidence of welfare receipt by education level. These incidences are then related to the average welfare payment. Annual figures can be extrapolated to calculate lifetime effects of increasing educational attainment. The average cost saving to the government per expected new graduate is $4,100 over the lifetime ($2,200 for males and $6,900 for females).[11]

The aggregate economic benefit to the government of one more high school graduate at aged 20 is $251,900 ($293,600 for males and $189,700 for females). The amounts vary by sex and race with these differences caused by many factors, including the strengths of educational effects, the progression rates to college, and the involvement of the different populations in the labor market. In all cases, the gross public benefits from graduation are very large.

One important consideration relates to the distribution of benefits across levels of government. Specifically, the bulk of the income tax returns are accrued by the federal government. In a separate analysis we performed for California we found that only 32% of the economic benefits were returned directly to the state Treasuries with the other 68% accruing to the federal government. From the narrow state government perspective, therefore, the economic benefits are strictly only one-third of the amounts reported above.

[10] These figures are considerably higher for males, 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.

[11] Although not trivial these welfare savings are low because: 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).

A similar proportion might be anticipated for Minnesota, although the exact figure depends on tax rates and the state/federal burdens for funding Medicare and Medicaid, for supporting the criminal justice system, and for paying welfare assistance.

3.3 Social benefits of education

Taxpayers are not the only ones who would reap economic benefits from increases in educational attainment: the entire state would benefit. The social gains to the state include the savings to the taxpayer, but there are three additional components.

First, there is the increase in private income earned by each new graduate. This increase in net income can be calculated as the change in gross income minus the tax payments. Second, there are savings to society from reductions in crime. Victims of crime (not taxpayers) bear the largest burden in terms of reduced quality of life and monetary losses (e.g. time off work). Moreover, all persons make private expenditures for insurance and other protections to prevent being the victim of crime or to cushion is financial impact. These costs are much harder than fiscal costs to estimate with precision: Ludwig (2006) estimates these social costs are 4.5 times larger than the fiscal costs; data reported by Miller et al. (1996) yields a factor that is closer to 2.5. Finally, there are externalities from education on economic growth: workers with more human capital might also make their co-workers' more productive and attract investment into the state. Reviewing the literature, McMahon (2006) estimates these externalities to be worth 37-61% of the total market returns to education.[12]

The result of adding in these extra benefits is of course to increase the total size of benefits very significantly. Using the more conservative factors for crime victimization and externalities, the social benefits to the state of Minnesota are $1,059,500 ($1,236,000 for males and $795,600 for females).[13] This shows that the primary beneficiary of additional education is the individual, and that the main burden of crime is on the victim and not the taxpayer such that the societal benefits are much larger than the fiscal ones.

[12] In an extensive review of the cross-country evidence, Pritchett (2006) suggests that the effect is quite small and possibly zero. However, this evidence draws upon many countries with very different economic structures from the U.S. Also, it should be noted that improvements in health (separate from their impact on health spending) are not included as a social gain.

[13] The social benefit equals $Y + 1.37*(Y-T) + 3.5C + H$, where Y is extra gross earnings, T is tax payments, C is fiscal crime savings, and H is fiscal health savings. Welfare payments are not included because these are a transfer across members of society.

The aggregate effects are substantial. Each year, with 9,960 dropouts in Minnesota, the opportunity cost to the state is almost $10.6 billion annually.

4. Costing out interventions to improve K-12 education

4.1 Identifying interventions

Importantly, the economic benefits calculated above are gross. They do not account for what it costs for the necessary educational interventions to raise the graduation rate or to fund college progression contingent on graduation. We now consider what it would cost to increase the numbers of high school graduates. Of course, this requires that we first identify effective educational reforms.

We adopt a wide approach for finding interventions that work. Potentially, the options are many, including: reforms to induce systematic and large-scale organizational or institutional change (e.g. accountability mandates or comprehensive school reform); policies to influence classroom conditions (e.g. reducing class size); programs applied to some children or in some settings (e.g. literacy programs); and specific, small-scale treatments (e.g. peer tutoring). We did not consider interventions outside the school, such as changes to home or family circumstances, although these are extremely important and may even be necessary pre-conditions for some educational interventions. Our literature review included academic journals and web-based literature, as well as research summarized in education clearinghouse databases.[14] We applied methodological criteria with priority given to experimental and quasi-experimental research designs over econometric studies.

Overall, the available evidence does not provide much guidance on what types of educational investments are optimal under a given set of circumstances (Mervis 2004).[15] We categorize the evidence into three groups: interventions with demonstrated effectiveness; promising interventions; and other educational reforms. The last category includes reforms which cannot easily be evaluated in terms of how they affect the graduation rate.

[14] These included: www.childtrends.org; www.campbellcollaboration.org; www.whatworks.ed.gov; www.evidencebasedprograms.org; and www.promisingpractices.net.
[15] Of the 300 reviewed by Lehr (2004) only ten directly measured enrollment status.

To expand the range of possible interventions, it is possible to consider reforms that have demonstrated impacts in raising test scores. If we include studies that increase test scores, we could also add up the economic benefits associated with higher test scores. This would require another complete study corresponding to that summarized in Section 3. Instead, it is reasonable to equate in-school achievement gains with subsequent graduation probabilities and assume that the same economic benefits can also be realised.

A number of studies have reported how test scores relate to graduation rates, controlling for individual and school-related characteristics.[16] Most studies use the NELS-88 data and so focus on secondary school test scores (8^{th} or 10^{th} grade).[17] The results are surprisingly consistent. Lee and Burkam (2003) report a one standard deviation increase in math GPA reduces the odds of dropping out by 32% (although controlling for school characteristics and socioeconomic status, the effect is no longer statistically significant). Rumberger and Larsen (1998, Table 5) find that a one standard deviation increase in eighth grade (reading and math composite) test scores reduces the probability of not graduating by 48%. So, if the initial dropout rate is 20%, the new rate would be 11%.[18] Based on data from one large school district, Zvoch (2006) estimates that one standard deviation in test scores is associated with a 35% reduction in the dropout probability (controlling for student and school characteristics). Finally, Finn et al. (2005) find that, based on the participants in the Tennessee class size experiment, a one standard deviation in achievement in early grades raises the probability of high school graduation by one-third.[19]

---

[16] Recent research highlights the importance of course-taking sequences, particularly in Math. Based on the Education Longitudinal Study of 2002, math skills are highly correlated with graduation probabilities. Only 52% of the students who take no math graduate from high school. Only 61% of those who take basic math graduate. Almost every single student who takes calculus graduates from high school (Bozick and Lauff, 2007).

[17] Although the link between early grade test scores and graduation may be weaker, a number of students will have already dropped out by 10^{th} grade. As such, the research evidence probably understates the relationship between test scores and graduation probabilities.

[18] Adopting a somewhat different perspective, Lillard and DeCicca (2001) ask: what would be the consequences on the dropout rate if states raised their course graduation rates? Using data from both NELS-88 and the High School and Beyond survey, they find a smaller effect: if course work standards are raised by one standard deviation, the average dropout probability increases by 10-17%.

