



University of Pennsylvania
ScholarlyCommons

Center for Benefit-Cost Studies of Education

Graduate School of Education


9-2009

High School Dropouts and the Economic Losses from Juvenile Crime in California

Clive R. Belfield

Henry M. Levin

Follow this and additional works at: <https://repository.upenn.edu/cbcse>

 Part of the [Economics Commons](#), [Educational Assessment, Evaluation, and Research Commons](#), and the [Education Economics Commons](#)

Belfield, Clive R. and Levin, Henry M., "High School Dropouts and the Economic Losses from Juvenile Crime in California" (2009). *Center for Benefit-Cost Studies of Education*. 26.
<https://repository.upenn.edu/cbcse/26>

This paper is posted at ScholarlyCommons. <https://repository.upenn.edu/cbcse/26>
For more information, please contact repository@pobox.upenn.edu.

High School Dropouts and the Economic Losses from Juvenile Crime in California

Abstract

California's juvenile crime rate is high. Juveniles commit one-in-six violent crimes and over one-quarter of all property crimes; they also commit crimes in school, victimizing one-quarter of all students and one-in-twelve teachers. The economic loss from juvenile crime is substantial. In total, each juvenile cohort in California imposes an economic loss of \$8.9 billion on the state's citizens. Part of the explanation for juvenile crime is poor education. In this paper, we estimate the economic loss from juvenile crime associated with not completing high school before age 18. Using results from three separate studies and applying their results for California, we estimate the annual juvenile crime loss associated with high school dropouts at \$1.1 billion. Finally, we compare the losses from juvenile crime with the costs of improving the education system. We calculate that savings in juvenile crime alone will offset approximately 16% of the costs of providing these interventions.

Keywords

high school dropouts

Disciplines

Economics | Educational Assessment, Evaluation, and Research | Education Economics



High School Dropouts and The Economic Losses from Juvenile Crime in California

California Dropout Research Project Report #16
September 2009

By

Clive R. Belfield
Queens College, City University of New York

and

Henry M. Levin
Teachers College, Columbia University

Abstract

California's juvenile crime rate is high. Juveniles commit one-in-six violent crimes and over one-quarter of all property crimes; they also commit crimes in school, victimizing one-quarter of all students and one-in-twelve teachers. The economic loss from juvenile crime is substantial. In total, each juvenile cohort in California imposes an economic loss of \$8.9 billion on the state's citizens. Part of the explanation for juvenile crime is poor education. In this paper, we estimate the economic loss from juvenile crime associated with not completing high school before age 18. Using results from three separate studies and applying their results for California, we estimate the annual juvenile crime loss associated with high school dropouts at \$1.1 billion. Finally, we compare the losses from juvenile crime with the costs of improving the education system. We calculate that savings in juvenile crime alone will offset approximately 16% of the costs of providing these interventions.

The authors are grateful for support from the California Dropout Research Project and comments from Russ Rumberger and a reviewer.

1. Introduction

The negative social and economic losses for the State of California from the low educational attainment of its citizens are substantial. Tax revenues are reduced and government spending on health, crime, and welfare is elevated, increasing the fiscal burden for all Californians. In earlier work, we found that as an adult each new high school graduate, compared to a high school dropout, generates a substantial net fiscal benefit for the taxpayer. After deducting the public cost of the additional investment in keeping students in school until graduation, each additional high school graduate contributes net fiscal benefits of \$115,300 (lifetime benefits in present value at age 20) to the federal government, and \$53,600 to California's state and local governments. The social gains for California are even greater: inducing a potential high school dropout to graduate generates a present value social gain to the state of up to \$392,000 (Belfield and Levin, 2007a; 2006 dollars).¹

One significant component of the fiscal and social costs of low education is the higher rate of criminal activity: for example, high school dropouts make up approximately two-thirds of all prison inmates (Harlow, 2003). Specifically, we estimated that each new high school graduate generates savings of \$31,800 to the criminal justice system and reduces social/victim costs of crime by \$79,900. Thus, investments in educational programs might be justified purely as crime prevention strategies.

¹ The social gain from education counts both the private gains (higher earnings, better health) and the societal gains (higher tax payments, lower Medicaid/Medicare expenditures, lower criminal justice system expenditures, and lower welfare expenditures). The present value expression is necessary because the gains from education accrue over a lifetime; all these gains are translated in present values, i.e. into values 'as if' that amount of money was available now in the form of a certifiable deposit.

However, even these figures are understatements of the full costs of inadequate education. They exclude any impact of education on criminal activity before the age of 20, i.e., they do not count any juvenile crime or any crime by those aged 18-19.

Juvenile crime is a large proportion of all crime committed in the State. In California in 2007, juveniles were arrested for one-in-six violent crimes and over one-quarter of all property crimes (NCJJ, 2008). Juveniles also commit crimes in school: one-quarter of all students and 8% of teachers report some form of victimization over a school year (national figures, Dinkes et al., 2007). Moreover, victims of juvenile crimes are typically themselves young, imposing lifetime social and psychological costs. Finally, given the well documented life-course patterns of escalating crime, juvenile offenses are often the precursors to more severe, more frequent adult criminal activity. The role of education in reducing the economic and social impacts of juvenile crime would therefore seem to be an important area for investigation.

Poor quality education (crowded schools and dilapidated facilities, poorly paid or uncertified teachers, ineffective school management systems) reduces achievement and causes more students to drop out (Balfanz and Letgers, 2004). In turn, this is likely to raise the juvenile crime rate. Our focus here is on the link between juvenile crime and dropping out of school. Each juvenile cohort (ages 12-17) in California is 3.56 million persons, of which 819,500 (23%) will not complete high school.² Yet, a

² This estimate is derived from Belfield and Levin (2007a, Table 3). Census population figures for each age range from 12 to 17 are weighted by graduation rates by sex and ethnicity (with a private school graduation rate of 95%). Our dropout rate of 23% does not include those persons who graduate between the ages of 18 and 20: approximately 10% of all students graduate late. So, the on-time graduation rate is 72%, not (as implied by a dropout rate of 23%) 77%. So, the estimate used here is conservative in terms of the numbers of dropouts. However, it might be argued that students who graduate late exhibit behaviors closer to those of on-time graduates than those of dropouts. Another way in which this estimate is conservative is that it counts GED recipients as graduates. Although there is ample evidence that GED recipients are not comparable to graduates in terms of earnings, there are no comparisons for criminal behavior. Moreover, a high proportion of GEDs are obtained by incarcerated

proportion of these ‘future dropouts’ would be capable of graduating if they received a high quality education; and along with all the private economic benefits of graduation, these individuals would also commit fewer juvenile crimes. Thus, a low quality education system is expensive to the state of California in that it raises the rate of juvenile offending across almost one million juveniles.

This paper calculates the economic loss to the state of California from juvenile crime and related, subsequent adult crime as a consequence of low education. Our primary effort is to provide new and detailed estimates for juvenile crime, but we also calculate the economic loss by young adults (ages 18-19) and add in estimates of adult crime (ages 20 onward); these figures for adults are extrapolations from our earlier work on adult crime in California (Belfield and Levin, 2007a).

The paper is structured as follows. We begin with a review of juvenile crime and justice in California. We document the extent of crime and the characteristics of its perpetrators; and we draw attention to important concerns for analyzing its impacts. In Section 3, we describe the costs of juvenile crime. We use both research evidence and budget data for California to calculate costs per crime and per juvenile criminal. In Section 4, we identify the size of the relationship between education and juvenile crime. In Section 5, we calculate the total costs of juvenile crime which are associated with the proportions of youth who drop out of high school, i.e., we add up all the juvenile crime committed by dropouts, including those crimes committed before they dropped out. We add to this calculation the costs of young adult crime and adult crime again insofar as these are associated with low education. In Section 6, we consider potential

persons, complicating the relationship between GED status and crime. Nevertheless, if GED recipients have crime rates equivalent to those of dropouts, then the relevant number rises by almost one-third from 819,500 to 1.105 million.

interventions that might reduce the rate of juvenile offending by raising graduation rates and whether these pass an economic test. Section 7 considers policy options to reduce the rate of juvenile crime by improving educational quality in California.

2. Juvenile Crime in California

The first column of Table 1 shows the extent of juvenile crime in California based on FBI arrest data. In 2007, there were 233,588 arrests of juveniles (ages 10-17) out of a population of 4.49 million (Hill, 2007). Of all arrests, 27% were felonies, 60% misdemeanors, and 13% were status offenses (i.e., crimes specific to juveniles).³ Across the juvenile felony arrests, 40% were for property crimes; 25% for violent crimes; 10% for drugs offenses; and 25% for others (including firearms possession). There were 170 homicide cases involving juvenile perpetrators.

The types of crimes juveniles commit differ somewhat from those by adults. Juvenile crimes are more likely to be related to drug use, gun violence, gang activity, alcohol abuse, and possibly sexual assault (see respectively Russell et al. [2008]; Watkins et al. [2008]; Decker et al. [2008]; Ford [2005]; and Woodhams et al. [2007]). The second column of Table 1 shows the proportion of all arrests in California where the arrestee is a juvenile. Overall, juveniles are arrested for one-in-six violent crimes and over one-quarter of all property crimes. They represent one-in-seven disorderly arrests, more than one-half of all arsons, and almost one-half of all vandalism arrests. However, Welsh et al. (2008) find that juvenile assaults may be more severe than adult assaults, and sentences for juveniles in California have trended toward those of adults (NCJJ,

³ Juvenile crime is processed differently from adult crime. Juveniles who are arrested are categorized as: informal probationers (for minor offenses); status offenders; criminal offenders (adjudicated in criminal court); and 'remands' to superior court (for severe crimes). Therefore, some minor offenses may not be processed formally through the criminal justice system.

2008). Thus, although the types of crimes committed by juveniles may differ from those of adults, they are of no lesser significance.

