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CLIVE R. BELFIELD, Queens College, CUNY



**Centro de Estudios Puertorriqueños
Hunter College (CUNY)**

695 Park Avenue, Room E-1429
New York, New York 10065

212.772.5686

www.centropr.org

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CLIVE R. BELFIELD

belfield@qc.edu

Queens College, City University of New York

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INDIVIDUALS WHO DROPOUT OF SCHOOL have on average significantly lower economic well-being over their lifetime; they also report lower health status, more criminal activity, and greater reliance on welfare. This is true for Puerto Ricans living in the United States (as for all subgroups of the population). Based on direct analysis of the National Latino Survey (2006) and the National Latino and Asian American Survey (2003), high school graduation is strongly correlated with both income and health status for Puerto Ricans in the U.S. Yet, over one-quarter of these Puerto Rican adults have not completed high school; and in 2008, 20,600 individuals will leave school without graduating. These individuals are risking their economic future, and taxpayers and communities face a larger economic burden. Using a wide range of social science evidence, this paper calculates the economic consequences of inadequate education for Puerto Ricans in the U.S.

Expressed in present values at age 20, the monetary estimates of dropping out of high school are very high. For example: gross lifetime incomes are lower by \$316,140; income tax payments are lower by \$69,130; government expenditures on health are higher by \$45,880; and spending on the criminal justice system is higher by \$25,850. In total, each new Puerto Rican high school graduate benefits the taxpayer by \$111,390. If the high school graduation rate of Puerto Ricans was equal to the national rate, the aggregate present value fiscal surplus for each graduating class would be \$765 million.

The costs are even larger from a social perspective. This perspective includes the fiscal impacts, the private earnings gains, the costs on the community of crime, the social value of health, and the externalities from having a more productive workforce. In total, each new Puerto Rican high school graduate generates a present value social benefit of \$597,960. Raising the graduation rate to the national norm would yield a social surplus of \$4,106 million. Given the residential clustering of Puerto Ricans in the U.S., these costs are heaviest in selected states; the analysis reports separate costs for New York, New Jersey, Connecticut, Florida, Pennsylvania, Illinois, and Massachusetts.

These costs are sufficiently high to motivate an intensive search for effective educational interventions or reforms in K-12 schooling. Possible reforms may include: early education; increased teacher salaries; smaller schools; elementary school reforms that emphasize reading; and high school mentoring programs.

INTRODUCTION

A wealth of social science evidence documents the importance of educational attainment and achievement for enhancing adult well-being. On average, individuals who graduate from high school will earn significantly more than dropouts, and those who go to college will earn more than high school graduates. Persons with more education report better health status (as do their children), and they are less likely to be involved in the welfare system or the criminal justice system. These private benefits yield fiscal and social benefits: tax revenues are higher and government expenditures are lower; and economic growth is boosted (Belfield and Levin, 2007).

This evidence applies to all groups in society, but the imperative to invest in more education is particularly compelling for groups where absolute education levels are low. The focus here is on raising the rate of high school graduation for Puerto Ricans in the U.S. We focus on Puerto Ricans because they represent a large subgroup of the Hispanic American population. Also, they are relatively young: according to the American Community Survey 2006 data, one-third are still in school; and so their importance in

the U.S. labor market will grow over future decades (Tienda and Alon, 2007). Finally, many Puerto Ricans come from families with low incomes and where English is not the first language; these attributes are often barriers to educational success. We focus on high school graduation because it is integral to ensuring students are ready for the labor market or for college; and because K-12 education is the most important public investment for promoting equitable opportunities for all citizens.

This investigation is structured as follows. Section 2 briefly describes education levels of Puerto Ricans, highlighting key aspects that motivate our subsequent analysis. Section 3 reports on the consequences of high school graduation on adult outcomes. Section 4 reports on the economic benefits of high school graduation; these benefits are calculated per student, for the national population, and, because of the demographic clustering of Puerto Ricans in the U.S., for seven selected states.¹ They are derived from the perspectives of private individuals, fiscal agencies (state/local governments), and local communities. Where available, data and research on Puerto Ricans are applied for each element of the analysis. However, we note at the outset that data for Puerto Ricans specifically is often not available, either because this ethnic status information is missing or because sample sizes are too small. Where specific data is unavailable, rates across all Hispanics are applied. Although this substitution is not ideal, using the Hispanic national average as a proxy may partially compensate for two characteristics: immigrant status; and the higher likelihood that English is not the first language. Our final contribution is to draw general policy conclusions about optimal strategies for investment in K-12 education for Puerto Ricans.

EDUCATION LEVELS OF PUERTO RICANS IN THE U.S.

Generally, the Hispanic population has lower attainment and higher school failure rates than the national average. As described by Lutz (2007), these educational disparities reflect many diverse factors, but one partial explanation is access to early education. Hispanic children enroll in preschool programs at relatively low rates: nationally, 60% of non-poor and 47% of poor children enroll, but the rates for Hispanic children are 48% and 36% respectively (KewalRamani et al., 2007, Table 6). Overall, only 40% of Hispanic children aged 3–6 enroll in some form of early education; this compares to 62% for white children and 67% for black children (data from the 2007 National Household Education Survey, O'Donnell, 2008). These initial disparities are then magnified during later childhood and youth. NAEP data on reading in fourth grade shows 32% of Hispanic students below basic compared to 20% of the national population; by eighth grade the disparity is 17 percentage points (KewalRamani et al., 2007).

A second consideration is the quality of education received by Hispanic students.² As reviewed by Fry (2005), Hispanic students attend larger public high schools: compared to black students, they are twice as likely to be in a large public high school (enrollment exceeding 1,838). Also, Hispanic students are more likely to be in schools with higher student-teacher ratios. Both of these characteristics are associated with low school productivity and so both are likely to contribute to poor academic outcomes.

However, the Puerto Rican population is even more disadvantaged when the most important factor for educational success — family background — is considered. Whereas 28% of Puerto Rican families in the U.S. live at income levels below the poverty rate, the Hispanic average is 26% and the national average 16% (KewalRamani et al., 2007, Table 4b). A similar pattern was found in the

TABLE 1. Educational Attainment: Puerto Ricans in the U.S.