[19] Allensworth and Easton (2007) examine data across Chicago high schools to identify in-school predictors of graduation. Grades are important: students who do not score any Fs in core subjects graduate at 82%; students who score at least one F graduate at a rate of 22%. Over 97% of students with a GPA over 3.5 graduate; only 72% of students with GPAs of 2.0 graduate. Each failed course reduces the probability of

Direct analysis of NELS-88 shows similarly-sized impacts. Our analysis here is intended to highlight differences in effects within subgroups, not to re-estimate an overall effect superceding that of Rumberger and Larsen (1998). Table 2 shows the coefficients from our models determining the probability of dropping out of high school (controlling for a set of individual and school-related characteristics, see Table Notes). The coefficients show that there is a strong impact of test scores on graduation rates.

Overall, our results and the prior literature do allow us to estimate an average overall relationship between achievement and graduation: approximately, increasing test scores by one standard deviation should reduce the dropout rate from 12% to approximately 12% in Minnesota. Hence, raising test scores should yield significant economic benefits.

However, the relationship between prior test scores and graduation varies across four critical dimensions: the subject of the test and the sex, race, and prior achievement of the individual student. Sub-group estimations by sex and race are reported in the last six columns of Table 2. As shown in row 1, the impact of socioeconomic status on graduation is broadly similar across all sub-samples (with the exception of Hispanic males). However, the test score impacts are varied. For males, higher reading scores reduce the dropout probability for blacks but not whites or Hispanics; yet for math scores the reverse is true. For females, dropout probabilities are very strongly influenced by reading scores and by math scores with the exception of whites in reading. Thus, for white students higher reading achievement *ceteris paribus* yields no advantage in future graduation opportunities; and in each case (except black males) math scores are a stronger predictor of dropping out than reading scores are.

Sub-group estimations are reported by 8th grade achievement quartiles in Table 3. The full sample is given in the first column for comparison, with estimates in the top panel for reading quartiles and in the bottom panel for math quartiles. For both reading and math scores, the results are consistent: there is no statistically significant relationship between prior test scores and graduation probabilities for those students who test above the median. The impact of test scores on graduation is driven entirely by the

---

graduating by 15 percentage points. Other measures are also important: a student who is absent more than 20 days in their freshman year has a less than 10% chance of graduating.

relationships for those below the median in test scores. Thus, for improvements in test scores to have any influence on getting students to graduate, those improvements must be made by students below the median in prior achievement. But, if these improvements can be made, graduation rates will improve significantly. For example, almost 30% of those in the bottom quartile on math tests will not graduate. Raising their achievement levels will have a much larger impact on graduation rates than across-the-board test score gains.

Our goal is to find as many effective interventions as possible, where effectiveness is defined either in terms of graduation rates or test scores. We also anticipate that interventions may be effective in various ways, some by raising attainment directly and others by raising achievement. As examples, interventions may either encourage families to get involved, such that students are motivated to learn in all subjects, or necessitate more qualified math teachers, such that discipline-specific knowledge is enhanced. The processes and mechanisms are less important than the outcomes. Because our evidence on the economic advantages of education are reported in terms of graduation, we hope that the interventions which raise achievement also increase graduation rates. However, given the variation in how achievement affects graduation (across race, sex, and subject), it is not certain that higher achievement will raise the graduation rate.

4.2 Interventions with demonstrated effectiveness on graduation rates

We identify a number of K-12 interventions that have demonstrated effectiveness. Certainly, our list is not a long one of effective interventions, particularly given the stakes and given that some of these interventions are not certain to raise dropout rates in Minnesota (and given that few have been replicated). In the next Section, where we review other possible interventions, we also highlight why our list is so short.

Investing in more high quality teachers is an important investment. High quality teaching raises student performance and its effect accumulate over the K-12 years (Wayne and Youngs 2003; Rivkin et al. 2005). Practically, one way to attract better teachers is to offer higher baseline wages: higher pay should also induce greater effort

(Loeb and Reininger 2004).[20] Loeb and Page (2000) estimate the association between higher teacher salaries and high school graduation rates ten years later. Using state-level panel data, their analysis improves on prior work by including controls for the opportunity cost (relative wages in other jobs) of teaching. Loeb and Page (2000, 406) find that a ten percent increase in teacher salaries across the K-12 years would increase the number of high school graduates by 5 percentage points.

The second policy for raising the graduation rate is to **reduce class sizes in the elementary school grades**. Evidence from Tennessee's Student Teacher Achievement Ratio (STAR) Project shows strong advantages from being in smaller classes: students randomly assigned to smaller classes were more likely to graduate from high school than students assigned to larger classes (Finn et al., 2005). Students in smaller classes in elementary school reported graduation rates that were 11 percentage points higher than students assigned to regular classes. The impacts were even greater – at 18 percentage points – for children eligible for free lunch.

Success for All is one whole-school reform model which has been evaluated and for which we have cost ingredients. Success for All focuses on promoting early school success for at-risk students and currently serves approximately 1 million children in 2,000 schools. It includes materials, training, and professional development to implement a school-wide program for grades K-5 to ensure every child will reach third grade on time. The evaluation by Borman and Hewes (2002) shows Success for All may be a good investment because it shows higher test scores at 8th grade, reduces special education placement, and reduces rates of grade retention. Specifically, the effect size gains in reading and math were 0.3 and 0.1 respectively. These effect size gains are significant because Success for All is targeted for at risk students and data from Table 3 shows how achievement gains for these students matter much more for raising graduation probabilities. Taking the average gain of 0.2, and applying Rumberger and Larsen's estimates to a dropout rate of 40% for at-risk students, the graduation rate would be higher by 4 students after implementation of Success for All.

[20] Some economists argue that higher wages will simply accrue as windfall payments to current teachers and induce no extra effort (Ballou and Podgursky, 1995). But there is considerable turnover among teachers (e.g. resignations and retirements) that allow for new hires from an enhanced talent pool. Generally, it would be a very extreme position to say that increasing the wage would have zero impact on teacher quality.

In high school, the strongest example of a successful reform is the Institute for Research and Reform in Education's **First Things First** (FTF). This program emphasizes small learning communities (less than 350 students), long-term teacher student relationships, mentoring, and teacher advocacy for each student with a rigorous curriculum (Quint et al., 2005). In a research study using interrupted time–series data, FTF generated higher graduation rates by 16 percentage points as a result of the intervention.

Talent Development is a multi-faceted high school reform. It begins in 9th grade based on new curriculum materials in 9th grade and then develops into a career academy model (CSRQ, 2006). The model has five main features: small learning communities; curricula eading to advanced English and mathematics coursework; academic supports for those needing extra help sessions; additional professional development; and parent and community strategies. In an evaluation by Kemple et al. (2005), the program raised progression rates between 9th and 10th grades by 8 percentage points.

Check & Connect is a program to monitor and assess student performance and to mentor students. This program is implemented in school districts in Minnesota and targeted to at-risk students. Sinclair et al. (2005) performed an experimental evaluation for 94 high school students in Minneapolis. Again, the evidence is mixed: there is no clear evidence that the program raises the graduation rate, but at least by 12th grade the dropout rate of program participants was considerably below that of the control group, at 39% compared to 58%. If this effect could be obtained in a broader implementation, 17 new graduates per one hundred students would be yielded.