But these proportions understate the significance of juvenile crime, not least because juveniles are tallied in comparison with those with a much more extensive range of ages (adulthood) and because juveniles will “age out” (unless they are arrested promptly when they begin their infractions). First, juveniles often have contact with the police prior to arrest through informal probation or warnings, thus avoiding the official statistics. Second, violations in school should also be added to these FBI statistics. During the school year 2007-08, California’s public schools reported approximately 130,000 violent incidents, almost 6,000 serious violent incidents, and 70,000 other incidents; these are incident rates of 2.8, 0.1, and 1.5 per 100 students (Neiman and DeVoe, 2009, Table 1). In addition, many schools report delinquent behavior such as: student racial/ethnic tensions; bullying; sexual harassment; abuse of teachers; class disorder; and gang activities (Neiman and DeVoe, 2009). Many of these activities are not prosecuted through the formal criminal justice system (e.g., juvenile gang activity, see Rainone et al., 2006). Third, victims of juvenile crimes are typically themselves juveniles, imposing on them a lifetime of social and psychological costs. And finally, criminal activity typically peaks at ages 18-19 with many studies establishing a life-course pattern of crime (Delisi and Gatling, 2003). Thus, juvenile crime—substantial in and of itself—is often a precursor of further criminal activity of increasing severity.

Three significant individual characteristics of juvenile criminals stand out. First, most juvenile criminal activity is performed by males (Tracy et al., 2009; Johansson and Kempf-Leonard, 2009; Martin et al., 2008). Three-quarters of juvenile arrests in

California are of males (Hill, 2007). Also, males disproportionately commit the more serious crimes: nationally, more than 80% of felony arrests and 93% of youth homicide suspects are male (Cook and Laub, 2002). Consequently, 95% of the population that is institutionalized by the Department of Juvenile Justice in California are male (CJSC, 2008).

Second, juvenile crime rates increase across their age range (Gottfredson and Soule, 2005). In California, 2% of arrests are for juveniles aged 10-11; 27% aged 12-14; and 71% aged 15-17 (Hill, 2007). However, initial criminal activity predominates at ages 13-15 (Welsh et al., 2008). Third, Black juveniles are arrested disproportionately to their populations (Bellair and McNulty, 2005). In California, Black juveniles account for 17% of all arrests although they are only 8% of the youth population.⁴ White and other race groups are arrested at rates lower than their populations, with Hispanics about proportionate, accounting for 46% of the youth population and 48% of juvenile arrests (Hill, 2007).

Juvenile arrests lead to prosecution through the criminal juvenile justice system. From the total arrests in 2007, there were 189,700 direct referrals to probation as well as another 13,800 cases referred from other agencies. Of these 203,500 probation dispositions, 36% were closed at intake (i.e., dismissed), 6% were placed in diversion programs, 5% were transferred to other government agencies, and 3% were placed on informal probation. The remainder were disposed to adult court (0.4% of the total, 700 cases) or juvenile court (50%, 101,800 cases). Of the adult court cases, 81% were convicted. Of the 101,800 juvenile cases, there were 61,600 wardships, 8,700

⁴ The racial composition of the California Department of Juvenile Justice is even more polarized: as of 2008, 56% were Hispanic, 30% African American, and 10% were White (CA Juvenile Research Branch).

diversions, and 10,500 non-ward or informal probations, and 19,400 cases dismissed (data from CSJC, 2008).⁵

Of the wardships, 58% were placed in (their) own or (a) relative's home, 29% (17,600 persons) were housed in a secure county facility, and 14% were housed in an alternative facility.⁶ These facilities include: detention centers (23%); shelters (6%); reception/diagnosis centers (3%); group homes (27%); boot/ranch camps (6%); training schools (7%); and residential treatment camps (29%). For those placed in a state facility, the average length of stay is 26 months, with an additional 40 months on parole. County placements are shorter: the median durations for community supervision are 5-9 months, for county placements are one year, and for county custodial sentences 1-4.5 months.⁷

There are three key concerns in analyzing (juvenile) crime. The first is the 'offense multiple', i.e., the number of crimes relative to arrests. Because many crimes—particularly minor ones—are not reported and many are not resolved, the arrest rate is only a fraction of total criminal activity. Based on comparisons of court records and self-reports from the Seattle Social Development Youth Study, Farrington et al. (2003) estimate large offense multiples. For example, the offense multiples are as high as six for crimes such as rape, assault, larceny and arson, i.e., for every one arrest for arson there will have been five other acts of arson committed within the same period. Of course, the offense multiples for juveniles are much greater if the subsequent adult

⁵ Wards are juveniles who are the responsibility of the court but may be placed 'at home' or in a secure facility; diversions are juveniles allocated to alternative rehabilitative programs or services; and informal probations are juveniles monitored typically in an unrestricted setting.

⁶ Although in most states offenders who are sentenced beyond age 18 are transferred to adult correctional facilities, in California the Division of Juvenile Justice retains offenders until age 25. California has an extended age up to 24 for juvenile jurisdiction, with juvenile court jurisdiction up to age 21 (NCJJ, 2008).

⁷ State facilities durations from California Department of Corrections and Rehabilitation, Division of Juvenile Justice website. County durations from Hennigan et al. (2007, Table 10a).

crimes are included.⁸ A second concern is that a small subset of criminals undertakes a large fraction of all crimes. Cohen and Piquero (2009) estimate that 6% of criminals ('chronic offenders') commit almost half of all crimes (for Black males, see Merlo and Wolpin, 2009).

The third concern is the extent to which early juvenile crime predicts later juvenile and adult crime. Many juvenile criminals may be 'experimenting' during adolescence and a first misdemeanor may not connote the extent of future criminal activity. However, juvenile crime is a very strong predictor of subsequent crime: not only because of underlying circumstances but also because of social labeling of early offenders as delinquents (Bernburg and Krohn, 2003). The correlation between juvenile offending and adult offending is very high (Delisi and Gatling, 2003; Ramchand et al., 2009). Therefore, a salient consideration in calculating the economic losses is the 'induced' adult crime that juvenile criminals commit.

Finally, historical patterns of juvenile crime are pertinent. Over the last decade, youth violence has dropped from its peak in 1993 (Cook and Laub, 2002). In California, even as the youth population has grown significantly, the absolute number of felony arrests has decreased significantly. Incarcerated populations have fallen accordingly: in 1999, there were 19,000 offenders in youth correctional facilities compared to 14,000 in 2005. Moreover, youth crime may have fallen faster than adult crime: juvenile and adult felony arrest rates were approximately equal in 1995 (at just under 2.5% of the respective populations); by 2005, the juvenile felony arrest rate was 1.3% compared to 2% for adults.

⁸ Moreover, these analyses do not include the links between crime and suicide. Both victims of crime and perpetrators of crimes (especially drugs and gun-related crimes) are more likely to commit suicide (Cutler et al., 2001).

However, national data indicates that younger violent offenders have grown substantially in relation to other age groups: whereas in 1982 43% of homicides were by persons aged under 25, by 1998 the proportion was 60% (Cook and Laub, 2002). Although correctional facilities house fewer juvenile criminals, many juvenile offenders may now receive alternative services (such as group homes).⁹ Also, crime rates are typically counter-cyclical with economic growth: declining crime rates over the past decade were in part a function of the high growth rate of income or gross domestic product (GDP), and, presumably better economic opportunities for youth.

3. Cost Estimates of Juvenile Crime

3.1 Crime Cost Items

We now turn to the economic loss imposed by crime in California. We include burdens imposed on fiscal agencies (state and federal governments) and society.¹⁰ Where available, we use California-specific data. Nationally, California ranks in the middle in its overall adult correctional control rate (percentage of the adult population incarcerated or on probation or parole). But, in spending on corrections as a proportion of general funds, the state ranks fifth (Pew Center on the States, 2009).

There are four main costs to government (Anderson, 1999): (1) costs of operating the criminal justice system (CJS) for policing and for trials and sentencing; (2) costs for incarceration, including parole and probation; (3) costs to the state from restitution for victims, from medical care, and from lost tax revenues (both from victims

⁹ Also, homicide incidences have become more dispersed geographically in that large cities no longer have higher murder rates. A more 'even' spread of homicide rates is likely to raise the costs of avoidance as all citizens are at risk.

¹⁰ We assume that California contributes funds for federal crime prevention proportionate to its size in the U.S. economy. We also assume that all crimes are committed in-state.

and perpetrators); and (4) costs of government crime prevention agencies (e.g., budgets for DHS, DEA, ATF). A fifth cost which is not often mentioned is the marginal excess tax burden (or deadweight loss) associated with collecting revenues to provide government services. However, because of data limitations, these fiscal costs are typically limited to information from two categories: CJS costs and incarceration costs.

The *social loss* associated with crime includes several other elements beyond the fiscal ones. It includes: the costs directly imposed on victims; transfers of assets from victims to criminals; avoidance costs by potential victims (including insurance claims); and productivity losses from participating in criminal activity rather than work. Again, because of data limitations, these social costs are typically reduced to direct victim costs in the form of missed work, medical expenses, and lower quality of life.

If the costs of crime and delinquency within schools are included, we should also add on two fiscal costs: the costs of crime prevention to the school and the added costs of compensation to attract teachers to dangerous school environments; and one large social cost: the costs in disruption to learning for student victims and classmates. These may be substantial. For example, the Los Angeles Unified School District has over 430 personnel in its School Police Department; many of these positions are administrative, but some are for school safety officers, and others for personnel trained as full police officers.¹¹ Adjusting for teacher quality, teachers who work in more dangerous schools will require additional pay to compensate for the danger. Also, there is strong evidence of disruptive peer effects: many studies have identified adverse academic effects on the victims of school violence, and that the effects are compounded as the level of violence rises (Graham et al., 2006).

¹¹ Website at www.lasped.com.

For juvenile crime, the costs may be expressed in several dimensions. We report the annual cost per cohort, i.e., the cost of crime committed by all juveniles (aged 12-17) in a given year. In addition, we report individual-level costs, both per youth and per offender. For offenders, it is also useful to consider subsequent crime costs, recognizing that juvenile crime strongly predicts adult crime and that juvenile crime may entail incarceration during adulthood.