	PERCENTAGE AGED 25+	HIGH SCHOOL CLASS OF 2008
High school dropout	28%	20,600
High school graduate	31%	23,200
Some college	26%	18,900
Completed college +	15%	10,900
Total	2,250,400	73,600

Source: American Community Survey (2006)

1990 Census by Hirschman (2001): across all Hispanic immigrant groups, Puerto Ricans had the highest poverty rate and the second highest dropout rate amongst young adults. Also, De Jesús and Vasquez (2005) do not find any evidence that the education status of the lowest-achieving Hispanic population has improved much since the 1990s. The college-going rate has risen somewhat, but mainly because of additional enrollments by Dominican Americans as opposed to Puerto Ricans (Hernández and Rivera-Batiz, 2003).

Table 1 shows the educational attainment of Puerto Ricans in the U.S. aged 25 or over. Of these 2.25 million adults, over one quarter have not graduated from high school (the national dropout rate is closer to 20%, Seastrom et al., 2006). Almost 15% have completed a college degree, but this is somewhat lower than the national average across all Hispanic groups and much below the national average. For this economic analysis, the focus is on the 2008 high school class, i.e. the cohort either entering the labor market or progressing to college. Across the U.S. this cohort is 73,600 Puerto Ricans; based on these data, 20,600 will not graduate, 23,200 will complete high school, 18,900 will attend college but not complete, and 10,900 will complete a college degree. At issue are the lost economic opportunities from having such a large number of high school dropouts.

This focus on the economic benefits of high school graduation (rather than, say, raising test scores) is motivated by several factors. First, large numbers of students do not graduate; in absolute terms there are likely to be significant economic consequences. Second, high school graduation is generally regarded as a pre-condition for independent economic well-being; and it is necessary for enrollment in college and further training. Third, dropping out is associated with greater relative adversities. That is, dropping out relative to graduating raises the probability of incarceration much more than completing college relative to not completing college; reducing the number of dropouts is therefore a more potent crime reduction strategy than raising the college completion rate. Finally, this focus may be motivated by equity considerations: rather than invest in high-yield government projects, public policy should aim to provide a baseline opportunity for all citizens.

One of the consequences of failing to graduate from high school is that higher education and training opportunities are foreclosed. Therefore, it is more accurate to calculate the economic costs per 'expected' high school graduate, taking into account the probability that a graduate will attend and possibly complete college. These probabilities can be inferred from the distribution of attainment from the American Community Survey (2006 data): conditional on high school completion, 36% attend college and another 21% complete college (with the remaining 43% not enrolling in any further education).³ However, these are probabilities across all students and those on the margin of high school graduation are unlikely to have the same propensity to go to college (Martinez and Klopott, 2005). An alternative is to model probabilities based on the college progression and completion rates for Hispanic students

nationally, but using the lowest socioeconomic status quartile of high school graduates. Based on the 1988 National Educational Longitudinal Survey and the 1996 Beginning Postsecondary Survey, Belfield and Levin (2007) calculate the following transition rates: conditional on high school graduation, 15% attend but do not complete college, and 11% complete college (with the remainder not enrolling in any further education). These lower progression rates are used to create an ‘expected high school graduate’ (in effect, applying weights across life outcomes of 0.74 for high school graduates, 0.15 for those with some college, and 0.11 for college graduates). This concept of an expected high school graduate is used throughout to calculate the costs of inadequate education.

THE ECONOMIC BENEFITS OF EDUCATION

Methodology

The method of calculating the lifetime economic benefits of high school graduation is formalized in Belfield and Levin (2007). **Box 1** summarizes this framework. First, the causal impacts of high school graduation on adult outcomes (such as labor market activities) must be identified. Second, these impacts must be translated into monetary benefits using a consistent accounting framework over the lifetime (up to age 65). Set against these benefits are the additional costs of staying in school to graduate (as well as college costs). Separate streams of benefits and costs are calculated from the perspective of the private individual, the taxpayer or fiscal agency, and society (which includes all beneficiaries net of transfers).

The impacts of education have been identified across a large amount of social science evidence. The primary beneficiary of education is of course the individual who experiences higher income, wealth, and improved health status, as well as a set of intra-household benefits. For income, the effect is assumed to be a direct skill effect (and not a signaling effect where employers simply interpret education as a sign that a person is innately more productive). The wealth effect may arise because educated persons have higher returns on financial assets or can better avoid poverty and debt.⁴ Health gains may arise in part because of higher incomes, but there is also a direct knowledge effect

BOX 1. Benefits from Education Across Different Perspectives

PERSPECTIVE	BENEFITS FROM EDUCATION
P Private individual	(1) Gain in net earnings and wealth + (2) Improved health status / life expectancy + (3) Household productivity gains - (4) Fees for education
F Fiscal or government (state/local and federal/central)	(5) Increased tax payments + (6) Lower reliance on government health programs + (7) Reduced expenditures on criminal justice + (8) Lower reliance on welfare - (9) Subsidy for education
S Social	Private individual benefits + Fiscal benefits + (10) Productivity externalities + (11) Gains from reduced crime + (12) Social value of health -(13) Net of transfers

(e.g. on disease etiology).⁵ Also, maternal education raises child health by improving the productivity of health inputs and by reducing the costs of gathering information about healthy behaviors.⁶ Finally, individuals gain from education through intra-household productivity gains, such as more efficient household management and better care of children and their health. Offsetting these private advantages from education are the costs. These costs have two main components: the opportunity cost of not working and the direct cost of fees for education.

A second beneficiary of education is the government (taxpayer). As education boosts incomes it increases tax payments and reduces reliance on government health, welfare, and other social support programs. As education reduces criminal activity taxpayers save on criminal justice system expenditures. However, taxpayers also subsidize education.

Finally, it is useful to consider the social impacts. A social perspective values all the benefits of education regardless of who benefits. So, it includes the private benefits and the fiscal benefits (excluding transfers) and counts all the costs of education, both private fees and public subsidies. In addition, a social perspective would count the gains to all citizens when crime rates are lower; these gains include savings from being a victim of crime and reduced costs of crime avoidance. The social perspective also counts productivity externalities, i.e. improvements in economic competitiveness that arise when the workforce has more human capital. Lastly, the social perspective also counts the social value of health, i.e. the economic benefits from reductions in infectious diseases or epidemics (such as HIV/AIDS).