Finally, **Achievement for Latinos through Academic Success** (ALAS) is a program that assigns counselors to monitor attendance, behavior, and achievement. The counselors work with the children and their parents to ameliorate problems, offer remediation, and provide feedback on school progress. Gandara et al. (1998) conducted an experimental method evaluation. For a sample of 81 students in California, ALAS reduced the probability of dropping out in 10th grade with retention rates of 86% for the treatment group versus 69% for the control group. By 12th grade, the respective graduation rates were 32% and 27%. Although these differences – based on the small

sample – were not statistically significant, they may be economically important. With this caveat, it is worth considering ALAS as a possible program.

4.3 Interventions with some promise

Promising interventions are those that lack rigorous evidence as to their effectiveness but possess some of the features associated with effectiveness.[21] We focus on high school reforms (based on evidence from the What Works Clearinghouse, 2006), but also consider whole school reforms and extended learning programs (summer and after school programs).[22] However, our investigation reveals that these interventions do not report the specific inputs required and so it is not possible to estimate their costs. We review these interventions, but we also describe why we do not provide cost estimates. Given their effectiveness, it is highly likely that they do yield a positive return to the state.

Mentoring programs

Twelve Together is a program offering peer support and mentoring in middle school and high school. Students participate in weekly after-school discussion groups. A randomized controlled trial of 219 8th graders in California found that the dropout rate for participants was five percentage points lower than the control group (Dynarski et al., 1998). WWC (2006) estimates the cost per student per month of program participation is under $300, but this amount almost certainly understates the resource requirements for the trained adult facilitators.

I Have a Dream is a program for inner-city low-income children from 6th to 12th grade. The program offers a mentor and facilitator for a selected class of 6th graders and the funding sponsors who are actively engaged with the students and the school and provide financial support for students who enroll in college. An evaluation by Kahne and Bailey (1999) reported graduation rates 34 percentage points higher for those in the program. However, the running costs were almost twice as high at one site as the other. The program requires an outside sponsor who is willing to fund college scholarships; it

[21] At the high school level, these features are: (1) small school size where students and staff know each other; (2) high levels of personalization to address students' personal and academic needs; (3) high academic expectations as part of a rigorous curriculum; (4) counseling for students with personal and educational difficulties; (5) parental engagement to support school programs; (6) extended-time school sessions; and (7) competent, well-qualified personnel committed to the school's mission.

[22] Two programs reviewed by WWC (2006) are not considered here: High School Redirection is not included because it is no longer operating, and Middle College High School did not generate sufficient benefits in terms of high school graduation (WWC, 2006).

also drew on resources (from AmeriCorps and Princeton Project 55) for two full-time staff members for two years and these were not included in the budgets.

College readiness programs

Talent Search is a program of academic support intended to raise the graduation rate and motivate low-income students to attend college. It serves about 380,000 students across over 400 sites. Importantly, this is a federally-funded program, with federal spending of approximately $800 per participant; state and local agencies also contributed to the program (but these amounts are unknown). Evaluations by Constantine et al. (2006) found that high school completion rates were 9 percentage points higher for those who had participated in Talent Search.[23]

The College Advisory Program (CAP) is a whole-school reform that emphasizes college preparation activities, along with mentoring to link high school students, college students, and young workers. CAP also makes use of technology to provide web-based tutorials, including information on colleges and financial aid. CAP has been studied by Schneider and Stevenson (1999) using longitudinal data on over 1,000 low income students in urban high schools. An adapted version of CAP called TEACH (Training Early Achievers for Careers in Health) was evaluated using a randomized trial (Arora et al., 2006).

Other college preparedness interventions include dual enrollment and AP course-taking. These interventions help motivate students for college and provide an alternative environment for learning outside of the regular classroom. Recent research suggests that both dual enrollment and AP course-taking can be effective (Mechur Karp et al., 2007; Jeong, 2007).

Employment readiness programs

Career Academies are school-within-school programs intended to promote employment readiness. Students are instructed with career-related materials and supported to gain work experience at local employers, with academies operating across the U.S. (Maxwell and Rubin, 2000). Kemple and Snipes (2000) evaluated the program used a randomized

[23] Federal allocations are estimated at $400 per participant per year. This would make the program extremely effective. However, there is no information on the additional spending by schools to implement Talent Search. Also, implementation of the program was not uniform. Although 30% of participants received 20 or more hours of service, nearly 50% received under 20 hours of service.

trial. For 1,764 students, Career Academies reduced dropout rates for the sub-sample of at-risk students over the control group (21% and 32%), but no impact on those students who were low or moderate risk. The costs of these programs are split across multiple agencies: just over one half is paid by the school district, one quarter by a city redevelopment agency (CRA), and the remainder by other agencies, including the federal government, local corporations, and state governments. Other groups provided significant in-kind supports. Costs data is only available for the resource contribution of the CRAs and the estimated costs vary according to which component of the program are implemented. In addition, the program requires significant start-up costs for staff development, curriculum design, and internships.

Extended hours programs

Extended school programs (after school or summer school) may be promising interventions (see Carneiro and Heckman, 2002a). These can directly raise attainment and may reinforce classroom learning; and summer school may ameliorate the phenomenon of 'losing ground' for minorities and lower socioeconomic students when school is not in session. Lauer et al. (2003) review the positive impacts of out-of-school educational strategies across the U.S. Based on an experimental field trial in Baltimore, Borman and Dowling (2006) show that summer school is effective: after two successive summer schools in kindergarten and first grade, the treatment group's test scores are approximately 0.5 standard deviations above those of the control group. A meta-analysis by Cooper et al. (2000) gives an effect size gain of approximately 0.2 across the U.S. However, this evidence is for summer schools in the early grades and we cannot easily translate early achievement gains into higher graduation probabilities.

4.4 Other educational interventions

We would not wish to restrict education policy reforms to only the above set of interventions. Other school-based policies and interventions might be considered, including: KIPP academies, Boys and Girls Clubs of America, Sponsor a Scholar, AVID[24], Project GRAD[25], and the Institute for Student Achievement model.[26] None of

[24] Watt et al. (2006) report graduation rates for AVID high schools at 85% versus 83% for comparison schools in 2002. However, comparisons across AVID districts and non-AVID districts show lower graduation rates in AVID districts (see also Martinez and Klopott, 2005).

these interventions have been evaluated using rigorous research methods. Interventions with other goals or those that take place outside school may also impact on the graduation rate (e.g. drug abuse and teenage pregnancy preventions, Lehr, 2004). But considering the full range of these interventions is beyond the scope of this paper.

Also outside our scope are early education investments. Several of these have been shown to yield very high rates of return (Barnett and Belfield, 2006). The High/Scope Perry pre-school program yields 16 new high school graduates and the Chicago Child-Parent Center program yields 11. Given the benefits of high school graduation, these programs are likely to pass a cost-benefit test. As well, economic calculations suggest that Head Start may be a good investment: in their cost-benefit analysis Ludwig and Phillips (2007) calculate that the program pays for itself even if the academic benefits are only 0.05 standard deviations. These interventions may be thought of as complements to the K-12 interventions proposed here.

There are also problems in recommending other popular reforms as solutions for the low graduation rate.