3.2 Prior Literature on the Costs of Juvenile Crime

Several studies for other states have calculated the costs of juvenile crime.¹² Data from each source is adjusted to account for California prices and express figures in 2008 dollars with a factor accounting for the relatively high rate of inflation of criminal justice services. We also adjust each source to account for the relative crime rate in California using FBI data. (In other respects, we are assuming that where we lack specific data for California, the national data correspond to the California context).

Fass and Pi (2002) report CJS unit costs of juvenile crimes in Texas. These costs—policing, screening, detention, intake assessment, court activity, and supervision, but not incarceration—vary depending on the treatment of the offender. Adjusted for California costs for these functions, the CJS costs per case are: \$1,400 for deferred prosecution cases; \$9,300 for probationary cases; \$13,300 for intensive supervision; and \$13,000 for local placement.

¹² Many of these sources (including Aos et al., 2006; Fass and Pi, 2002) rely on primary evidence from Miller et al. (1996) for victim costs.

In their direct investigation of juvenile violence in Pennsylvania in 1993, Miller et al. (2001) estimated 93,900 violent crimes by juveniles, leading to 5,133 referrals.¹³ Adjusted for the context in California, this estimate of juvenile violence would translate into a fiscal cost of \$400 million, not counting any costs to the criminal justice system. Miller et al. (2001) also estimated the social costs to victims of juvenile crime in terms of medical care, public programs, lost future earnings, property losses, and quality of life. Adjusted for California, these social costs would be \$14.1 billion. Not counting other crimes, these estimates suggest that juvenile violence alone might impose costs for the state of California of approximately \$14.5 billion.

Other literature has focused on the lifetime victim costs of career criminals or chronic offenders. Based on a sample of 503 boys in Philadelphia, Welsh et al. (2008) calculate the costs of a juvenile cohort (aged 7-17) using victim costs derived from Miller et al. (1996). Each juvenile imposes present value costs of \$210,000 during the juvenile years, with early onset offenders imposing much higher victim costs (2% discount rate). However, these costs do not include CJS costs; and the sample is urban males, with a disproportionate weighting of at-risk youth. Also, the pattern of juvenile crime reported by Welsh et al. (2008, Table 2) does not correspond to the arrest data in California given in Table 1.¹⁴ A fuller estimate is given by Cohen and Piquero (2009) using willingness-to-pay measures for avoiding crime. Assuming that juvenile crime leads to adult crime, Cohen and Piquero (2009) calculate that the lifetime present value crime

¹³ Adopting a per crime type approach allows for a disaggregated costing method, with more transparent assumptions and more rigorous sensitivity analysis. Using aggregate measures has the advantage that all costs may be accounted for, but the disadvantage that costs and crimes cannot be directly related.

¹⁴ Based on records of serial offenders in Texas, Delisi and Gatling (2003) estimate that the average career criminal imposes \$1.11 million in victim costs and \$360,000 in CJS costs over the life course. It is not clear that this is a present value. Also, because it is based on retrospective information from adult serial offenders, it may not include all juvenile crime.

burden imposed by a high-risk 14-year-old is \$2.6-\$5.3 million (assuming a 2% discount rate). Of this total social burden, \$930,000 arises from juvenile crime. However, because both these studies focus on high-risk youth, estimates for an entire cohort cannot easily be projected.

In light of these estimates and the data limitations, our approach is to use the CJS and incarceration costs from budgetary expenditures in California and to use adjusted victim costs from Miller et al. (1996). In addition, we include school-site costs of juvenile crime based on expenditures by the California Department of Education.

3.3 Budgetary Spending on Juvenile Justice in California

Budgeted spending on juvenile crime is primarily composed of spending on policing, the criminal justice system, and corrections. In California, annual state spending on policing is \$13.3 billion, and spending on the judicial branch and department of justice is an additional \$4.75 billion (LAO, 2009; Pew Center on the States, 2009). This covers all crimes, adult and juvenile. If we assume that juvenile crime is 10% of the total amount, then the state fiscal loss (in policing and CJS) of juvenile crime is \$1.8 billion (this is an understatement because it does not include federal agencies or other state agencies that may play a law enforcement role, nor does it include independent rehabilitation, remedial, and support programs which may be offered to juveniles).¹⁵

County CJS spending on juveniles is also significant. However, county financial statements itemize expenditures under a general label of 'public protection', without separating out spending on juvenile and adult crime. Also, a substantial proportion of county spending is funded by federal and state transfers. To estimate county spending

¹⁵ It is also possibly an understatement because juveniles commit 15% of crimes, not 10%. However, juveniles do not commit crimes as severe as adults, or in some cases are not prosecuted as intensively, so the incidence rate is not a perfect guide to the cost implications.

on budgetary data we review the financial statements of seven large counties.¹⁶ These counties comprise 63% of the state population, but 76% of the state's crime, so we weight their expenditures accordingly to obtain total county-level spending on public protection. In 2008, we estimate that county-level spending on public protection was \$13.2 billion. However, on average across the seven counties, 35% of this spending is appropriated from federal and state transfers. Assuming again that juvenile crime is 10% of net county spending, the county fiscal loss (in policing and CJS) is \$810 million.

For incarceration, Table 2 shows expenditures for fiscal 2007 by the California Department of Corrections and Rehabilitations (almost all of which is allotted through general funds). Total annual expenditure is almost \$10 billion, but the bulk of that is for housing adult criminals. Juvenile corrections expenditures total \$520 million annually: this is composed of \$208 million for operations, \$178 million for support programs, \$37 million for paroles, and \$100 million for healthcare.¹⁷ Strikingly, there are only 2,300 wards in the state juvenile corrections system. Thus, annually, these wards are costing over \$200,000 per person (Hill, 2007).

Also, as noted above, many juveniles are not incarcerated. Informal probationers impose relatively light costs on the criminal justice system, but are often referred to other public services, such as drug counseling or mental health programs. Status offenders also impose relatively light costs in that they are referred to remedial programs. Moreover, the facilities are likely to vary in unit cost: not only do they offer

¹⁶ Specifically, these counties are: Los Angeles, San Bernardino, Sacramento, San Francisco, Santa Clara, Orange County, and Riverside. Spending in 2008 on public protection in these seven counties was \$10 billion. We subtract 5% for expenditures on items unrelated to juvenile crime (e.g., forestry protection). This total is under-estimated insofar as counties also spend a proportion of their education budgets on crime prevention.

¹⁷ Similarly, our cost estimates are conservative because of the costs we omit. Some proportion of funding for the Correctional Standards Authority should also be apportioned to spending on juvenile justice. In addition, the California Victim Compensation and Government Claims Board expenditures are \$150 million annually (VCP website financial statement). Also, there are funds allocated through the Office for Victim and Survivor Services but these cannot be apportioned to victims of juvenile crimes.

different services, but they vary in size and so vary in economies of scale (with detention centers, reception centers and training schools being the largest, see Livesey et al., 2009).

These estimates of total policing, CJS and incarceration expenditures in fiscal 2007 for California from juvenile crime are summarized in Table 3; based on current estimates of expenditures, they amount to approximately \$3.1 billion annually. An alternative, partial estimate is reported in Fellmeth (2005, Table 9-F). It sums local law enforcement responding to juvenile crime, juvenile prosecution and defense, juvenile courts, and juvenile probation at \$2.2 billion. Adding in our estimates of incarceration spending raises the estimate to \$2.7 billion (2003 dollars, adjusted to 2008). Another alternative is to apply the unit costs reported in Fass and Pi (2002) to the incidence of crime in California given in Section 2, whereby CJS spending in California would amount to approximately \$1.1 billion. Again, this does not account for incarceration, so a comparable estimate including the criminal justice system costs would be \$1.6 billion. Weighting the Miller et al. (2001) estimates by the proportion of violent crimes out of total felony crimes, we estimate that the fiscal costs of juvenile crime are at least \$1.1 billion. This is likely to be a significant understatement because it assumes that CJS and incarceration costs are only for felonies.¹⁸

3.4 Social Costs

A full accounting of the social costs of crime should include all the items listed in Section 3.1. However, because of a lack of directly available data, we apply the cost estimates

¹⁸ Also, it does not include the costs of therapeutic interventions such as drug and alcohol rehabilitation or anger management, which are found in the budgets of other agencies.

from Miller et al. (1996).¹⁹ Below we show that this application is an understatement of the total costs.

Social costs are a function of the amount of crime and not the number of arrests, since only a small proportion of crime actually culminates in arrests. We therefore weight the arrests by an appropriate vector of juvenile offense multiples, i.e., each arrest is multiplied by the likely number of crimes committed but which did not lead to an arrest. The only available offense multiples for juveniles are from Welsh et al. (2003). However, these are based on youth residing in a high-crime area in Seattle (Washington) and as such they are likely to overstate the offense multiple across the general population. Therefore, we weight them by the proportions of high-crime areas. This yields a set of offense multiples as reported in the first column of Table 4. For example, for each arrest for curfew, there were in fact twice as many actual curfew violations.

Table 4 reports the social (victim) costs per unit of crime and the total social costs (number of crimes times unit cost) for fiscal 2007. The social costs of juvenile crime in California are estimated at \$5.28 billion. Almost one-half of these victim costs are from assaults, and approximately one-seventh from sex offenses.

3.5 Costs of Crime and Delinquency in School

There is limited data on the costs of offenses (and general delinquency) committed in school; therefore, estimates of these costs must be treated with caution. However, we are not counting the cost that is probably the most significant: the costs in disruptions to learning.

¹⁹ An alternative is to use estimates by Ludwig (2007) and Anderson (1999) of the relationship between the fiscal and social burdens of crime. Specifically, the social cost of crime is 2.5-4 times as large as the fiscal burden. Based on discussions above about the particular distinctiveness of juvenile crime, these proportions may not be appropriate.

On crime prevention and school safety, the most relevant calculation is taken from Rothstein (1995), who estimated schools spend approximately 2-5% of their budgets on these services. Adopting the lower figure, and applying it to students aged 12 and above in half of all schools, these school-site costs amount to \$340 million.²⁰ On the costs to the state from paying higher wages to teachers to accept positions in riskier situations (when teacher quality is accounted for), Belfield and Schwartz (2006) calculate that, controlling for individual characteristics (including experience and training), teachers are paid 1-4% more in schools with high rates of robbery/theft, vandalism, or drug abuse. However, there is no robust calculation of the monetary value lost by students attending schools with disruptive peers. Adopting the lower figure, and applying it to students in sixth grade and above in half of all schools, these additional wage payments amount to \$110 million.