The calculations are performed for Puerto Ricans, using national datasets (and, as noted above, information on Hispanic populations where more finely disaggregated data are unavailable). All the economic benefits are expressed in present values for an 'expected high school graduate' at age 20 in 2008 dollars. Present values are calculated using a discount rate of 3.5% (recommended by Moore et al., 2004). The primary focus is on the fiscal consequences to see what is being lost by taxpayers as a result of low attainment levels. If there are strong private returns, this suggests either lack of information by families or, more likely, that families cannot borrow to fund the optimal level of education. Social returns are useful if a broader community perspective is adopted; for example, most crime victims are the same race as the perpetrators, so reducing crime by Puerto Ricans will also significantly benefit the local Puerto Rican community.

Methodological Challenges

This economic method has several advantages, not least in terms of conceptual simplicity, for formulating educational policies. It illuminates the relative importance of education across the domains of life. It relates directly to how decisions about educational investments should be made, both by individuals and by government agencies. Perhaps most important is the utility in comparing the economic consequences of school failure with the burden of funding for education. Clearly, determination of the burden of funding for education is a key policy issue, and this burden should in part reflect the benefits principle, i.e. agencies should fund education to the extent to which they benefit from it. This analysis helps shed light on the optimal burden between public agencies and private fees.

However, there are several methodological challenges to undertaking such work. First, most social science research applies controlled observational methods which do not establish causality. However, at least for the education-earnings relationship, there is sufficient evidence to conclude that correlation studies do approximate well with the

causal impact (see the discussion in Rouse, 2007). Given the importance of income on other domains (e.g. health), it is plausible to identify the other benefits as a function of gains in income.

Second, it is important to fully account for the costs and benefits of education. Internationally, there is some evidence of education's influence on: intra-family behaviors (such as child-rearing); compliance with environmental regulations; family formation and household size; intergenerational influences; life expectancy; and civic order.⁷ Yet, for each of these there is either no sufficiently accurate way to calculate benefits or no consensus that the benefits are genuine. For some benefits, the challenge is finding accurate costs data. For example, it is necessary to place an economic value on gains in health or reductions in crime, but these do not usually have observable prices.⁸ Often it is necessary to rely on government budgetary spending as an indicator of the economic consequences of poor health status or high crime. Typically, information is only available on average cost even though marginal cost is the more relevant value.⁹ In terms of the cost consequences, the largest data uncertainty relates to government financing and fiscal implications of education. Although there is information on government expenditures, there is limited information on who bears the tax burden and on whether marginal and average tax rates differ significantly.

Third, if the supply of high school graduates goes up, then their wages will go down and this will lower the returns to graduation. However, these general equilibrium effects may not be strong. Educational changes take a long time to permeate the labor market (as some students go to college) and even then the new entrants are a flow being added to a very large stock (of about 30 times the size). Moreover, education increases mobility, such that new graduates may move to alternative labor markets to get jobs. Finally, intensive investigation for the U.S. has found that demand-side changes significantly offset labor supply changes (Goldin and Katz, 2007). These demand-side changes (sometimes referred to as skill-biased technical change) dominate the supply-side changes, such that the income benefits from graduation have risen even as overall education levels have gone up. The long run correlation between aggregate skills and wages is therefore unclear and any fall in wage returns is likely to be small.¹⁰

Finally, time on activities besides work may not be precisely valued. For youth, time in school may have a high opportunity cost, particularly for families below the poverty line. Many children are not in school because they must work or help with housework to support the family. However, child labor is either illegal, compromises child development, or is not monetarily compensated. Here, the assumption is that child time out of school has no opportunity cost. For families, household work is not monetarily compensated; no income is earned and so no tax paid. The assumption here is that education is equally beneficial in non-market settings as it is in the labor market. That is, education changes the opportunity cost of working versus not working so that college-educated non-workers must get equivalent benefits to those of college-educated workers.

In summary, the costs of school failure are only approximated. However, our assumptions are conservative, such that the estimates reported below are likely to be understatements rather than overstatements. Specifically, we do not count the impacts of education on juvenile crime; on intra-family interactions (e.g. child health); wealth accumulation; or the deadweight loss in collecting taxes. Also, the rate of college progression is assumed to follow that of the lowest quartile of socioeconomic status. The main concern regarding overstatement is if there is a fall in wages as more graduates enter the labor market; yet any significant fall would run counter to historical trends over the last six decades.

TABLE 2. Determinants of Wages: Puerto Rican U.S. Adults

	(1) EMPLOYMENT PARTICIPATION EQUATION	(2) WAGE EQUATION (LOG INCOME)
<i>Relative to high school dropout:</i>		
High school graduate	0.207 (0.264)	0.426 (0.154)***
College	0.155 (0.291)	0.781 (0.170)***
BA degree or higher	0.609 (0.318)*	1.087 (0.176)***
Male	0.065 (0.231)	-0.042 (0.119)
Married	0.348 (0.231)	0.594 (0.132)***
Age	-0.013 (0.008)*	0.003 (0.029)
Age squared		-0.000 (0.000)
Black		0.269 (0.224)
<i>Relative to residents in West:</i>		
North east		-0.360 (0.235)
North central		-0.389 (0.294)
South		-0.378 (0.260)
Observations	218	218

Source: National Survey of Latinos, 2006, Pew Hispanic Center.

Notes: Standard errors in parentheses. Constant term also included. Non-zero wages observed for 182 observations. * significant at 10%; ** significant at 5%; *** significant at 1%.

CALCULATING THE BENEFITS OF EDUCATION

Fiscal Benefits of High School Graduation

Four fiscal benefits are counted: additional taxes paid and lower expenditures on health, crime, and welfare. Offsetting these benefits are the additional costs when students stay in school and attend public colleges. Each of these effects are calculated in present values for a person aged 20.

The education-earnings relationship is one of the most intensively tested relationships in economics. **Table 2** shows the impact on Puerto Rican’s wages of various characteristics, including education. The data are from the 2006 National Survey of Latinos, conducted by the Pew Hispanic Center.¹¹ The full dataset includes responses from 2,000 adult Latinos across the U.S., but our focus is on the 218 respondents who identified themselves as Puerto Ricans. For these individuals a wage equation is

TABLE 3. Present Value Lifetime Incomes and Tax Payments by Education Level

	LIFETIME INCOMES	FEDERAL TAXES PAID	STATE/LOCAL TAXES PAID
High school dropout	\$396,300	\$41,610	\$15,890
High school graduate	\$631,960	\$71,410	\$28,440
Some college	\$846,110	\$97,300	\$42,310
Completed college +	\$1,071,590	\$139,310	\$58,940
Surplus: Expected high school graduate — High school dropout	\$316,140	\$41,150	\$17,980