Privatization reforms to create more options for parents and more competition between schools may be effective in raising outcomes. This reform encompasses an array of policies, such as: promoting inter-district enrollments; encouraging private schools and charter schools; voucher programs; and promoting competition between schools. However, there is very little solid evidence that privatization will raise the rate of high school graduation or dramatically increase test scores.[27] In addition, the costs of privatization reforms are not easily identified (Levin and Driver, 1997).

---

[25] Also, although Project GRAD showed modest early gains in achievement, an evaluation by Snipes et al. (2006) showed negative impacts on high school graduation.

[26] Grade retention is not considered because there is general agreement that it does not pass a cost-benefit test: it imposes additional costs on a school system and appears to disadvantage the retained students (Temple et al. 2003). Whole-school reforms may change the culture and organization of a school to enhance educational outcomes (although test score gains are not definite, Borman et al., 2003). Moreover, there are few economic analyses of whole-school reforms, despite the substantial cost involved in implementing them (Levin, 2002; King, 1984).

[27] On open enrollment programs, the Chicago lotteries analyzed by Cullen et al. (2005, Table 6) show no gains from winning a place in a preferred school in terms of dropping out in 9th or 10th grade. On private schooling, Neal (1997) does not identify any increase in attainment from attending Catholic school. Zimmer and Buddin (2005) do not find that charter schools in California are outperforming local public schools. On vouchers, there are only moderate gains in achievement (Figlio and Rouse, 2006); some studies do find competition raises attainment (Belfield and Levin, 2002).

Raising standards on exit-based exams appears attractive because it might be low cost: schools already impose some form of assessment, so a replacement should not be expensive, and tougher exams mean students will have to work harder (and their time is not a cost to the public purse). Accountability frameworks may therefore help in raising achievement for some students (Hanushek and Raymond, 2005). However, imposing exit-based tests may discourage students from accumulating attainment, reducing education levels for those who expect to fail the test. Dee and Jacob (2006) find gains for those pushed to study harder but losses for those who drop out early. The net effect on the dropout rate is therefore likely to be small.

Smaller schools may enhance educational outcomes (Kuziemko, 2006). But the specifics of how smaller schools operate is unknown and the costs of reducing school size are unknown. Similarly, peer tutoring is an intervention which might easily pass a cost-benefit test: it is primarily attractive because it enlists children to teach other children, showing strong results for both tutor and tutee (Wolfe and Tefft, 2004). Again, however, the costs of administering such a program are unknown.

Raising family incomes (either through tax relief or labor market policies) might raise children's educational performance. However, temporary increases in family income do not strongly influence children's educational attainment (Blau, 1999); increases in family incomes have to be sustained and ideally for families with young children (Carneiro and Heckman, 2002b; Duncan et al., 1998). Taylor et al. (2004) find positive effects from higher 'permanent income', but that these effects are not much larger than those from educational interventions. Recently, Dahl and Lochner (2005) have identified a strong effect of family income on test scores (up to 0.2 standard deviations) through increases in the Earned Income Tax Credit. More investigation into how income supports translate into educational gains is therefore appealing.

Lastly, we consider the issue of 'teacher quality'. Reconfiguring the teacher labor force may be an alternative to paying higher salaries as a way to increase teacher quality. This reconfiguration should involve allocating, hiring, and firing teachers according to their success in the classroom. But the evidence on how to do this is inadequate. As maintained by Hanushek (2006, 459), "Estimating the costs of achieving improvements in the teacher force is generally impossible based directly on current data. We simply

have limited experience with any policies that alter the incentives for hiring and retaining high quality teachers" (see also Lankford et al., 2002; on performance-related pay, see Ballou, 2001). Although raising teacher quality is consistently promoted as a solution for low educational performance, the evidence base for policy reforms is far too weak, extending even as far as uncertainty on how to define 'quality'.

4.2 Measuring the costs of interventions

For each demonstrated intervention we calculate the costs of implementation; where possible we calculate costs based on the ingredients method (Levin and McEwan, 2002). We apply a price index such that these costs are in Minnesota prices (Taylor and Fowler, 2006).

For each intervention we calculate two costs. The first is the cost of implementation per student (the 'unit cost' of delivering the program to one student). The second is the cost to yield an additional high school graduate. Certainly, the latter greatly exceeds the former because no intervention provided to a student guarantees that a potential dropout will definitely become a high school graduate; and many students who appear to be potential drop-outs would have graduated anyway. It is therefore necessary to offer interventions to many students to yield one additional graduate. The 'yield cost' is therefore the 'unit cost' divided by the percent increase in the graduation rate. Importantly, we can only calculate average costs and not marginal costs. Strictly, the decision to invest in programs to yield extra high school graduates should consider the marginal cost; however, this cost is typically not available. For small-scale programs implemented in new settings it may be reasonable to assume that marginal cost is close to average cost. But for larger-scale programs, marginal costs may exceed average costs.

Finally, in these calculations of costs we separate out the costs of the intervention itself and any additionally induced costs. Clearly, a student who graduates will be staying in school for longer but he or she may also progress on to college and this is also partly subsidized by the state. These additional public costs of education must also be taken into account.

One complicating factor is that the interventions take effect at different points in a child's schooling (e.g. in elementary school or high school). So the cost of each intervention must be transformed into present values. We transform each money value

into present values at age 20. This means that each intervention can be compared on a consistent basis regarding when in the course of a child's educational experience the investment must take place and regarding the economic benefits calculated above. For example, an intervention in first grade will not raise the graduation rate until 11 years later, whereas a high school investment may do so in only a few years. For these present values we apply a discount rate of 3.5% (see Moore et al., 2004).

Table 4 reports the unit costs of delivering the intervention to one student in the first column. The second column reports the yield of new high school graduates. From this we calculate the yield cost, i.e. the amount of resource required to induce one dropout to become a new high school graduate.

Investing in more high quality teachers: In present values, paying teachers ten percent more through the K-12 years would increases the public costs of education in Minnesota by $2,850 per student. The present value cost per additional graduate would be $56,850 per student.

Reducing class sizes in the elementary school grades: Following the implementation of Project STAR we assume a class size reduction from 22 to 15 implemented for 2.3 years in elementary school. The present value unit cost per student is $12,840. With a 'yield' of 11 new graduates per 100 students, the cost per new graduate is $116,720. If class size reductions are targeted to only those students eligible for free lunch, the yield of new graduates would be 18. Consequently, the cost per new graduate would fall to $71,330.

Success for All: Based on the ingredients reported in Borman and Hewes (2003), we estimate the costs of this program in Minnesota would be $3,842 per student. With a yield of 4 new graduates, the cost per additional graduat would be $96,050.

First Things First high school reform: Based on cost estimates derived by Levin et al. (2007), the present value unit costs of this program are $5,440 per child in Minnesota. The cost per new high school graduate is $33,680.

Talent Development: Based on reported ingredients and our own calculations of the costs of the 9th grade curriculum and three years of the academy model, the cost per student for this program is $2,790. The cost per new high school graduate is therefore $34,850.

Check & Connect: Based on a template of expected ingredients, the reported annual unit cost for the program is $1,800 (Minnesota prices, $2007) and it is assumed that this is delivered for the four years of high school. Accounting for present values, the total unit cost per student is $8,150. The cost per new graduate is therefore $47,930.

ALAS program: the present value unit cost of the ALAS program over three years is approximately $3,940 per participant. (This cost is based on our ingredients method; costs are lower in Gandara et al., 1998). With five new graduates, the cost per new high school graduate is $78,860.