Conservatively, therefore, the costs of juvenile delinquency to the school system in California are estimated at \$450 million.

3.5 Costs per Crime and Criminal

Table 5 summarizes the total fiscal cost to the state from juvenile crime. The baseline estimate is \$8.9 billion, composed of victim costs (60%), fiscal costs (36%), and school-site costs (4%).

To check the robustness of this estimate, we derive 47 alternative combinations of costs. These combinations either use figures reported above or apply different scalar factors to each component: we vary victim costs, offense multiples, school security

²⁰ There are 3.56 million students aged 12-17 in California (Census). Annual school spending in 2007 is \$9,600 per student (NCES, 2007). Therefore, 2% of this amount is \$679.7 million. For the compensating wage differential, we estimate annual spending on teachers at \$6,600 per student. The cost is applied to half of all schools so as to bring these schools in line with the average school in terms of safety (not in line with the safest school).

costs, and the size of the compensating wage differentials (see Table 5 Notes). These 47 tests have an average somewhat lower than the baseline estimate; however, they also yield a standard deviation of \$1.4 billion. Therefore, our estimates of the fiscal and victim costs of crime (in California) are estimated at \$8.9 billion with a one standard deviation confidence interval of +/- \$1.38 billion.

From these costs it is possible to calculate the average annual costs per juvenile and per juvenile offender. These costs are reported in the top panel of Table 6. Simply, there are 3.56 million Californians aged 12-17; the costs per juvenile are therefore \$2,480 (= \$8.9 billion / 3.56 million).

However, it is important to distinguish between males and females and between offenders and non-offenders. Based on relative crime commission rates and population sizes by sex, the average social loss is \$4,140 per male juvenile and \$760 per female juvenile. According to tabulations from Merlo and Wolpin (2009) and Cohen and Piquero (2008), the juvenile population may be divided into the 2% of chronic offenders (who commit 50% of all crimes), 12% of occasional offenders, and 86% of non-offenders. Applying this distribution, we estimate the cost per juvenile offender is \$10,350 and the cost per chronic offender is \$62,110. Disaggregating the estimates by sex, we calculate the annual cost per male juvenile chronic offender at \$103,520.

An alternative expression is the present value loss per juvenile over the ages 12 through 17. These costs are reported in the bottom panel of Table 6. We apply a discount rate of 3.5% (based on the consensus proposed by Moore et al., 2004). Across the entire juvenile years, each individual imposes an economic loss of \$14,680. However, occasional offenders impose burdens over four times as large (\$61,160) and

chronic offenders over 25 times as large (\$366,940). Adjusting for sex, we estimate that a male chronic offender in California imposes a social loss of well in excess of half a million dollars (\$611,570). Moreover, this estimate does not include any crime-related burden during adulthood.²¹

3.6 Sensitivity Analysis of Crime Costs

The above estimates may be subject to measurement error: the typical or average costs of crime are not easily calculated, in part, because they depend on an accurate count of the offense multiple.²² However, these costs are likely to be conservative: they are considerably below those derived from research based on how much people are willing to pay for a lower crime rate (Cohen et al., 2004).²³ Also, many of the components of the full fiscal and social costs of crime are omitted because of data limitations.

Specifically, the victims' costs in Miller et al. (1996) exclude avoidance costs, mental health costs (including referrals to clinics or psychological counseling), long-term disability costs, and hospital care paid by insurers, as well as omit any induced crime by victims of crime (Cohen, 2005). They also do not include the deadweight loss from tax collection to pay for public services to combat crime.

Furthermore, juvenile crime costs may not correspond to average costs across all crimes. There are several reasons why juvenile crime may be more expensive than

²¹ Following earlier studies for purposes of comparability, we can also apply a 2% discount rate in reporting present values. (Because of a lack of information, we cannot translate the figures in earlier studies into our preferred discount rate). For chronic offenders, the present value burden per male offender is estimated at \$625,300, which may be compared with the estimate of \$930,000 calculated by Cohen and Piquero (2008). The difference arises largely because we apply a lower offense multiple for chronic offenders.

²² There are several empirical challenges to collecting costs data. First, there are few sources for costs, either at the aggregate, per-crime, or per-criminal level. Also, a particular crime cannot be always be linked to a specific unit cost measure.

²³ If, as estimated by Ludwig (2007) and Anderson (1999), the social cost of crime is 2.5 times as large as the fiscal burden, then the annual social burden from juvenile crime is \$11.4 billion for the state of California. Of course, this simple calculation does not account for differences in the severity of crimes by juvenile status, in life-course effects, or in treatment by the justice system. However, it is suggestive of the extent to which the figures in Table 5 are conservative.

adult crime. Typically, economic valuations of quality of life costs vary inversely with the victim's age, so average estimates of the costs of a crime are understatements when juveniles are the victims. Juvenile victims may receive more support from government agencies, including social/victim services and mental health care agencies. Also, because the processing of juvenile cases is at the county level, and each county must develop and implement its own practices, there may be significant duplication of resources. Conditional on incarceration, juvenile corrections costs may be higher than those for the typical adult prisoner: all juveniles are now entitled to rehabilitative treatment, leading to smaller units of incarceration and upgrading of existing units (NCJJ, 2008). The burden of payment for defense may vary between adult and juvenile crimes: in California, 90% of juvenile defenses are by court-appointed counsels or public defenders (CJSC, 2008). Also, risk assessments are more common for juveniles and after-care step-down programs may be more intensive during parole. In contrast, one factor driving down costs is that juveniles are more likely to be treated informally and—if adjudicated—placed in diversion programs rather than prisons.²⁴

Of course, any changes in criminal activity may not be fully reflected in spending. The available data is expenditure data; these yield average costs per crime. We are not able to estimate cost functions for crime and so cannot derive the marginal change in expenditure for a given change in the crime rate.²⁵ For California, there is evidence that expenditures and criminal activity are not perfectly correlated. Specifically, spending did

²⁴ There are two methodological challenges in relating juvenile and adult crime costs. First, one of the costs to victims is lost productivity measured in lost wages. But youth victims are not working, so the most sensible approach is to equate this cost in terms of lost school days. For simplicity, we assume that lost productivity and lost school days are equal. Second, a fuller measure of the costs of incarcerating juveniles is 'willingness-to-pay'. However, Nagin et al. (2006) report that citizens put higher values on rehabilitation rather than incarceration for juveniles. As such, expenditures on juvenile incarceration are an understatement of the full costs.

²⁵ Fass and Pi (2002) apply a marginal cost value equal to only 17.5% of average costs.

not fall as fast as crime did: state expenditures on juvenile corrections fell by 22% in the decade before 2006 (from \$600 million to \$470 million, 2006 dollars), but the ward population fell by more than 70%. Ultimately, costs should fall as crime falls, but the precise relationship cannot easily be predicted.

A last factor to consider is the rate of change of costs in the future. Total annual state spending in California grew by 7% between 1996 and 2006; yet spending on the criminal justice system grew by 10%. Notably, incarceration spending in California is now twice as much as it was two decades ago (real dollars). One of the reasons is healthcare of the incarcerated, which is now more extensive and costly, with spending having doubled between 2000 and 2008 (NCJJ, 2008, Livsey et al., 2009). Another reason is that staffing shortages lead to reliance on overtime payments to current staff. Moreover, current spending in California does not fully reflect the new standards for juvenile rehabilitation: Hill (2007) estimates the additional cost to provide a rehabilitative model of corrections may be 25% more than is currently spent. Costs are also likely to escalate as prison populations exceed their holding capacities. Thus, these expenditures are likely to grow in the medium term.

Given these factors, it is likely that our estimate of \$8.9 billion as the economic loss from crime per juvenile cohort in California is very conservative. The figure is also likely to grow as health care requirements for juvenile cohorts increase.

4. Link between Education and Juvenile Crime

Given the substantial losses as a result of juvenile crime, it is worthwhile to consider whether educational reforms would be effective. The link between education and juvenile crime is not easily established, not least because of the challenges in

measuring and classifying the incidence of crime noted above. Even when crime is accurately measured, there are many confounding influences, including: family circumstances, such as household income; family characteristics, such as single parenthood or whether a parent has been convicted of a crime; economic conditions and youth labor market opportunities; and the effectiveness of policing and crime prevention strategies. Many of these affect both the propensity to commit crime and to drop out of school such that isolating a single chain of causality is difficult.

However, in their review, Farrington and Welsh (2007) emphasize low attainment and cognitive scores as key determinants of juvenile crime. If education provision were of a higher quality, then juvenile crime would be lower.²⁶

Better quality education (as reflected in high school graduation) is likely to reduce juvenile crime by improving the 'social bond' with school (Spratt et al., 2005); possibly, education is associated with psychological attributes such as social control or time preference (Longshore et al., 2005; Wilson and Daly, 2006). This leads students to have: greater attachment to school; increased commitment to the value of education; and more acceptance of the authority of school. Also, attending school has a straightforward effect on displacing the opportunity to commit crime, although this may re-direct some crime to the school site. Potentially, the association between educational quality and delinquency may not be linear. Educational quality may only work in conjunction with other protective factors, may only influence lesser crimes, or it may need to be of extremely high quality in order to have any effect. Finally, it is

²⁶ Here, we exclude attainment of a GED as 'better quality': increasing the numbers of GED holders will mean a lower dropout rate, but its implications for the juvenile crime rate are unclear.

necessary to consider whether the causality is reversed, i.e., whether juvenile crime itself causes low attainment.

For adults, the empirical association between more education and less crime is strong (Farrington, 2003).²⁷ There is less evidence for juveniles, and the methodological challenges are the same. But, the association between juvenile crime and low education is found in every available study.