Notes: : Earnings data from American Community Survey (2006) for Hispanic males and females, adjusted for employment probabilities, employment benefits, and inflation (www.census.gov). Basic earnings data for Puerto Rican adults is not available, but education earnings premiums for Puerto Ricans are derived from Table 2. Zero productivity growth assumed. Present values expressed at age 20 with a discount rate of 3.5%. Expected high school graduate adjusts for college enrollment and completion probabilities. Federal tax payments calculated from IRS 2005 data [www.irs.gov/pub/irs-soi/05in11si.xls] based on incomes by education level yields rates as a proportion of AGI at: 0.105 (dropouts); 0.113 (graduates); 0.115 (some college); and 0.13 (college graduation). State tax payments calculated as national averages from TAXSIM NBER version 8, with 5% weighting for property taxes.

estimated, with a Heckman correction for participation in the labor market. We compare patterns for high school graduates, those with some college, and college completers relative to those for high school dropouts. Column (1) shows the participation equation: there is a slightly positive effect on employment rates by education levels, but the standard errors are high so statistical significance is only obtained for those individuals with the highest levels of education. Labor market participation rates are so high that this result is not surprising. Nevertheless, the results in column (2) show a very large difference in earnings across education levels. The coefficients are interpretable as percentages: relative to a high school dropout, a high school graduate earns 43% more, a person with some college earns 78% more, and a college graduate earns 109% more on an annual basis. These differences take account of sex and age, as well as skin color designation. They also control for location of residence, although the only distinction here is that Puerto Ricans living in the West earn approximately 38% more than residents elsewhere in the U.S.

Importantly, this method accurately approximates to a causal difference in wages (for a full justification, see Rouse, 2007). In fact, the economic advantage for a person with more education is likely to be even larger than shown in Table 2: this dataset does not contain information on employment benefits, such as pensions and health plans, and these are much more common for highly skilled workers.¹² These earnings gaps by education level therefore show a very large cost from failing to ensure that adults have graduated from high school.

Average full-time incomes for Puerto Ricans in 2006 were \$44,700 for males and \$36,000 for females; median household incomes were \$35,900 (data from the Census). Adjusting for employment probabilities and benefits, inflation, and for the earnings premiums estimated in Table 2, the lifetime present value earnings at age 20 across the four education levels are calculated. As reported in **Table 3**, high school dropouts are expected to earn just under \$400,000, considerably below those with more education. At the highest end, a Puerto Rican at age 20 who completes college is predicted to earn almost \$1.1 million over the lifetime. The final row reports the surplus from each expected high school graduate over a dropout; this estimate of the lost earnings from school failure is \$316,140.

TABLE 4. Health Status and Smoking Prevalence by Education Level: Puerto Rican U.S. Adults

	(1) POOR/FAIR PHYSICAL HEALTH	(2) POOR/FAIR MENTAL HEALTH	(3) SMOKER	(4) SELF-EFFICACY
Dropout	54%	66%	37%	64%
High school graduate	26%	25%	29%	78%
College	15%	8%	24%	81%
BA degree or higher	4%	2%	10%	86%
Observations	495	495	495	218

Source: National Survey of Latinos, 2006, Pew Hispanic Center.

Notes: Standard errors in parentheses. Constant term also included. Non-zero wages observed for 182 observations. * significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE 5. Determinants of Health Status and Smoking Prevalence: Puerto Rican U.S. Adults

	(1) POOR/FAIR PHYSICAL HEALTH	(2) POOR/FAIR MENTAL HEALTH	(3) SMOKER
Relative to high school dropout:			
High school graduate	-0.395 (0.266)	-0.474 (0.341)	-0.176 (0.242)
College	-0.847 (0.307)***	-1.457 (0.510)***	-0.299 (0.257)
BA degree or higher	-1.625 (0.491)***	-2.271 (1.045)**	-0.618 (0.328)*
Female	0.413 (0.226)*	0.518 (0.309)*	-0.637 (0.189)***
Age	0.040 (0.007)***	0.022 (0.008)**	-0.001 (0.006)
Household income	-0.000 (0.000)***	-0.000 (0.000)***	-0.000 (0.000)
Observations	495	495	495

Source: National Latino and Asian American Survey, 2003.

Notes: Standard errors in parentheses. Constant term also included. * significant at 10%; ** significant at 5%; *** significant at 1%.

These income differences translate into differences in tax payments. Federal tax payments across income levels are taken from IRS tables; and state tax payments are calculated using the NBER TAXSIM program (see notes to Table 3). As shown in columns 2 and 3 of Table 3, higher earners pay more taxes: over the lifetime, an expected high school graduate is anticipated to pay \$41,150 more in federal taxes and \$17,980 more in state taxes.

The health-education link has also been comprehensively tested. Cutler and Lleras-Muney (2006) report on over 30 separate measures of health, controlling for background characteristics, and find more education is strongly and negatively associated with almost all conditions (e.g. heart conditions, strokes, high cholesterol, depression, and

diabetes, but not cancer) and behaviors (e.g. smoking). Specific health survey data also show an association between low education levels and poor health behaviors for Puerto Ricans. In their study for East Harlem in New York City, Robles et al. (2006) find that 58% (75%) of male (female) drug users were not high school graduates.

For Puerto Ricans, health gaps by education are clear. The correlation is estimated using the subsample of 495 Puerto Ricans from the National Latino and Asian American Survey (2003), which is a component of the National Survey of American Life. **Table 4** shows the cross-tabulations by education level for three conditions: self-reports of physical and mental health status; and smoking prevalence. Whereas 54% of dropouts are in poor or fair physical health, only 26% of high school graduates are, and only 4% of college graduates. Whereas 66% of dropouts report being in poor or fair mental health, only 25% of graduates do, and only 2% of college graduates. Smoking rates show a similar correlation: more than one-in-three dropouts smoke, compared to one-in-ten college graduates. Finally, the only available measure from the National Survey of Latinos is information about self-efficacy. Specifically, individuals are asked whether they agree or disagree with the statement 'It doesn't do any good to plan for the future because you don't have control over it'. Among dropouts, 64% disagree. However, disagreement is much higher for high school graduates (78%), persons with some college education (81%), and college graduates (86%).

The strong associations for health status and smoking hold after controlling for sex, age, and family income. **Table 5** shows the strongly negative impact of greater education on each of these three indicators of health status, controlling for personal characteristics.