5. Comparing the costs and the benefits

5.1 Benefit-cost ratios for interventions to raise the graduation rate

We now compare the benefits and costs for each intervention. The benefit-cost ratios for the interventions are reported in Table 5. The first column reports the fiscal benefits per graduate. Derived from the evidence in Table 1, these must be adjusted to account for the additional spending on education in high school and college for new graduates. Hence, the net fiscal benefits per graduate are $228,630.

For each of the selected interventions the costs per additional graduate are less than the benefits. The highest benefit–cost ratios are for Talent Development, which is low cost and relatively effective, and for First Things First, which is very effective at raising the graduation rate. These interventions appear relatively cost-effective in part because the lag between their impact and adult outcomes is the shortest. The lowest ratio is for Success for All and for class-size reduction reforms applied across all students. However, even here the benefit–cost ratio exceed 1, such that investments pay for themselves from the perspective of the taxpayer. Also, these reforms are likely to benefit all students, some of whom would have graduated anyway.

These results are unlikely to be overturned by different assumptions (a full sensitivity analysis for this method is reported by Belfield and Levin, 2007). Our calculations are grossly conservative in one respect: they assume that an intervention to increase the number of high school graduates will have zero impact either on students who would have graduated anyway or on students who still fail to graduate. The only benefits that are being counted are those that result from one additional student now

becoming a high school graduate. Yet, it is likely that even those who still fail to graduate will have accumulated some skills, and those that would have graduated anyway will have had their skills reinforced.

6. Policy Considerations

The economic benefits of more education are very strong: individuals, taxpayers, and society all gain substantially. This is the case even for states such as Minnesota where educational standards are already high. However, as we show in Box 1, the list of programs that we are confident will raise graduation rates is not long.

(1) We do not know a lot about what works. Perhaps it is not surprising that so little is known: evaluating educational interventions is far from straightforward. Education provision is a complex activity, involving many stakeholders, each with only partial influence over the children being educated. Overwhelmingly, family background differences determine educational outcomes, with the effects of a particular school or program significantly less important (Rumberger, 2004). Moreover, family background typically overlaps and is confounded statistically with school quality, creating difficulty in separating the influence of the former from the latter. Educational programs have diverse consequences, including the development of cognitive and non-cognitive skills (Heckman et al., 2006), and the relative importance of these skills in determining productivity and income cannot easily be weighed. Isolating causality from a single intervention is therefore challenging. For economic evaluations, complications arise because cost data are often incomplete: accounting data is often confidential; some resources are provided 'in-kind'; and funds are obtained from multiple private and public sources.

(2) The best investments are of course both high yield and inexpensive. Whereas the latter attribute is obvious, the former is typically given less attention. Higher yields will obviously be generated by better targeting of interventions yet fewer interventions are evaluated in terms of how well they target at-risk students (Grissmer, 2002). Moreover, such targeting is not easily performed as there is little guidance on how to identify potential dropouts when they are in elementary school. Also, dropouts are not clustered in single classrooms or schools. Nevertheless, yields will be higher in some

schools than others and some economists have argued for this to be accounted for much more explicitly in educational reforms and policy discussions (Wyckoff, 2006).

(3) It is not a given that it is more efficient to invest early in a child's education rather than late. Elementary school is not 'cheaper' (it is necessary to wait at least a decade for an impact on graduation), but human capital accumulation is 'dynamic': higher level skills cannot be obtained without the foundation of earlier, lower level skills (on investing in young children, see Isaacs, 2007). Interventions in high school to reduce the dropout rate must overcome accumulated deficiencies in academic ability. However, there are effective reforms for high school students, and these too pass a cost–benefit test. Indeed, these reforms may have two advantages: there is not a long lag between the investment and the outcome (graduation); and high school reforms can be more accurately targeted to at-risk students, using prior academic standing to predict the likelihood of dropping out. There are also a set of promising interventions that – if they can be demonstrated as effective – might also pass a benefit–cost test.

(4) Policymakers are not constrained to select just one intervention. It is possible to offer multiple interventions within the context of a wider organizational reform. Indeed, as Carneiro and Heckman (2002a, 159) note, "Marginal improvements in school quality are likely to be ineffective in raising lifetime earnings and more fundamental changes are required if we hope to see a significant improvement in our educational system". Such fundamental change might include several of the above interventions. We recognize that it is very unlikely that a single type of investment will yield significant economic returns in each situation. Some students will be reluctant to participate and the benefits will not apply to all students (Grissmer, 2002). But, fundamental or incremental, it is still necessary to calculate the costs of any reforms and their likely effectiveness.

(5) Costs and benefits of education are not closely linked. Strictly, there are three beneficiaries: the individual, the taxpayer, and the citizen. Each obtains some proportion of the benefits. Yet, the costs are not correspondingly linked to the benefits. Individuals appear to benefit substantially, so much so that it is surprising that the graduation rate is so low. Most likely, it is because individuals place a very high discount rate on future earnings. Taxpayers also reap large benefits, but the federal tax effects are much larger

than the state effects despite the burden of education primarily being put on the state. This distortion may explain why public investments in education appear to be too low.

(6) Finally, our review suggests some areas for prioritizing reforms. Clearly, a lot of educational investment must be spent on teaching personnel, so reforms to the teaching profession should be investigated further. Further investigation should look at what makes teachers more productive (e.g. how absenteeism and turnover rates can be reduced, or how job satisfaction can be enhanced, particularly through improvements in working conditions), as well as how better teachers raise student achievement.

We recognize that there are challenges to ensuring these interventions work in practice.

First, some commentators have argued that the focus should be on reorganization of existing resources to improve the efficiency of the education system. Our results do not prohibit or preclude the search for efficiency gains. However, the source of these efficiency gains has yet to be established: promising reforms such as privatization, inter-district and intra-district competition, or vouchers have yielded very little evidence that they can improve efficiency. Moreover, the quest is not for the most efficient investments, but simply for ones that yield a positive return. Our analysis shows both how much could be spent on interventions and how effective these interventions would need to be before they would yield negative returns.

Second, these interventions would need to be implemented faithfully and would need to be as effective when scaled up. These conditions are not simple to meet, such that raising the graduation rate across the state would be straightforward. Class size reduction policies in California in the 1990s seem to offer a cautionary tale. In 1996 California implemented a class size reduction policy on a large scale, reducing average class size to 20 across 18,000 classrooms in K-3 schools across the state (Bohrnstedt and Stecher, 2002). Initial evaluations of the policy failed to find achievement gains for students in smaller classes. Critically, state funding for reducing class size was far too low (at $930 per child in 2004, in small classes, with a one-time facilities grant of $40,000). This funding amount is considerably below the costs incurred in Project STAR. Clearly, policies cannot be faithfully implemented if they are not allocated adequate funding.

These returns will be significantly influenced by two factors. The first is how fast costs will rise if the intervention is expanded. Based on the benefit–cost ratios, marginal cost will have to be more than double that of average cost for the median intervention (increasing teacher salaries). In the case of "new" interventions, there is also the possibility that costs will decline as teachers and schools implement the reform as part of their training and supervision routines. The second is the extent to which an intervention can be targeted. Throughout we have assumed that the interventions cannot be well targeted. If they can be perfectly or more precisely targeted, then the benefits will exceed the costs by very large amounts.