For juveniles aged 15-19, Levitt and Lochner (2001, Table 7.5) estimate the individual determinants of violent and property crime using the National Longitudinal Survey of Youth from 1979 (NLSY79). They find a significant influence of education, measured either as achievement or attainment. For males, a one quartile increase in the Armed Forces Qualifying Test (AFQT) score reduces the probability of committing a crime by 3-4 percent; and higher math scores reduce criminal activity, but English and mechanical skills scores do not. Being a high school graduate by age 18 is associated with reductions in property crime by 9%, violent crime by 17%, and drug-related crimes by 10% (for minor property and minor violent crimes the association is negative but not statistically significant). For females, the educational effects are generally negative but not statistically significant because they commit so few crimes.²⁸ However, these relationships are very likely to be understatements for any specific educational indicator

²⁷ Using pooled 1960-1980 Census data, FBI data, and the NLSY79, Lochner and Moretti (2004) find a strongly negative effect of high school graduation on criminal activity and incarceration. Belfield and Levin (2007a) use these estimates to calculate the costs of crime by dropouts aged over 20. Other studies testing for graduation's influence on adult crime report more mixed/weaker results: graduation does not necessarily reduce all types of crime (Grogger, 1998; Witte, 1997). Williams and Sickles (2002) find weak effects of high school graduation, but their models include graduation and years of schooling in the same model, thus identifying a "sheepskin effect" rather than educational effect. Lochner and Moretti (2004) and Arum and Beattie (1999) report strong correlations between low education and incarceration.

²⁸ Indeed, almost no economic, family background, age or race effects are identifiable as independent determinants of female criminal activity. Also, none of Lochner and Levitt's specifications explain more than 10% of the variance in criminal activity.

because they include multiple educational status measures in the same analyses (test scores and graduation probabilities).²⁹

Merlo and Wolpin (2009) focus on the 1,163 Black male juveniles in the NLSY97, i.e., youth who were aged 16-19 in 1996. Of those who were attending school at age 16, 18% have committed a crime, 12% have been arrested, and 4% are incarcerated at the ages 19-22; of those not in school at age 16, the respective arrest, crime, and incarceration figures are 31%, 27%, and 16%. Dividing the Black male population into three groups based on risk factors related to being in school, working, and arrest/incarceration rates, Merlo and Wolpin (2009) also find non-linear relationships. They estimate that not being in school at age 16 (equivalent to not graduating), significantly increases subsequent incarceration rates. For the most at-risk group, not graduating raises the probability of being incarcerated between the ages 19-22 by 8.1 percentage points; for the middle group, not graduating raises the probability by 5.6 percentage points. These groups have incarceration probabilities of 39% and 58% respectively over this brief three-year age span.³⁰

Critically, Spratt et al. (2005) find that stronger social bonds with school are powerful in preventing delinquency for all children, and in fact are more powerful for high-risk juveniles. Using longitudinal data on Canadian adolescents, they find that strong school bonds reduce rates of violent and non-violent offending, and that the impact is greater for juveniles with environmental factors that would predict a greater

²⁹ Evidence from England also shows a strongly negative relationship between education and crime amongst juveniles born in the 1980s (Sabates, 2008).

³⁰ Within the juvenile justice system, educational status may also be influential. Using data from juvenile court referrals in Maricopa County, Arizona, Rodriguez (2007) finds that 56% of juveniles attending school were detained compared to 69% of juveniles not attending school.

risk of offending. Thus, education may influence the commission of serious crimes as well as minor offenses.

For juveniles, two studies have identified the straightforward impact of attending school on the opportunity to commit crime. Notably, this impact seems to have contrasting effects on property crime and violent crime: the former is reduced simply by an 'incapacitation effect' of being in school; but the latter may be heightened because school increases interactions between youth. Using teacher training days as times when students would otherwise be in school, Jacob and Lefgren (2003) estimate that extending the school year leads to a decrease in property crimes of 14%, but an increase in violent crimes of 28%, for each extra day. Using teacher strikes as an identifier, Luallen (2006) finds stronger effects related to the number of school days: per strike day, property crime rises by 29% and juvenile crime falls by 31-36%.³¹ However, it is not clear how far these figures can be extrapolated across large numbers of extra days in school.

Testing for education–crime causality is further complicated because of simultaneity of being in school and committing crime. Poor educational performance may cause juvenile crime, but the causality may be reversed.³² Crime may cause low attainment: the criminals may be stigmatized at school, may get placed in lower quality schools or instructional programs, or may miss instructional time at school (either when perpetrating crime or incarcerated). We found five studies that report a causal path from juvenile crime to educational attainment. However, all these studies include prior achievement as a control for initial juvenile crime.

³¹ On after school programs a report by *Fight Crime: Invest in Kids* (undated, p.51) asserts a 50% reduction in violent acts and 66% drop in vandalism and stealing. But the validity of these findings cannot be established.

³² Similarly, neighborhood characteristics may be strongly co-determined with crime and poor quality education (Aizer, 2008).

Hjalmarsson (2008) estimates using the NLSY97 data source that: the average graduation rate at age 19 is 67%; but for juveniles arrested (and/or charged) before age 16 it is 61%; for juveniles arrested, charged and convicted, it is 57%; and juveniles arrested, charged, convicted, and incarcerated, it is 49%.³³ But these estimates control for prior achievement tests (as well as 'risky behaviors'). Similarly, Sweeten (2006) uses the NLSY97 and finds that a first-time arrest during high school almost doubles the odds of failing to graduate. Here too, Sweeten (2006) reports that prior academic test scores strongly predict both criminal activity and graduation. Using data from the school system in Georgia, McGarvey et al. (2008) find a strong association between school violent crimes and test scores: earlier test scores predict levels of violent crime; and violent crime predicts later test scores. Using longitudinal data on a sample of 529 at-risk adolescents (ages 13-22) in New York state, Bernburg and Krohn (2003) find that police and juvenile justice interventions—even after controlling for delinquent behavior— significantly reduce the probability of high school graduation. But, education appears to reduce the severity of the required intervention, and dropping out of high school raises (the issue of) non-employment during young adulthood (ages 19-22), which in turn is found to increase criminal activity. Lastly, Hannon (2003) uses the NLSY79 to correlate numbers of charges/arrests and delinquent behavior against the probability of dropping out. Both variables are strong influences on the probability of dropping out, but Hannon's regression specifications also control for educational aspirations and academic aptitude.

³³ The graduation rate reported by the BLS from the NLSY97 at age 19 is higher at 77%. But it presumably includes all respondents unadjusted for item response rates (<http://www.bls.gov/nls/nlsy97.htm>).

Finally, simple tabulations of the education levels of incarcerated juveniles is suggestive of the importance of education. Based on an educational survey performed in Los Angeles (LA) County, approximately 15-20% of youth who enter juvenile halls, probation camps and community day schools are classified as requiring special education services. Of the remaining youth in custody, the average reading and math levels are equivalent to fifth- to sixth grade. Across the state in 2003-04, 75% of students passed the high school exit exam; in LA County, the pass rate was 70%; but for students in LA County juvenile hall or community day school, the pass rate was 26% (LA CCPC, 2006).

In summary, it is sensible to assume that poor achievement, juvenile crime, and high school failure are co-determined. At one level, our cost calculations can be regarded as estimates of the 'overall' loss associated with juveniles who are dropouts. More compellingly, our cost calculations can be applied to educational interventions which have been established to reduce crime (see Section 6 below).

5. The Economic Losses from Low Educational Status

5.1 Juvenile Crime Economic Losses

Clearly, there are several different metrics for calibrating the education–crime relationship. Hence, there are several ways to express and calculate the fiscal and social economic losses imposed by juvenile crime and the high number of dropouts in California.

We apply three metrics, based on the results given in Levitt and Lochner (2001), Merlo and Wolpin (2009), and Sweeten (2006). Because of the way in which the results

are reported, we are not able to derive an equivalent metric for the study by Hjalmarsson (2008). From each study, we calculate the extent to which juvenile crime would be lower if a high school dropout became a high school graduate. We then calculate the value of that switch in status using our crime cost estimates summarized in Table 6. The three metrics are calculated assuming a high school dropout rate of 23% for males and 20% for females in California (see above); these rates mean 123,800 dropouts each year and a projected 819,500 dropouts in a juvenile cohort aged 12-17. No adjustments for the racial composition of juvenile crime and low education are applied; these compositional effects are already reflected in the results of each study. For each estimate we also report the one standard deviation confidence interval, also using the range of costs derived above. To get an overall single-value estimate, we take the average across the three studies.

Using Levitt and Lochner (2001), we estimate that each new high school graduate would have a crime rate 17% lower for violent crimes and 10% lower for all other crimes. This impact only occurs for males, although they are responsible for the majority of all crimes. Based on proportions from Sweeten (2006), the average male dropout causes an economic crime loss of \$6,730. Therefore, a 17% and 10% reduction in violent and other crimes if the dropout became a graduate would mean a saving per additional high school graduate of \$960.³⁴ Across all 417,940 male dropouts, the total economic loss associated with low education is therefore \$399 million (= \$960 * 417,940).

³⁴ This is calculated as follows: of the \$4,140 total, 60% is from violent crime and 40% from all other crimes. Thus, the savings across all crime is \$590 (= \$4,140 * 0.6 * 0.17 + \$4,140 * 0.4 * 0.10).

Using the Merlo and Wolpin (2009) relationship, high school dropouts cause 34% of all crimes despite being only 23% of the population, thus, they are responsible for 34% of all costs (i.e., \$3.01 billion), which amounts to \$3,670 per person. In contrast, high school graduates commit only 66% of all crimes but are 77% of the population. The economic loss per graduate amounts to \$2,040 per person. Therefore, each high school graduate saves \$1,630 (\$3,670-\$2,040) over a dropout in juvenile crime costs. Across a single juvenile cohort of 819,500 persons in California, the present value economic loss at age 12 associated with low education is \$1.33 billion.

Finally, Sweeten (2006) estimates that criminal activity of high school dropouts is twice as high as that of graduates. This yields a very similar estimate to the previous one: high school dropouts are responsible for 37% of juvenile crime (despite being only 23% of the population), and this yields a juvenile crime cost per dropout of \$4,040.³⁵ In contrast, high school graduates (and those with more education) are responsible for 63% of all crimes despite being 77% of the population; the unit 'cost' is \$2,020 and this is the saving per graduate. Across the entire juvenile cohort, the total juvenile crime loss from low education is \$1.66 billion.