From the fiscal perspective, persons with better health status are less likely to use public programs such as Medicaid and disability-related Medicare (and they typically have jobs that provide health insurance). Moreover, because Medicaid eligibility is means-tested, higher incomes reduce government health spending automatically. For the national Hispanic population, early health care is much less available than for the rest of the population: in 21% of Hispanic families the children are uninsured, compared to 12% for black families and 9% for white families. Yet, household head education does have an important role in significantly reducing these gaps between whites and Hispanics (Pylypchuk and Selden, 2008); families with more education are much more likely to have private health insurance.

The fiscal cost of poor health amongst Puerto Ricans is derived from calculations by Muennig (2007) applied across all Hispanic populations in the U.S. (as data on Puerto Rican families is not available). Educational attainment strongly predicts enrollment in Medicaid and Medicare (on overall health status for Latino populations, see Acevedo et al., 2007). For Medicaid, whereas 20%/36% of male/female dropouts are enrolled, the respective figures are: 7%/13% for high school graduates; 4%/8% for those with some college; and 1%/2% for college graduates. For Medicare, 8%/6% of dropouts are enrolled, compared to: 4%/3% for high school graduates and college enrollees; and 1% for all college graduates. Based on Muennig's calculations from the Medical Expenditure Panel Survey (2004), it is possible to calculate the lifetime present value savings per expected high school graduate. Over the lifetime, government spending on health care amounts to \$69,630 per dropout; the figures are considerably lower for graduates and for persons who complete college. Accounting for college progression, the fiscal surplus for government health care spending per expected high school graduate is \$45,880.

Criminal activity is a third domain where education plays an important role (Farrington, 2003; Lochner and Moretti, 2004). Across the national Hispanic

TABLE 6. Present Value Lifetime Fiscal Surplus Per Expected High School Graduate Over Dropout

	PRESENT VALUE SURPLUS AT AGE 20 PUERTO RICANS IN THE U.S. EXPECTED HIGH SCHOOL GRADUATE — HIGH SCHOOL DROPOUT
Federal tax payments	\$41,150
State tax payments	\$17,980
Health subsidies	\$45,880
Expenditures on crime	\$25,850
Expenditures on welfare:	
TANF	\$1,320
Food stamps	\$340
Housing assistance	\$600
State welfare programs	\$350
Expenditures on education:	
School subsidies	(\$15,280)
College subsidies	(\$6,800)
Total fiscal surplus per capita	\$111,390
Aggregate fiscal surplus per cohort from a one-third reduction in the dropout rate (=6,800 new high school graduates)	\$765 million

Notes: Present values expressed at age 20 with a discount rate of 3.5%. 2008 dollars. Federal tax payments and state tax payments from Table 3. Health subsidies derived from Muennig (2007). Expenditures on crime derived from Belfield (2007). Expenditures on welfare from Belfield and Levin (2007). Expenditures on school education from NCES (2003, Table 168) and college education from NCES (2002, Tables 312, 314).

population, 3% of young males are currently incarcerated (Pew Trusts, 2008); and Wolf Harlow (2003) reports that over half of those persons were dropouts. Based on Census data, Lochner and Moretti (2004) estimate that becoming a high school graduate reduces criminal activity by at least 11%; a corresponding effect on incarceration rates is assumed.

From the government perspective, the costs of crime include: policing, including crime prevention agencies (e.g. the FBI); trials and sentencing; incarceration costs (including parole and probation); and government-funded victim costs (e.g. medical care and lost tax revenues). Costs are derived from Levin et al. (2006), where the 11% crime reduction effect is calculated for the five most severe types of crime and for incarceration and parole. Based on Bureau of Justice Statistics data and survey information, the cost saving per expected high school graduate is \$25,750.

Finally, welfare receipt is also correlated with education levels (Rank and Hirschl, 2005). Again this correlation is partially a consequence of some welfare programs being means-tested. However, for several reasons welfare effects are considerably smaller than those in other domains. First, across the Hispanic population in the U.S., 13% received food stamps within the last year (ACS, Q.B22005, 2006); the rate for white families is 5% but for black families it is much higher, at 20%.¹³ Claimant rates for Hispanic families are relatively low, conditional on eligibility.¹⁴ Second, welfare receipt is not strongly correlated with high school completion; the substantive correlation is with college participation. Whereas TANF and housing assistance rates for dropouts and

TABLE 7. Present Value Lifetime Fiscal Surplus Per Expected High School Graduate Over Dropout

	PRESENT VALUE SURPLUS AT AGE 20 PUERTO RICANS IN THE U.S. EXPECTED HIGH SCHOOL GRADUATE — HIGH SCHOOL DROPOUT
Total fiscal surplus (net of welfare transfers)	\$108,780
Earnings (net of taxes)	\$257,010
Private fees for college	(\$11,780)
Value of reduction in crime	\$114,700
Productivity externalities	\$95,090
Value of health gains	\$34,160
Total social surplus per capita	\$597,960
Aggregate social surplus per cohort from a one-third reduction in the dropout rate (=6,800 new high school graduates)	\$4,106 million

Note: Present values expressed at age 20 with a discount rate of 3.5%. 2008 dollars.

high school graduates are about equal, the rates for those who have attended college are less than one-tenth as large (Barrett and Poikolainen, 2006). Third, much welfare is time-limited or tied to children, rather than individual education levels. Thus, even though there will be welfare savings, their monetary value is much smaller than the figures for incomes, health, and crime.

Based on data from the Current Population Survey, it is possible to calculate the lifetime incidence of welfare receipt by education level for Puerto Ricans for each of the main welfare programs: TANF, food stamps, and housing assistance, with state programs estimated proportionately. These cost savings amount to \$2,610 per expected graduate.

Finally, each new high school graduate would of course receive educational subsidies when in school and if they enroll in college. These subsidies must be subtracted from the benefits of graduation. The costs are based on 1.5 years more high school and college participation rates applied for an expected high school graduate (15% enroll and another 11% complete). NCES (2002, 2003) reports that public expenditures for 1.5 additional years of high school are \$15,280 in present value at age 20. For those who progress on to college, two years of college cost \$16,560 (but only 15% enroll) and four years of college cost \$39,300 (but only 11% complete). Thus, the cost per expected high school graduate is \$6,800 in college subsidies.

The fiscal benefits for each additional Puerto Rican high school graduate are summarized in Table 6. At this stage, no distinction is made between tax dollars that flow to the federal government versus those that flow to state governments. In total, the fiscal benefit at age 20 is \$111,390. Conservatively, this is the amount taxpayers are losing by failing to ensure that each Puerto Rican graduates from high school.