Notwithstanding the challenges, it is imperative for public policy to ascertain the fiscal and social benefits from high school graduation by determining which interventions work and whether the benefits of providing them exceed their costs. Research needs to include an economic component and the ingredients need to be reported in a consistent framework.

References

Allensworth E. and J.Q. Easton (2007): What matters for staying on-track and graduating from Chicago High School. CCSR (July 2007).

Ballou, D and M Podgursky. 1995. Recruiting smarter teachers. *Journal of Human Resources*, **30**, 326-338.

Barnett, S and C Belfield. 2006. Early childhood development and social mobility. *Future of Children*, **16**, 73-98.

Belfield, C and H Levin. 2002. The effects of competition on educational outcomes: a review of the U.S. evidence. *Review of Educational Research* **27**, 279-341.

Belfield, C and H Levin. 2007. *The Price We Pay*. Brookings Institution Press: Washington, DC.

Blau, D. 1999. The effect of income on child development. *Review of Economics and Statistics*, **81**, 261-276.

Bohrnstedt, G and B Stecher. (Eds.) (2002). *What have we learned about class size reduction in California*? Sacramento: California Department of Education.

Borman, G, Hewes, G, Overman, L and S Brown. 2003. Comprehensive school reform and student achievement: a meta-analysis. *Review of Education Research*, **73**, 125-230.

Borman, GD and GM Hewes. 2002. The long-term effects and cost-effectiveness of Success for All. *Educational Evaluation and Policy Analysis* 24, 243-266.

Borman, GD and NM Dowling. 2006. Longitudinal achievement effects of multiyear summer school: Evidence from the Teach Baltimore randomized field trial. *Educational Evaluation and Policy Analysis* 28, 25-48.

Bozick, R and E Lauff. 2007. *Education Longitudinal Study of 2002: A first look at the initial postsecondary experiences of the sophomore class of 2002*. NCES: Washington, DC.

Carneiro, P and J Heckman. 2002a. Human capital policy. In James Heckman and Alan Krueger, Eds, *Inequality in America. What Role for Human Capital Policies?* MIT Press: Cambridge, MA.

Carneiro, P and J Heckman. 2002b. The evidence on credit constraints in post-secondary schooling. *Economic Journal*, **112**, 705-734.

Clune, W. 2002. Methodological strength and policy usefulness of cost-effectiveness research. In Levin, H and PJ McEwan, Eds, *Cost-Effectiveness Analysis and Educational Policy*. AEFA Yearbook: Eye on Education, Larchmont, NJ.

Constantine, J, Seftor, N, Martin, E, Silva, T, and D Myers. 2006. A study of the effect of the Talent Search program on secondary and postsecondary outcomes in Florida, Indiana, and Texas: Final report from phase II of the national evaluation. Mathematica Policy Research.

Cooper, H, Charlton, K, Valentine, JC, and L Muhlenbruck. 2000. Making the most of summer school: A meta-analytic and narrative review. *Monographs of the Society for Research in Child Development* 65, serial no. 260.

CSRQ. 2006. CSRQ Report on Middle and High School Comprehensive School Reforms. Monograph, www.csrq.org

Cullen, J, Jacob B and S Levitt. 2005. The effect on school choice on student outcomes: Evidence from randomized lotteries. *Journal of Public Economics* 89, 729-760.

Cutler, D, and A Lleras-Muney. 2006. Education and health: evaluating theories and evidence. NBER Working Paper.
Dahl, G and L Lochner. 2005. The effect on family income on child achievement. NBER Working Paper, #11279.
Dee, T and B Jacob. 2006. Do high school exit exams influence high school achievement and labor market performance? NBER Working Paper, #12199.
Duncan, Q, Young, W and J Brooks-Gunn. 1998. How much does childhood poverty affect the life chances of children? *American Sociological Review*, 63, 406-423.
Duncombe, W and J Yinger. 2005. How much more does a disadvantaged student cost? *Economics of Education Review*, **24**, 513-532.
Dynarski, M., Gleason, P., Rangarajan, A., and Wood, R. 1998. I*mpacts of dropout prevention programs: Final report. A research report from the School Dropout Demonstration Assistance Program evaluation.* Princeton, NJ: Mathematica Policy Research, Inc.
Education Trust. 2006. Funding gaps, 2006. http://www2.edtrust.org/NR/rdonlyres/CDEF9403-5A75-437E-93FF-EBF1174181FB/0/FundingGap2006.pdf
Farrington, DP. 2003. Developmental and life-course criminology: Key theoretical and empirical issues. *Criminology*, **41**, 221-246.
Figlio, D and C Rouse. 2006. Do accountability and voucher threats improve low performing schools? *Journal of Public Economics* 90, 239-255.
Finn, J, Gerber S and J Boyd-Zaharias. 2005. Small classes in the early grades, academic achievement, and graduating from high school. *Journal of Educational Psychology* 9, 214-223.
Gándara, P, Larson, K, Mehan, H, and R Rumberger. 1998. Capturing Latino Students in the Academic Pipeline. Berkeley, CA : Chicano/Latino Policy Project.
Grissmer, D. 2002. Cost-effectiveness and cost-benefit analysis: The effect of targetting interventions. In H Levin and P McEwan, Eds, *Cost-Effectiveness Analysis and Educational Policy*. AEFA Yearbook: Eye on Education, Larchmont, NJ.
Hanushek, E and M Raymond. 2005. Does school accountability lead to improved student performance? *Journal of Policy Analysis and Management*, 24, 297-327.
Hanushek, E. 2006. Alternative school policies and the benefits of general cognitive skills. *Economics of Education Review* 25, 447-462.
Heckman, J, Stixrud J and S Urzua. 2006. The effects of cognitive and noncognitive abilities on labor market outcomes and social behavior. NBER Working Paper, w12006.
Isaacs, JB. 2007. Cost-Effective Investments in Children. Brookings Institution, Budget Options Series.
Jeong, D-W. 2007. Issues Involving the Equity and Effectiveness of Advanced Placement Programs in United States High Schools, Unpublished Ph.D. Dissertation, Graduate Faculty of Arts and Sciences, Columbia University.
Kahne, J and K Bailey. 1999. The role of social capital in youth development: The case of *I Have a Dream*. *Educational Evaluation and Policy Analysis*, 21, 321-343.
Kemple, J and J Snipes. 2000. *Career Academies: Impacts on students' engagement and performance in high school.* New York: MDRC Manpower Demonstration Research Corporation.

Kemple, JJ, Herlihy, CM, and TJ Smith. 2005. *Making Progress Toward Graduation*. MDRC, New York.

King, JA. 1994. Meeting the needs of at-risk students: A cost analysis of three models. *Educational Evaluation and Policy Analysis*, **16**, 1-19.

Kuziemko, I. 2006. Using shocks to school enrollment to estimate the effect of school size on student achievement. *Economics of Education Review* 25, 63-75.

Lankford, H, Loeb S and J Wyckoff. 2002. Teacher sorting and the plight of urban schools. *Education Evaluation and Policy Analysis* 24, 37-62.