These estimates of the economic losses of juvenile crime arising from low education are summarized in Table 7.³⁶ These show the reduction in the economic burden if the dropout rate in California fell by a set percent. So, a 100% fall would mean that there are no dropouts. Although implausible, this figure gives the total juvenile crime loss from low education; across the three studies it ranges from \$399 million to

³⁵ Implicit in this calculation is that dropouts commit the same types of crimes as graduates, but just commit more of them. It is possible that dropouts commit more serious crimes, such as violent assault, in which case our estimates of the economic loss are biased downward.

³⁶ To repeat, this loss is the entire juvenile criminal activity of dropouts even *before* they have dropped out of school.

\$1.66 billion with an average of \$1.13 billion and confidence interval of +/- \$170 million. This represents about 13% of the \$8.85 billion in total economic losses from juvenile crime (Table 5) and corresponds to almost 60,000 of an estimated 467,116 juvenile crimes committed in 2007 (233,558 crimes reported Table 1 times an assumed average offense multiple of two based on figures from Table 4). From an educational reform perspective, a more appropriate number might be a 20% fall in the dropout rate (from 23% to 18%). Based on the three estimates, the economic savings from such a reform across a juvenile cohort are between \$100 million and \$330 million: the average across the three estimates is \$230 million with a confidence interval of +/- \$40 million. Other sized reductions (e.g. 10% or 50%) are also shown in Table 7.

Note that these are annual figures for the cohort of persons aged between 12 and 17. Obviously, each year there is another cohort of persons aged between 12 and 17. So, from the perspective of California, the figures in Table 7 should be thought of as annual amounts. Using the perspective of a juvenile, the figures in Table 7 are the full loss incurred over the six juvenile years.

5.2 Adult Crime Economic Losses

We should also add to the costs of juvenile crime the consequential impact of associated costs of crime during adulthood.

In total, there are 1.2 million property crimes in California each year, as well as high numbers of larceny-theft, motor vehicle theft, burglary, and property crime. Per 100,000 persons in the state, there are 526 violent crimes, over 1,920 property crimes, 7 murders, and 26 rapes per year (these are reflected in the proportions of non-juvenile

crime in Table 1). As with juveniles, dropouts commit a disproportionate fraction of adult crime.

Here, we draw on our earlier estimates of the economic losses associated with low education for California (Belfield and Levin, 2007a). These earlier estimates calculated the present value loss associated with higher crime per high school dropout over the lifetime, but starting at age 20. We modify these estimates in two ways. First, we include criminal activity at ages 18-19 based on a backward extrapolation that adjusts for the relative incidence of crime at that age (i.e., we predict age-19 crime as age-20 crime plus the difference between age-20 and age-21 crime). Second, we report present values at age 12 (all figures are in 2008 dollars).

Table 8 reports the estimates for adult crime of the loss associated with low education. The total fiscal cost of crime associated with low education is substantial.³⁷ Expressed as the present value difference between the adult crime costs of a dropout as against a high school graduate, the fiscal loss associated with low education is \$24,030 (\$39,270 for males and \$8,800 for females). The social loss is even larger, at \$60,080 per dropout (\$98,160 for males and \$22,000 for females). In total, the present value lifetime loss from adult crime aged 18 onward per dropout is \$84,110 (\$137,430 for males and \$30,790 for females). This amount should be added to the juvenile crime costs to get a full life-course loss from crime by high school dropouts.

³⁷ The method used to calculate these costs is reported in full in Belfield and Levin (2007a) although it follows a similar protocol to that undertaken above. Separate costs per arrest and per crime are calculated for the five types of crime. Crime is assumed to decay with age. Costs include policing, trials and sentencing, and incarceration and costs to the government in payments to victims, based on the National Crime Victimization Survey; costs estimated by Cohen (2005) of payments from the Crime Victims Fund; costs to federal agencies committed to reducing crime (notably for the "war on drugs"); and costs estimated by MacMillan (2000) on the annual loss of tax revenues because victims are unable to work. Both federal and state costs are included. The fiscal cost of this criminal activity is \$22 billion annually in policing and judiciary expenditures, as well as \$9.3 billion in corrections expenditures (see Table 2). Social costs are estimated at 2.5 times the fiscal costs, based on a conservative ratio detailed in Belfield and Levin (2007a). The costs reported in Belfield and Levin (2007a) cannot easily be compared to those reported here: the latter are in 2008 dollars, present values aged 12, and include crime committed at ages 18-19.

Table 9 summarizes the economic loss from dropouts. The Table includes the loss from juvenile crime, adult crime, and all the other associated impacts from low education. These other impacts are detailed in full in Belfield and Levin (2007a) and include: lower earnings and tax payments associated with low education; higher welfare payments; increased payments for government-run health programs; and positive externalities from having an educated workforce.

To simplify the exposition and make sure we are adding up figures that correspond to each other, we look at the single-age cohort of children currently aged 12 in 2009 in California.³⁸ This single-age cohort group includes 136,000 dropouts, with an economic loss in terms of additional juvenile and adult crime over their high school graduate classmates. All these dropouts will impose a juvenile crime loss of \$1.13 billion and an adult crime loss of \$10.5 billion (figures in present values at age 12). The loss from juvenile crime is approximately one-tenth of the total loss as a result of low education; however, much of adult crime is committed by persons who began their criminal activities during their juvenile years. As such, a significantly high proportion of adult crime may be interpreted as 'induced' by juvenile criminal behavior. Moreover, as noted above, the juvenile years are only from ages 12-17, but the adult years are ages 18 and above, i.e., approximately 8 times as long. In addition, there are substantial other losses associated with low education: for this single age cohort, these amount to \$34.51 billion. Therefore, in total, the economic loss associated with having any high school dropouts in California is \$46.15 billion. This is a present value amount spread over the lifetime of a single cohort. Of course, each year there is a new cohort of dropouts, so the total is best interpreted as an annual loss.

³⁸ As described above, a juvenile cohort is all persons aged 12-17.

6. Policy Responses to Juvenile Crime

Clearly, the relationship between juvenile crime and education is strong and economically meaningful. Therefore, it may be appropriate to invest in educational programs to alleviate this burden. Here, simple calculations of the costs of investments in education are compared to the losses associated with juvenile crime.³⁹

Overall, there is a strong case for simply raising the quality of schooling that many students receive: that will reduce the dropout rate and so reduce the crime rate.

In an earlier study, we identified five approaches with compelling evidence that they would raise the high school graduation rate: raising teachers' salaries; reducing class size (targeted or population-wide); a whole-school reform at the high school level; and two pre-school programs. We also identified eight approaches that had promising evidence. We can compare the costs of these programs with their likely savings solely from lower rates of juvenile crime, i.e., excluding other benefits such as income or health gains.

Table 10 briefly describes each effective intervention and reports its cost per yield of one additional high school graduate (present values at age 12 using 3.5% discount rate, 2008 dollars).⁴⁰ The second column shows the percentage of these costs

³⁹ We do not consider whether improving education is more cost-effective than crime prevention or rehabilitation strategies or reforms to the criminal justice system. The effectiveness of crime prevention depends on the specifics of the program. Worrall (2004) finds no effect on juvenile arrests from the \$50 million in Challenge Grants allocated in California in 1996. Caldwell et al. (2006) estimate a 6-to-1 benefit-cost ratio from an intensive treatment program delivered to incarcerated delinquent boys. Fass and Pi (2002) calculate that, although more punitive juvenile justice does reduce crime in Texas, the costs of implementation significantly outweigh the benefits. Lastly, Cuellar et al. (2006) report on an effective mental health intervention for juvenile offenders in Texas; they estimate it reduced re-arrests within one year from 1.54 for the comparison group to 0.86 for the treatment group. However, no cost information is reported on the program. The costs and benefits of judicial and systemic reforms are reviewed in Butts and Roman (2009).

⁴⁰ These cost estimates are from our prior work (Belfield and Levin, 2007b, Table 1), although in that paper we expressed them as present values at age 20. We have also estimated the economic gains from raising math achievement (Belfield and Levin,

that would be offset by lower rates of juvenile crime. The percentage savings range from 8% to 24% for the five compelling interventions, with an average of 16%. The range is 5% to 62% for the interventions with some promise. Interventions that are implemented at the high school level (such as First Things First) cannot reduce juvenile crime until high school, and so appear less cost-effective.

The final column of Table 10 compares the cost to yield one extra graduate with the total benefits from one additional graduate. The total benefits amount is derived from Table 9, and so includes the economic consequences of juvenile crime, adult crime, and all the other impacts of education. These figures are illustrative, because they do not adjust for the time periods over which each intervention might be implemented. However, they are striking in that in all cases the benefit-cost ratios are significantly greater than 1.

Although expressed in present values, these education reforms would only pay off when youth reach the ages at which they would be likely to commit such crimes. In the case of pre-school programs, that would not be for ten years; for middle school and high school reforms the effects would be more immediate. But of course the benefits of graduating from high school extend much more broadly than reductions in juvenile crime. There are many other income and health benefits that need to be included in a full benefit-cost analysis of dropping out. From our earlier analysis, we estimate the lifetime PV benefits from age 20 at \$42,300 to California's state and local governments; the social PV benefits from age 20 onward are \$309,600 (present values at age 12 in

2009), as has Goodman (2008). An alternative metric is staying on track in terms of passing high school courses (Allensworth and Easton, 2007). However, these math gains (and 'staying on track' rates) are not easily amenable to interpretation in terms of graduation rate changes and costs per student. As noted above, we are skeptical that raising the numbers of GED-recipients will be equally effective even though it will technically reduce the dropout rate.

2008 dollars, adjusted from Belfield and Levin, 2007a). Although not large in relative terms, therefore, the savings from reductions in juvenile crime—at approximately \$8,700 per new graduate over the entire juvenile period— are not trivial. From a policy perspective it is useful to note that the savings from reduced juvenile crime are quickly realized, and so are less sensitive to the discount rate used to report cost-benefit totals. Straightforwardly, adding in these juvenile crime savings will raise the benefit–cost ratios for education reforms, giving further confirmation that these reforms have a high rate of return.