Social Benefits of Education

Communities benefit from higher levels of educational attainment. These social gains include taxpayer savings (net of welfare transfers) and four additional components. The first component is the extra private income earned by new graduates (net of taxes). This was calculated above at \$257,010.¹⁵ From this, fees for college (of \$11,780) must be subtracted. Second, there are savings to society from reductions in crime, such as: improved quality of life; fewer monetary losses (e.g. for time off work); and lower private expenditures for

TABLE 8. Puerto Rican Populations and Economic Conditions: Selected States

	PUERTO RICAN POPULATION	PERCENT OF STATE POPULATION	GRADUATION RATE (HISPANIC)	STATE INCOME TAX
New York	1,229,550	6%	55%	4-5%
Florida	564,420	3%	60%	0
New Jersey	429,760	5%	64%	1.4-8.5%
Connecticut	227,170	7%	54%	4-5%
Illinois	185,020	1%	56%	3%
Massachusetts	233,030	4%	49%	5%
Pennsylvania	268,160	2%	58%	3%
<i>National Average:</i>			58%	4%
	STATE SALES TAX	AVERAGE WEEKLY WAGE	COST OF EDUCATION INDEX	PERCENT GENERAL FUND SPENT ON INCARCERATION
New York	4%	\$1,110	1.030	5.1%
Florida	6%	\$741	0.851	9.3%
New Jersey	7%	\$931	1.114	4.9%
Connecticut	6%	\$1,033	1.062	4.4%
Illinois	6.25%	\$928	0.933	5.2%
Massachusetts	5%	\$1,008	0.963	5.1%
Pennsylvania	6%	\$849	0.983	6.2%
<i>National Average:</i>	5%	\$821	1.000	6.8%

Notes: Graduation rates for Puerto Rican students are not available.

Sources: Vargas Ramos (2006); Duany and Matos-Rodriguez (2006); Education Week (2008); www.taxadmin.org (rates applied in this analysis); Bureau of Labor Statistics (www.bls.gov/ncs, first quarter 2008); Taylor and Fowler (2006); Pew Trusts (2008).

insurance and crime prevention. These costs are almost certainly large, but are hard to estimate precisely; estimates range from 2.5 to 4.5 times the size of the fiscal costs (Ludwig, 2006; Miller et al. 1996). Applying the 2.5 ratio, the social costs would amount to \$114,700 per graduate. Third, there are productivity externalities as educated workers raise firm productivity (and attract capital investment). Reviewing the literature, McMahan (2006) estimates these externalities to be worth 37–61% of the income gains; applying the lower figure, this amounts to \$95,090.¹⁶ Finally, there is a social value to improved health. Based on estimates by Cutler and Lleras-Muney (2006), this value can be calculated based on gains in life expectancy. Conservatively, an expected high school graduate has a life expectancy which is higher by 0.45 years; in present values this is worth \$34,160.

Adding these four extra benefits increases the total economic cost of high school failure dramatically. As shown in **Table 7**, the social benefits per extra graduate are \$597,960. These figures also show that the primary beneficiary of additional education is the individual and that the social gains to a community from education are in fact larger than the fiscal gains. Importantly, given demographic clustering of Puerto Ricans in the U.S., these communities are likely to reap a large proportion of these benefits.

The State-Level Benefits of Graduation

To further examine the economic consequences of education, the above method is applied to seven states with high concentrations of Puerto Ricans (Duany and Matos-

TABLE 9. Present Value Lifetime Surplus Per Expected High School Graduate: Selected States

	PER CAPITA		AGGREGATE PER COHORT IF GRADUATION RATE EQUAL TO NATIONAL AVERAGE (\$ MILLION)		SOCIAL SURPLUS AS % OF GROSS DOMESTIC STATE PRODUCT
	STATE FISCAL SURPLUS	STATE SOCIAL SURPLUS	STATE FISCAL SURPLUS	STATE SOCIAL SURPLUS	
New York	\$67,480	\$665,220	\$228.99	\$2,257.46	0.205%
Florida	\$45,340	\$442,450	\$62.78	\$612.66	0.083%
New Jersey	\$63,810	\$562,220	\$60.55	\$533.49	0.115%
Connecticut	\$66,430	\$621,490	\$42.57	\$398.33	0.184%
Illinois	\$60,870	\$559,760	\$60.87	\$279.49	0.046%
Massachusetts	\$66,760	\$609,260	\$48.66	\$444.10	0.126%
Pennsylvania	\$56,800	\$511,690	\$39.24	\$353.47	0.067%

Notes: Tables 6 and 7, adjusted for parameters in Table 8. Fiscal surplus includes state-specific values for: tax payments; health subsidies; crime justice expenditures; welfare costs; and public subsidies for education. State-specific price indices are applied for wages and government expenditures and for costs of education (see Table 8). For graduation rate to equal national average, the Puerto Rican dropout number would have to fall by one-third. Gross Domestic State Product from Bureau of Economic Analysis (www.bea.gov/regional/gsp/, 2005).

Rodriguez, 2006). These state-level estimates are modifications of the national model, taking account of differences in: graduation rates, wages, costs of education (Taylor and Fowler, 2006), tax rates, crime and incarceration rates, and of course the sizes of the populations of Puerto Ricans. State-level estimates are also distinct in that they exclude federal government benefits. Whereas the federal government collects payroll taxes and funds some anti-poverty programs, it does not provide a large proportion of the funding for education. For the state-level estimates, these funding burdens are distinguished in a very conservative way. Specifically, zero federal benefits are included; this is equivalent to assuming that no federal spending occurs within each state. All federal budgetary consequences for taxes paid and health and criminal justice system expenditures are excluded, as well as federal subsidies for education.¹⁷ Finally, all social benefits are assumed to accrue within a state (i.e., net migration is trivial).

The demographic characteristics and economic conditions in the selected states are reported in **Table 8**. These conditions are incorporated into the national model to yield state-specific estimates of the costs of inadequate education from the fiscal and social perspective. These costs are reported in **Table 9**. The Notes to Tables 8 and 9 give more detailed information.