Lauer, P, Akiba, M, Wilkerson, S, Apthorp, H, Snow, D, and M Martin-Glenn. 2003. The Effectiveness of Out-of-School-Time Strategies in Assisting Low-Achieving Students in Reading and Mathematics: A Research Synthesis. Aurora, COL.

Lee, VE and DT Burkam. 2003. Dropping out of high school: The role of school organization and structure. *American Educational Research Journal*, **40**, 353-393.

Lehr, CA. 2004. Increasing school completion: Learning from research-based practices that work. Research to Practice Brief, www.ncset.org

Levin, H and C Driver. 1997. Costs of an educational voucher system. *Education Economics* 5, 303-311.

Levin, H and PJ McEwan. 2002. *Cost-Effectiveness Analysis and Educational Policy*. AEFA Yearbook: Eye on Education, Larchmont, NJ.

Levin, H, Belfield, C, Muennig, P and C Rouse. 2007. The costs and benefits of an excellent education for America's children. Working paper, www.cbcse.org.

Levin, H. 2001. Waiting for Godot: Cost-effectiveness analysis in education. In Richard Light (Ed.) *Evaluations that Surprise*. Jossey-Bass: San Francisco.

Levin, H. 2002. Issues in designing cost-effectiveness comparisons of whole-school reforms. In Levin, H and PJ McEwan, Eds, *Cost-Effectiveness Analysis and Educational Policy*. AEFA Yearbook: Eye on Education, Larchmont, NJ.

Lillard, DR and PP DeCicca. 2001. Higher standards, more dropouts? Evidence within and across time. Economics of Education Review, **20**, 459-473.

Lochner, L and E Moretti. 2004. The effect of education on crime: Evidence from prison inmates, arrests, and self-reports. *American Economic Review*, **94**, 155-189.

Loeb, S and M Page. 2000. Examining the link between teacher wages and student outcomes: the importance of alternative labor market opportunities and non-pecuniary variation. *The Review of Economics and Statistics* 82, 393-408.

Loeb, S and M Reininger. 2004. *Public Policy and Teacher Labor Markets: What We Know and Why It Matters*. The Education Policy Center at Michigan State University.

Ludwig, J. 2006. The cost of crime: Understanding the financial and human impact of criminal activity. Testimony, US Senate Committee on the Judiciary, September 19 2006.

Ludwig, J and D Phillips. 2007. The benefits and costs of Head Start. NBER Working paper, 12973.

Martinez, M and S Klopott. 2005. The link between high school reform and college access and success for low income minority youth. Washington, DC: American Youth Policy Forum.

Maxwell, N and L Rubin. 2000. *High school career academies: A pathway to educational reform in urban school districts?* Kalamazoo, MI: Upjohn Institute for Employment Research.

McMahon, WW. 2006. Education finance policy: Financing the non-market and social benefits. *Journal of Education Finance*, **32**, 264-284.

Mechur Karp, M, Calcagno, JC, Hughes, KL, Jeong D-W and TR Bailey. 2007. *The Postsecondary Achievement of Participants in Dual Enrollment: An Analysis of Student Outcomes in Two States.* St. Paul, Minnesota: National Research Center for Career and Technical Education, University of Minnesota.

Mervis, J. 2004. Education research – Meager evaluations make it hard to find out what works. *Science* **304**, 1583.

Miller, TR, Cohen, MA, and B Wiersema. 1996. Victim Costs and Consequences: A New Look. National Institute of Justice Research Report, NCJ-155282.

Moore, MA, Boardman, AE, Vining, AR, Weimer, DL and DH Greenberg. 2004. Just give me a number! Practical values for the social discount rate. *Journal of Policy Analysis and Management*, **23**, 789-812.

Neal, D. 1997. The effects of Catholic secondary schooling on educational attainment. *Journal of Labor Economics*, **15**, 98-123.

Neumark, D. 2006. Evaluating program effectiveness: A case study of the School-to-Work Opportunities Act in California. *Economics of Education Review* 25, 315-326.

Pritchett, L. 2006. Does learning to add up add up? The returns to schooling in aggregate data. In E Hanushek and F Welch (Eds). *Handbook of the Economics of Education*. Elsevier: Amsterdam.

Quint, J, Bloom, HS, Rebeck Black, A and L Stephens with TM Akey. 2005. *The Challenge of Scaling Up Educational Reform: Findings and Lessons from First Things First.* New York: Manpower Development Research Corporation.

Rank, MR and TA Hirschl. 2005. Likelihood of using food stamps during the adulthood years. *Journal of Nutrition and Behavior*, **37**, 137-146.

Rivkin, S, Hanushek E and J Kain. 2005. Teachers, schools, and student achievement. *Econometrica* 73, 417-458.

Rouse, CE. 2007. The effect of education on earnings. In Belfield, C and H Levin (Eds.) *The Price We Pay*. Brookings Institution Press: Washington, DC.

Rumberger, R. 2004. Why students drop out of school. In *Dropouts in America*. G Orfield (Ed). Harvard Education Press: Cambridge, MA.

Rumberger, RW and KA Larson. 1998. Student mobility and the increased risk of high school dropout. *American Journal of Education*, **107**, 1-35.

Schneider, B and D Stevenson. 1999. *The Ambitious Generation: America's Teenagers, Motivated but Directionless*. New Haven, CT: Yale University Press.

Seastrom, M et al. 2006. *User's Guide to Computing High School Graduation Rates, Volume 2: Technical Evaluation of Proxy Graduation Indicators* (NCES 2006-605). US Department of Education, NCES, Washington DC.

Sinclair, M, Christenson, S and M Thurlow. 2005. Promoting school completion of urban secondary youth with emotional or behavioral disabilities. *Exceptional Children, 71*, 465–482.

Snipes, JC, Holton GI, Doolittle, F and L Sztejnberg. 2006. Striving for Student Success. The Effect of Project GRAD on High School Student Outcomes in Three Urban School Districts. MDRC Report.

Taylor, BA, Dearing, E and K McCartney. 2004. Incomes and outcomes in early childhood. *Journal of Human Resources* 39, 980-1007.

Taylor, LL and W Fowler. 2006. A Comparable Wage Approach to Geographic Cost Adjustment. EFSC, NCES: Washington, DC.

Temple, J, Reynolds A and S Ou. 2003. Grade retention and school dropout: Another look at the evidence. In Walberg, HJ, Reynolds, AJ, and MC Wang, Eds,. *Can Unlike Students Learn Together?: Grade Retention, Tracking, and Grouping.* Greenwich, CT: Information Age.

Waldfogel, J, Garfinkel, I and B Kelly. 2005. Public assistance programs: How much could be saved with improved education? Working paper for Education Symposium, Teachers College, Columbia University.

Watt, K, Powell, CA, Mendiola, ID and G Cossio. 2006. School-wide impact and AVID: How have selected high schools addressed the new accountability measures? *Journal of Education for Students Placed at Risk*, **11**, 57-73.

Wayne, AJ and P Youngs. 2003. Teacher characteristics and student achievement gains: A review. *Review of Educational Research* 73, 89-122.

Wolfe, B and N Tefft. 2004. Child interventions that may lead to increased economic growth. Working paper, Pew Charitable Trusts.

WWC. 2006. Dropout prevention. Topic 6, www.whatworks.ed.gov

Wyckoff, J. 2006. The imperative of 480 schools. *Education Finance and Policy* 1, 279-287.