More directly, schools may combat crime by delivering educationally-based crime prevention programs. These prevention programs may then have a joint effect in raising achievement and reducing crime (Greenwood, 2008; Aos et al., 2006). It is instructive to see how much these programs cost and set this cost against the calculations of the losses associated with juvenile crime.

The most direct method for intervening is through school-based violence prevention programs. Although there is evidence that these are effective (Gottfredson et al. 2005), there are few well-established programs with prescribed inputs such that cost calculations are permissible. Based on evidence on effectiveness reviewed in the Colorado Blueprints series (Drake, 2007), two programs for middle and high school students may be feasible: *Functional Family Therapy*, which is a family-based intervention with therapists and 12 visits over a 90-day period to reduce risk factors; and *Aggression Replacement Training (ART)*, which is for youth who are likely to re-offend and may lack pro-social skills, and includes guided group discussions over a 10-week, 30-hour program for small groups of juvenile offenders. Adjusted for California prices,

and taking the average cost, the estimated per student cost for an effective violence prevention program is \$2,800.⁴¹ Also, for elementary school students, the *PATHS (Promoting Alternative Thinking Strategies) Curriculum*, which is intended to promote emotional and social competencies and reduce aggression and behavior problems, may be appropriate (Greenberg et al., 1998). Adjusted for California prices, the estimated costs for the *PATHS* curriculum materials are \$200 per elementary student. These cost figures compare favorably with the annual loss from juvenile crime; when they are compared to the lifetime economic loss imposed by a chronic juvenile offender, they are likely to yield a significantly positive rate of return.

Intensive early education programs may reduce juvenile crime. Reynolds et al. (2002) found that participants in the Chicago Child-Parent Centers program had been arrested 0.47 times before age 18; the comparison group students had arrest rates of 0.67. This 29% fall in juvenile criminal activity would translate into savings of at least \$3,420 if the program were provided to all young children (present value at age 5, 3.5% discount rate, 2008 dollars). If the Chicago program were delivered to students with a higher tendency to commit crime (our category of offenders), the savings would rise to \$14,250. Both figures compare favorably with the estimated costs of the program at \$8,100 per participant. Similar results are found for the High/Scope Perry pre-school program, as Nores et al. (2006) report significantly lower criminal activity over the life-course by participants, relative to a control group.

Finally, longer school days and after-school programs may be effective, even simply through requiring students to spend more time in school and less time out of it. The estimates from Jacob and Lefgren (2003) and Luallen (2006) reviewed above

⁴¹ This figure can be compared to the present values at age 12 if the program is delivered at that age.

suggest adding three days to the school calendar, i.e., increasing student hours in school by 1.66%. With constant economies of scale and per pupil spending of \$9,600 in California, expenditures would therefore rise by \$180 per student. More plausibly, economies of scale in terms of a few extra hours of school per student will be constant, but they would have to be very strongly decreasing to reach even \$800 or \$1,000 in additional costs. Hence, purely as a juvenile crime prevention program, longer school hours may be cost-effective. However, the effects on achievement and attendance would need to be explicitly modeled; these may be positive or negative.

Moreover, both educational investments and crime prevention interventions can be targeted. Nationally, Balfanz and Letgers (2004) have identified 'dropout factories', i.e., high schools with very high dropout rates. And the targeting can be further refined by including local demographic conditions in California, as per the analysis by Rumberger and Arellano (2007). Such targeting might also reduce the costs of interventions by concentrating it in those populations where it is likely to be most effective.

7. Conclusions

Juvenile crime is significant, both economically and socially. Each cohort of juveniles imposes a social loss of \$8.9 billion annually and even this figure is likely to be an understatement. The full economic implications of juvenile crime are hard to quantify: it affects many domains of life and absorbs resources from multiple levels of government and public and private agencies (there are also large gaps in the data, both on the crime side and on the costs side). Policy solutions are therefore hard to devise and

implement. Yet, there is compelling evidence that raising the high school graduation rate would reduce the juvenile crime rate, and there is research evidence on effective strategies to raise graduation rates. If these are implemented, there are likely to be substantial economic savings: we calculate that \$1.1 billion of the costs of juvenile crime are a result of having large numbers of high school dropouts. Furthermore, given the economic losses associated with juvenile crime, a number of educationally-based crime prevention programs should pass a cost-benefit test. If these educational investments or prevention programs are targeted at chronic offenders or those most at-risk, the presumption of benefits exceeding costs is even stronger. When we take account of the life-course patterns of crime and the rate of growth of expenditures on crime, policy solutions become more urgent still.

Finally, we should note public preferences for investing in improved education over spending on the criminal justice system. Simply, citizens would prefer to spend tax dollars on education (and or juvenile crime prevention) than on a juvenile justice and incarceration system (Nagin et al., 2006). Our economic calculations—substantial in themselves—do not take into account the extent to which the public regards poor quality education as a lost opportunity to alleviate juvenile crime.

References

- Aizer, A. 2008. Neighborhood violence and urban youth. NBER working paper no. 13771.
- Allensworth, EM and JQ Easton. 2007. What matters for staying on-track and graduating in Chicago public high schools. Consortium on Chicago School Research Working Paper, ccsr.uchicago.edu/publications/07%20What%20Matters%20Final.pdf
- Anderson, DA. 1999. The aggregate burden of crime. *Journal of Law and Economics*, XLII, 611-642.
- Aos, S, Miller, M and E Drake. 2006. Evidence-based public policy options to reduce future prison construction, criminal justice costs, and crime rates. Washington State Institute for Public Policy, www.wsipp.wa.gov/pub.asp?docid=06-10-1201.
- Arum, R and IR Beattie. 1999. High school experience and the risk of adult incarceration. *Criminology*, 37, 515-537.
- Balfanz, R and N Letgers. 2004. Locating the dropout crisis: Which high schools produce the nation's dropouts? In G. Orfield (Ed.) *Dropouts in America*. Harvard University Press: Cambridge, MA.
- Belfield, CR and HL Schwartz. 2006. The Economic Consequences of Early Childhood Education on the School System. Monograph, National Institute for Early Education Research, www.nieer.org
- Belfield, CR and HM Levin. 2007a. The Economic Losses from High School Dropouts in California. Working Paper, UC-Santa Barbara, Center for Research on Dropouts Project.
- Belfield, CR and HM Levin. 2007b. The Economic Return to Investments for Raising California's High School Graduation Rate. Working Paper, UC-Santa Barbara, Center for Research on Dropouts Project.
- Belfield, CR and HM Levin. 2009. Some Economic Consequences of Improving Mathematics Performance. Working paper, Center for Benefit-Cost Studies in Education, Teachers College, Columbia University.
- Bellair, PE, McNulty, TL. 2005. Beyond the bell curve: Community disadvantage and the explanation of black-white differences in adolescent violence. *Criminology*, 43, 4, 1135-1168.
- Bernburg, JG and MD Krohn. 2003. Labeling, life chances, and adult crime: The direct and indirect effects of official intervention in adolescence on crime in early adulthood. *Criminology*, 41, 1287-1318.

- Butts, JA and JK Roman. 2009. Juvenile crime interventions. In DL Weimer and AR Vining (Eds.) *Investing in the Disadvantaged*. Washington, DC: Georgetown University Press.
- Caldwell, MF, Vitacco, M, Van Rybroek, GJ. 2006. Are violent delinquents worth treating? A cost-benefit analysis. *Journal Of Research In Crime And Delinquency*, 43, 148-168.
- CJSC. 2008. *Juvenile Justice in California 2007*. California Department of Justice: Sacramento, CA.
- Cohen MA, Rust RT, Steen S, and ST Tidd. 2004. Willingness-to-pay for crime control programs. *Criminology*, 42, 89-109.
- Cohen, M, and A Piquero. 2009. New evidence on the monetary value of saving a high risk youth. *Journal of Quantitative Criminology*, 25, 1, 25-49.
- Cohen, MA. 2005. *The Costs of Crime and Justice*. Routledge: New York.
- Cook, PJ, Laub, JH. 2002. After the epidemic: Recent trends in youth violence in the United States. *Crime And Justice: A Review Of Research*, 29, 1-37.
- Cuellar, AE, McReynolds, LS, Wasserman, GA. 2006. A cure for crime: Can mental health treatment diversion reduce crime, among youth? *Journal Of Policy Analysis And Management*, 25, 197-214.
- Cutler, D, Glaeser, EL and KE Norberg. 2001. Explaining the rise in youth suicide. In J Gruber (Ed.) *Risky Behavior among Youths. An Economic Analysis*. University of Chicago Press: Chicago.
- Decker, SH, Katz, CM, Webb, V. 2008. Understanding the black box of gang organization - Implications for involvement in violent crime, drug sales, and violent victimization. *Crime & Delinquency*, 54, 1, 153-172.
- Delisi, M and JM Gatling. 2003. Who pays for a life of crime? An empirical assessment of the assorted victimization costs posed by career criminals. *Criminal Justice Studies: Critical Journal of the Criminal Law Society*, 16, 283-293.
- Dinkes, R, Cataldi, EF and W Lin-Kelly. 2007. *Indicators of School Crime and Safety: 2007*. NCES, Institute of Education Sciences, U.S. Department of Education: Washington, DC.
- Drake, E. 2007. Evidence-Based Juvenile Offender Programs: Program Description, Quality Assurance, and Cost. WSIPP Report, www.wsipp.wa.gov/rptfiles/07-06-1201.pdf
- Farrington, D., and B Welsh. 2007. *Saving Children From a Life of Crime*. New York: Oxford University Press.