New York State is home to approximately one-third of Puerto Ricans. However, in recent decades the growth rate of Puerto Ricans has slowed. Although the population has spread out from New York City, three-quarters of all Latino students in the state of New York are educated in the New York City public school system. Educational attainment is low: 43% are high school dropouts, 26% graduated from high school, 22% attended college, and 10% completed college (De Jesús and Vasquez, 2005). Given this low attainment and the concentration of Puerto Ricans in urban areas (where wages are higher and externalities larger), the economic benefits for New York are very high. Per new graduate in New York state, the present value fiscal benefits to state taxpayers are \$67,480. The social benefits are \$665,220. If the state reduced its high school dropout

rate for Puerto Ricans from 45% to 30%, this would yield another 3,000 new high school graduates. The aggregate impact fiscal surplus would be \$229 million. The social surplus would be \$2.257 billion. This is equivalent to 0.2% of annual state gross domestic product, noting that Puerto Ricans are only 6% of the state population.

Florida has experienced an extremely rapid increase in its Puerto Rican population. Between 1980 and 2000, the numbers grew by over 400% and the state is now home to one-in-six of all Puerto Ricans; and this growth has been accompanied by greater segregation and concentration in specific counties (Duany and Matos-Rodriguez, 2006). However, the costs of inadequate education in Florida, although significant, are lower than for other states because Florida does not have a state income tax and because it is a relatively low-wage state. However, incarceration absorbs more than 9% of total general fund spending in the state. Applying the parameters in Table 8, it is estimated that for each new high school graduate, the state would gain \$45,340 in present value government net revenues.

Ten percent of all Puerto Ricans live in **New Jersey** (this represents 5% of the state's population). New Jersey wages and taxes are relatively high, as is the cost of education. For each new high school graduate, the fiscal surplus is \$63,810 and the social surplus \$556,220. However, New Jersey's graduation rate for Hispanic students is higher (at 64%) than the national average; these reduce the aggregate fiscal and social consequences of school failure.

Connecticut has the densest population of Puerto Ricans: just under 7% of the state's population is Puerto Rican. This population is heavily segregated and the state graduation rate is below the national average. Wages are relatively high, as is the cost of education, although the state spends relatively small amounts of general fund revenues on incarceration. The fiscal surplus per new high school graduate is \$66,430 and if the dropout rate is reduced by one-third, the aggregate fiscal surplus for Connecticut amounts to \$42 million. The social surplus is very high: per capita it is \$621,490; and in the aggregate it is \$398 million, or 0.18% of Gross State Domestic Product.

For **Illinois**, the Puerto Rican community was initially clustered in Chicago and heavily segregated. But, in recent decades the Puerto Rican population growth rate in Illinois has slowed: only 1% of the state population is Puerto Rican. As such, the model values for Illinois are close to the national averages used to calculate the figures in Tables 6 and 7. For Illinois, the state fiscal surplus is \$60,870 and the social surplus is \$559,760 per additional high school graduate. However, one of the factors associated with low attainment is the poor quality of inner-city schools and Chicago Public Schools have been significantly criticized in this regard. This model does not account for educational quality and so it is likely that the costs of school failure are under-estimated.

Massachusetts has a state population which is 4% Puerto Rican. With relatively high state taxes and high incomes (and low costs of education), the costs of school failure are high in Massachusetts. At the fiscal level, the surplus per graduate is \$66,670; and the social surplus is \$609,260. Moreover, the Puerto Rican population in the state has a very low graduation rate (49%) and so the aggregate consequences of school failure are magnified: the social surplus from increasing the graduation rate to the state norm is \$444 million, or 0.126% of Gross Domestic State Product.

Finally, Table 9 shows results for **Pennsylvania**, which has a population composed 2% of Puerto Ricans. The national estimates are broadly applicable to Pennsylvania: wages in Pennsylvania are comparable with the national average; as are the cost of education, spending on incarceration, state tax rates, and the graduation rate. Hence,

the fiscal and social surplus estimates can be taken as broadly representative for the nation. That is, per new high school graduate the state will save \$56,800 in government spending and will gain \$511,690 in state benefits. If the dropout rate is cut by one-third, the aggregate gain in social surplus will amount to 0.07% of Gross State Product.

These state-specific estimates are illustrative of the burden of inadequate education imposed on state communities where Puerto Ricans predominantly reside. Because of demographic segregation or clustering of Puerto Ricans in high wage states, with high tax rates and poor education systems, these state-specific analyses suggests that the national estimates in Tables 6 and 7 are probably conservative. Moreover, local communities bear the heaviest consequences of low education, not only because their citizens are economically disadvantaged but also because these communities experience more crime, poorer health status, and greater welfare dependency. This local burden is probably understated here because many important externalities — such as supporting the family, or helping the local community — are not enumerated in this analysis.

Policies to Raise the Rate of High School Graduation

Nationally, the cost of failing to ensure a Puerto Rican student graduates from high school is large. For the individual, the earnings foregone amounts to a present value of over one-quarter of a million dollars. For the taxpayer, the fiscal consequence is over one-tenth of a million dollars and for the local community the economic impact is more than half a million dollars. From all perspectives further investments in education would therefore seem worthwhile.

However, the economic benefits calculated above are gross. That is, they do not account for what it would cost to ensure that a dropout does graduate. It seems unlikely that the costs of effective interventions to ensure graduation would exceed the amounts reported above, but it is still necessary to identify them. Potentially, there are many options, 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 address particular needs (e.g. literacy programs); and specific, small-scale treatments (e.g. peer tutoring).

Unfortunately, few interventions have been *proven* to raise graduation rates directly.¹⁸ Indeed, many educational policies are proposed without a strong evidence base to support them; and simply committing extra resources in an unspecified way is unlikely to be effective.

One possible option is to pay higher wages to teachers; Loeb and Page (2000) estimate 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. Another is to reduce class size in the elementary grades. Finn et al. (2005) estimate that smaller elementary classes increase graduation rates by 11 percentage points generally and by 18 percentage points for children eligible for free lunch. A third option is high school reform. A strong example is First Things First, which emphasizes small learning communities, long-term teacher student relationships, mentoring, and teacher advocacy for each student with a rigorous curriculum (Quint et al., 2005); results for the model sites generated higher graduation rates by 16 percentage points.¹⁹

None of the above interventions are targeted specifically at Puerto Rican students (or show differential effects across racial subgroups). However, Achievement for Latinos through Academic Success (ALAS) is a program that assigns counselors to monitor attendance, behavior, and achievement. In an experimental evaluation

of 81 students in California, ALAS increased 10th grade retention rates to 86% for the treatment group versus 69% for the control group; by 12th grade, the respective graduation rates were 32% and 27% (Gándara et al., 1998). 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 small-scale program for Puerto Ricans. A large-scale proposal is to raise the school leaving age: Oreopoulos (2007) finds that Hispanic students have benefited the most from this policy reform in the past.