Zimmer, R and R Buddin. 2005. Charter school performance in urban districts. Are they closing the gap? RAND Study, www.rand.org

Zvoch, K. 2006. Freshman year dropouts: Interactions between students and school characteristics and student dropout status. *Journal of Education for Students Placed At Risk* **11**, 97-117.

Table 1
Lifetime Economic Benefits for Minnesota for each new high school graduate

	Average	Male	Female
Earnings gain (Y)	$475,900	$550,400	$364,600
Additional tax payments (T)	$167,000	$200,900	$116,400
Government health savings (H)	$48,900	$43,900	$56,500
Government crime savings ©	$31,800	$46,600	$9,800
Government welfare savings (W)	$4,100	$2,200	$6,900
Total fiscal benefit (F)	$251,900	$293,600	$189,700
Social benefits (S)	$1,059,500	$1,236,000	$795,600

Notes: Dollar figures for 2005, adjusted for Minnesota prices, expressed as present values for a person aged 20. Total fiscal benefit F = T+H+C+W. Total social benefit S = Y+1.37*(Y-T)+3.5C+H. Discount rate of 3.5% applied. Figures rounded to nearest $100.

Table 2
Determinants of dropout status

	Full sample	Male			Female		
		White	Black	Hispanic	White	Black	Hispanic
SES index	-0.299	-0.343	-0.406	-0.127	-0.277	-0.424	-0.313
	(0.026)*	(0.045)*	(0.108)*	(0.093)	(0.044)*	(0.101)*	(0.090)*
Reading score							
(8^{th} grade, SD=8)	-0.010	-0.004	-0.051	-0.015	-0.004	-0.032	-0.027
	(0.003)*	(0.004)	(0.014)*	(0.011)	(0.004)	(0.012)*	(0.010)*
Math score							
(8^{th} grade, SD=12)	-0.034	-0.033	-0.014	-0.043	-0.037	-0.036	-0.028
	(0.002)*	(0.003)*	(0.011)	0.009*	(0.004)*	(0.011)*	(0.008)*
Observations	*13263*	*4945*	*631*	*820*	*5194*	*748*	*925*

Source: National Educational Longitudinal Survey, 1988-1994.
Notes: Logit models for dropout status (1,0). Each equation includes dummy variables for free-school lunch populations, minority status, public school, urban school, and whether the school is dangerous or disruptive. The equation in column 1 also includes race and gender dummy variables. Standard errors in parentheses. * significant at 1%.

Table 3
Determinants of dropout status by achievement quartiles

	Full sample	Sample split by 8th grade reading achievement quartiles			
		First quartile (lowest)	Second quartile	Third quartile	Fourth quartile (highest)
SES index	-0.299	-0.301	-0.273	-0.356	-0.299
	(0.026)*	(0.043)***	(0.049)***	(0.059)***	(0.073)***
Reading score (8th grade, SD=8)	-0.010	-0.024	-0.035	-0.017	0.013
	(0.003)*	(0.011)**	(0.015)**	(0.016)	(0.014)
Math score (8th grade, SD=12)	-0.034	-0.049	-0.035	-0.029	-0.025
	(0.002)*	(0.005)***	(0.004)***	(0.004)***	(0.005)***
Mean dropout rate	15.2%	26.4%	15.7%	8.7%	4.2%
Observations	*13263*	*3326*	*3305*	*3315*	*3305*
	Full sample	**Sample split by 8th grade math achievement quartiles**			
		First quartile (lowest)	**Second quartile**	**Third quartile**	**Fourth quartile (highest)**
SES index	-0.299	-0.248	-0.358	-0.373	-0.233
	(0.026)*	(0.041)***	(0.048)***	(0.060)***	(0.083)***
Reading score (8th grade, SD=8)	-0.010	-0.028	-0.003	-0.005	0.002
	(0.003)*	(0.005)***	(0.004)	(0.005)	(0.007)
Math score (8th grade, SD=12)	-0.034	-0.054	-0.041	-0.013	-0.019
	(0.002)*	(0.011)***	(0.012)***	(0.012)	(0.010)*
Mean dropout rate	15.2%	28.9%	16.2%	7.4%	2.6%
Observations	*13263*	*3316*	*3292*	*3324*	*3321*

Source: National Educational Longitudinal Survey, 1988-1994.
Notes: Logit models for dropout status (1,0). Each equation includes dummy variables for sex, race, free-school lunch populations, minority status, public school, urban school, and whether the school is dangerous or disruptive. Standard errors in parentheses. * significant at 1%.

Table 4
Interventions to raise the high school graduation rate

		Unit costs per student	Extra high school graduates per 100 students	Costs per additional graduate
TSI	**Increasing teacher salaries** by 10% for the K-12 years	$2,850	5	$56,850
CSR – population	**Reducing class sizes** in elementary school across all students (Project STAR)	$12,840	11	$116,720
CSR – free lunch eligible	**Reducing class sizes** in elementary school for free lunch eligible students only (Project STAR)	$12,840	18	$71,330
SFA	**Success for All** Elementary school reform	$3,842	4	$96,050
FTF	**First Things First** High school reform (small learning communities)	$5,440	16	$33,680
TD	**Talent Development** High school reform with new 9th grade curriculum and career academy model	$2,790	8	$34,850
C&C	**Check & Connect** High school mentoring and monitoring program	$8,150	17	$47,930
ALAS	**Achievement for Latinos through Academic Success** High school program monitoring behavior and academic success	$3,940	5	$78,860

Notes: Costs are expressed as present values for a student at age 20. Unit costs are net of savings for special education and grade retention. Costs per additional graduate do not include the additional costs of providing K-12 schooling and college to new high school graduates. These costs are accounted for in the net benefits.

Table 5
Benefit–cost ratios for interventions to raise the graduation rate

	Fiscal benefits per graduate [B]	Costs per additional graduate [C]	B/C
TSI	$228,630	$56,850	4.01
CSR – population	$228,630	$116,720	1.96
CSR – free lunch eligible	$228,630	$71,330	3.21
SFA	$228,630	$96,050	2.38
FTF	$228,630	$33,680	6.72
TD	$228,630	$34,850	6.56
C&C	$228,630	$47,930	4.77
ALAS	$228,630	$78,860	2.90

Notes: Fiscal benefits per graduate are taken from Table 1, adjusted for additional government payments for school and college. Costs per additional graduate are taken from Table 4.

Box 1
What Works for Raising Attainment?

Programs with demonstrated effectiveness and known cost ingredients	Effective programs that may pass a cost-benefit test if cost ingredients can be determined	Areas of reform where more knowledge is critically needed	Reforms where economic evaluations are complex
Increasing teacher salaries by 10% for the K-12 years	Mentoring programs (12 Together, I Have a Dream)	Specific programs (AVID, Project GRAD, KIPPS academies, ISA model)	Privatization
Reducing class size in elementary school (Project STAR)	College readiness programs (CAP, TEACH, Talent Search)	Teacher quality	School size reforms
First Things First high school reform	Employment readiness programs (Career Academies)	Family interventions	Raising standards
Success for All	Extended hours programs (After-school, summer school)		Raising family incomes
Talent Development			
Check & Connect			
ALAS			
Pre-school programs			