Another approach is to suggest reforms based on the educational experiences of Puerto Rican students as described in Section 2. Four areas of education reform offer promise.

Improving access to preschool programs would significantly help Puerto Rican children simply because they currently enroll in preschool at relatively low rates. The explanation for this low enrollment is partly demography — Hispanic children generally live in states with limited public programs — and partly historical — they have not accessed federal Head Start programs in large numbers. Yet, there is compelling evidence that attending preschool is beneficial into high school and adulthood (Reynolds et al., 2002). With longitudinal data on 30 Hispanic families with 73 children, Lopez et al. (2007) estimate the explanatory power of preschool on literacy and English proficiencies. They find that preschool attendance has almost the equivalent effect as home literacy activities on these proficiencies. Expanding opportunities to enroll in preschool would therefore be economically beneficial.

Two other reforms relate to high school experiences. As documented by Fry (2005), Hispanic students generally attend very large high schools (with fewer resources). Kuziemko (2006) finds that the academic penalty from attending a very large school (so-called ‘drop-out factory’) is severe. Therefore, breaking these large schools into smaller units would most likely raise graduation rates and Hispanic students would disproportionately benefit. Similarly, Hispanic rates of college enrollment are low and often the opportunity to go to college motivates students to complete high school. College support programs may therefore be helpful. One example is Talent Search, a national program of academic support intended to raise the graduation rate by motivating low-income students to attend college. The supports include test taking assistance, advising, tutoring, and financial aid assistance. 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.

Finally, Hispanic students generally — and Puerto Rican students especially — experience perhaps the greatest level of family disadvantage, compounded by low English language skills. These in turn impact on school performance. Family disadvantage is particularly influential because it is cumulative from an early age. Therefore, educational interventions for young children that include a significant family involvement component and are intended to raise literacy levels may be beneficial. In a meta-analysis of existing programs, Senechal (2006) finds that parental reading programs in elementary school are effective, particularly for low-income families.

Clearly, it is a challenge to find effective interventions and secure public support for them. However, the above evidence strongly suggests that the economic burden of not investing in adequate education for Puerto Ricans is very high. This burden is large for taxpayers, but it is extremely large for the communities in which inadequate education is most prevalent.

NOTES

¹ These states are: New York; Massachusetts; Connecticut; New Jersey; Pennsylvania; Florida; and Illinois.

² Typically, across the U.S. public investments are *lower* for disadvantaged students (Education Trust, 2006). In their review of funding for at-risk students, Duncombe and Yinger (2005) conclude that “no state has an effective poverty weight as high as the estimated weight in the scholarly literature (p.515).”

³ These calculations are derived as follows: $\Pr(\text{some college}|\text{high school})=18,900/(23,200+18,900+10,900)$; $\Pr(\text{college completion}|\text{high school})=10,900/(23,200+18,900+10,900)$.

⁴ Grinstein et al. (2008, Table 3) calculate that the net worth of households with a household head who was a dropout are 6% lower than those who are high school graduates and 11% lower than those with some college and 44% lower than those who have completed college.

⁵ There are also effects on fertility from education. Specifically, where females have more labor market options they have a lower demand for children and, by staying in school, the number of years available for child-rearing are reduced.

⁶ Compelling international evidence is summarized in Hanmer et al. (2003): across ten studies of infant mortality, eight find a clear, statistically significant reduction in infant mortality from mother’s education.

⁷ One issue not considered here is remittance income and or migration. The effects are subtle because education is positively correlated with migration decisions which in turn induce remittances. Yet, for Puerto Rico, Muschkin and Myers (1993) do not find strong income effects inducing reverse migration. Families that remit money do not have higher incomes than families that do not remit and that less than 5% of GDP is generated through remittances (Acosta et al., 2008).

⁸ One measure of costs is the amount that private individuals spend as a proportion of their budgets; but this is problematic because higher incomes allow families to consume more health or less crime. The only shadow price for family valuations of child health is from Dickie (2005). Using U.S. data, families report a willingness-to-pay to avoid one school day lost to health of \$100-\$150 (1997 dollars). Approximately, therefore, one lost school day equates to one lost day of work.

⁹ Also unavailable is information on tax avoidance and on the deadweight loss of collecting taxes.

¹⁰ This effect is separate from the notion that new graduates will not have the same set of skills as the average graduate. By assumption, any new graduates are held to have genuine graduate-level skills. This is plausible if many students fail to graduate because of circumstances outside their control.

¹¹ An earlier investigation using data from 1998–99 is performed by Aguilera (2005). Earnings premiums for education are smaller in that study.

¹² Nationally, Rouse (2007, Table 5–1) reports that of college-educated workers 58% have employer-provided pension plans and 49% have employer-provided health plans; the respective figures for dropouts are 29% and 21%.

¹³ Welfare receipt data is taken from question B22005 of the 2006 American Community Survey.

¹⁴ Basic estimation of the Puerto Rican subsample of the NLAAS shows no strong relationship between education status and ever having received welfare (details available from the author). However, the small sample size and low incidence of welfare mean low statistical power to identify any relationships.

¹⁵ As per Table 3, gross earnings gains are \$316,140, with federal and state taxes of \$41,150 and \$17,980 respectively.

¹⁶ In a review of cross-country evidence, Pritchett (2006) estimates a coefficient of almost zero. However, this evidence draws upon many countries with very different economic structures from the U.S. Also, Aguilera’s (2005) analysis indicates that externalities are subtle: Puerto Rican females appear to benefit significantly in terms of higher wages from greater social capital; but males do not.

¹⁷ Based on Muennig (2007), federal and state agencies approximately split the funding of

Medicare and Medicaid (with the exception of Florida and Pennsylvania, where the federal share is a few percentage points more than the state share).

¹⁸ Increasing test scores may raise graduation rates. Lee and Burkam (2003) report a one standard deviation increase in math GPA reduces the odds of dropping out by 32%. 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%. However, the relationship between prior test scores and graduation varies by race, and the impacts for Puerto Rican students are not available.

¹⁹ An alternative high school reform is Talent Development; it has been found to raise progression rates between 9th and 10th grades by 8 percentage points (CSRQ, 2006).

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**Centro de Estudios Puertorriqueños
Hunter College (CUNY)**

695 Park Avenue, Room E-1429

New York, New York 10065

212.772.5686

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