- Farrington, DP, Jolliffe, D, Hawkins, JD, Catalano, RF, Hill, KG, and Kosterman, R. 2003. Comparing delinquency careers in court records and self-reports. *Criminology*, 31, 933-958.
- Fass, SM, and CR Pi. 2002. Getting tough on juvenile crime: An analysis of costs and benefits. *Journal Of Research In Crime And Delinquency*, 39, 363-399.
- Fellmeth, RC. 2005. California Children's Budget, 2004-05. Monograph, Children's Advocacy Institute, <http://www.cachildlaw.org/childrens-budget.htm>.
- Fight Crime: Invest in Kids California (undated). *California's After-School Choice: Juvenile Crime or Safe Learning Time*. Retrieved June 2 2009 from www.fightcrime.org/reports/ca-as.pdf.
- Ford, JA. 2005. The connection between heavy drinking and juvenile delinquency during adolescence. *Sociological Spectrum*, 25, 629-650.
- Goodman, J. 2008. The labor of division: Returns to compulsory math coursework. Working paper, Columbia University.
- Gottfredson, DC, Gerstenblith, SA, Soule, DA, Womer, SC, Lu, SL. 2004. Do after school programs reduce delinquency? *Prevention Science*, 5, 253-266.
- Gottfredson, DC, Soule, DA. 2005. The timing of property crime, violent crime, and substance use among juveniles. *Journal Of Research In Crime And Delinquency*, 42, 110-120.
- Gottfredson, GD, Gottfredson, DC, Payne, AA, and NC Gottfredson. 2005. School climate predictors of school disorder: Results from a national study of delinquency prevention in schools. *Journal of Research in Crime and Delinquency*, 42, 412-444.
- Graham, S, Bellmore, A and J Mize. 2006. Peer victimization, aggression, and their co-occurrence in middle school: Pathways to adjustment problems. *Journal of Abnormal Child Psychology*, 34, 363-378.
- Greenberg, MT, Kusché, C and SF Mihalic. 1998. Promoting Alternative Thinking Strategies (PATHS): Blueprints for Violence Prevention, Book Ten, University of Colorado.
- Greenwood, P. 2008. Prevention and intervention programs for juvenile offenders. *Future Of Children*, 18, 185-210.
- Grogger, J. 1998. Market wages and youth crime. *Journal of Labor Economics*, 16, 756-791.
- Hannon, L. 2003. Poverty, delinquency, and educational attainment: Cumulative disadvantage or disadvantage saturation? *Sociological Inquiry*, 73, 575-594.

- Harlow, JW. 2003. Education and corrections populations. Bureau of Justice Statistics, www.ojp.usdoj.gov/bjs/pub/pdf/ecp.pdf.
- Hill, EG. 2007. California's Criminal Justice System: A Primer. Legislative Analyst's Office, State of California, Sacramento.
- Hennigan, K, Kolnick, K and J Poplawski. 2007. Phase 1: Survey of Interventions and programs: A continuum of graduated responses for juvenile justice in California. Working Paper, http://www.cdcr.ca.gov/Reports_Research/docs/JJDPSurveyFinalReport.pdf.
- Hjalmarsson, R. 2008. Criminal justice involvement and high school completion. *Journal Of Urban Economics*, 63, 2, 613-630.
- Jacob BA, and L Lefgren. 2003. Are idle hands the devil's workshop? Incapacitation, concentration, and juvenile crime. *American Economic Review*, 93, 1560-1577.
- Johansson, P, and K Kempf-Leonard. 2009. A gender-specific pathway to serious, violent, and chronic offending? Exploring Howell's Risk Factors for Serious Delinquency. *Crime & Delinquency*, 55, 216-240.
- LA CCPC. 2006. *Youth in the Los Angeles County Juvenile Justice System: Current Conditions and Possible Directions for Change*. Monograph, United Way LA.
- Legislative Analyst's Office (LAO). 2009. *1009-10 Budget Analysis Series: Judicial and Criminal Justice*. Monograph, LAO: Sacramento, CA.
- Levitt, SD and L Lochner. 2001. The determinants of juvenile crime. In J Gruber (Ed.) *Risky Behavior among Youths. An Economic Analysis*. University of Chicago Press: Chicago.
- Livsey, S, Sickmund, M and A Sladky. 2009. Juvenile Residential Facility Census, 2004: Selected Findings. Office of Justice Programs, www.ncjrs.gov/pdffiles1/ojjdp/222721.pdf
- 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.
- Longshore, D, Chang, E, Messina, N. 2005. Self-control and social bonds: A combined control perspective on juvenile offending. *Journal Of Quantitative Criminology*, 21, 419-437.
- Luallen, J. 2006. School's out... forever: A study of juvenile crime, at-risk youths and teacher strikes. *Journal of Urban Economics*, 59, 75-103.

- McGarvey, MG, Smith, WJ and MB Walker. 2008. The joint determination of test scores and school and neighborhood crime. Working paper, University of Nebraska–Lincoln.
- Martin, D, Martin, M, Dell, R, Davis, C, Guerrieri, K. 2008. Profile of incarcerated juveniles: comparison of male and female offenders. *Adolescence*, 43, 607-622.
- Merlo, A and KI Wolpin. 2009. The transition from school to jail: Youth crime and high school completion among black males. Working Paper, University of Pennsylvania.
- Miller, TR, Fisher, DA, and MA Cohen. 2001. Costs of juvenile violence: Policy implications. *Pediatrics*, 107, 1, e3.
- 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.
- Nagin, D., Piquero, A., Scott, E., and Steinberg, L. 2006. Public preferences for rehabilitation versus incarceration of juvenile offenders: Evidence from a contingent valuation survey. *Crime and Public Policy*, 5, 301-326.
- National Center for Juvenile Justice (NCJJ). 2008. 'California'. State Juvenile Justice Profiles. Pittsburgh, PA: NCJJ.
- Neiman, S and JF DeVoe. 2009. Crime, Violence, Discipline and Safety in U.S. Public Schools: Findings from the School Survey on Crime and Safety 2007-08. National Center for Educational Statistics, U.S. Department of Education: Washington, DC.
- Nores, M, Belfield, CR, Barnett, WS and L Schweinhart. 2006. Updating the economic impacts of the High/Scope Perry Preschool program. *Educational Evaluation and Policy Analysis*, 27, 245-261.
- Pew Center on the States. 2009. One in 31: The Long Reach of American Corrections. Washington, DC: The Pew Charitable Trusts.
- Rainone, GA, Schmeidler, J, Frank, B and RB Smith. 2006. Violent behavior, substance use, and other delinquent behaviors among middle and high school students. *Youth Violence and Juvenile Justice*, 4, 247-265.
- Ramchand, R, MacDonald, JM, Haviland, A, Morral, AR. 2009. A Developmental Approach for Measuring the Severity of Crimes. *Journal Of Quantitative Criminology*, 25, 129-153.
- Reynolds, AJ, Temple, JA, Robertson, DL, Mann, EA. 2002. Age 21 cost-benefit analysis of the Title I Chicago Child-Parent Centers. *Educational Evaluation And Policy Analysis*, 24, 267-303.

- Rodriguez, N. 2007. Juvenile court context and detention decisions: Reconsidering the role, of race, ethnicity, and community characteristics in juvenile court, processes. *Justice Quarterly*, 24, 629-656.
- Rothstein, R. 1995. *Where's the Money Gone?* Washington, DC: Economic Policy Institute.
- Rumberger, R and B Arellano. 2007. Student and school predictors of high school graduation in California. Working Paper, UC-Santa Barbara, Center for Research on Dropouts Project.
- Russell, K, Dryden, DM, Liang, YY, Friesen, C, O'Gorman, K, Durec, T, Wild, TC, Klassen, TP. 2008. Risk factors for methamphetamine use in youth: a systematic review. *Pediatrics*, 8, 48.
- Sabates, R. 2008. Educational attainment and juvenile crime. *British Journal Of Criminology*, 48, 3, 395-409.
- Sprott, JM, Jenkins JM, and AN Doob. 2005. The importance of school: protecting at-risk youth from early offending. *Youth Violence and Juvenile Justice*, 3, 59-77.
- Sweeten, G. 2006. Who will graduate? Disruption of high school education by arrest and court involvement. *Justice Quarterly*, 23, 4, 462-480.
- Tracy, PE, Kempf-Leonard, K, and S Abramoske-James. 2009. Gender differences in delinquency and juvenile justice processing, evidence from national data. *Crime & Delinquency*, 55, 171-215.
- Watkins, AM, Huebner, BM, and SH Decker. 2008. Patterns of gun acquisition, carrying, and use among juvenile and adult, arrestees: evidence from a high-crime city. *Justice Quarterly*, 25, 674-700.
- Welsh, BC, Loeber, R, Stevens, B, Stouthamer-Loeber, M, Cohen, MA and DP Farrington. 2008. Costs of juvenile crime in urban areas: a longitudinal perspective. *Youth Violence and Juvenile Justice*, 6, 3-27.
- Williams, J and RC Sickles. 2002. An analysis of the crime as work model: Evidence from the 1958 Philadelphia Birth Cohort Study. *Journal of Human Resources*, 37, 479-509.
- Wilson, M, and M Daly. 2006. Are juvenile offenders extreme future discounters? *Psychological Science*, 17, 989-994.
- Witte, AD. 1997. Crime. In J Behrman and N Stacey (Eds). *The Social Benefits of Education*. Ann Arbor, MI: University of Michigan.

Woodhams, J, Gillett, R, Grant, T. 2007. Understanding the factors that affect the severity of juvenile stranger, sex offenses - The effect of victim characteristics and number of, suspects. *Journal Of Interpersonal Violence*, 22, 218-237.

Worrall, JL. 2004. Funding collaborative juvenile crime prevention programs - Does it make a difference? *Evaluation Review*, 28, 471-501.

Table 1
Juvenile arrests and percent of all arrests in California (2007)

	(1) Total arrests of persons aged under 18	(2) Aged under 18 % of all arrests
Total¹	233,558	15%
Violent crime²	17,416	14%
Property crime³	45,662	28%
Curfew and loitering law violations	21,126	100%
Runaways	4,189	100%
Disorderly conduct	11,835	71%
Arson	860	56%
Vandalism	16,887	49%
Robbery	6,721	32%
Larceny-theft	26,331	30%
Burglary	13,908	26%
Weapons; carrying, possessing, etc.	8,597	26%
Liquor laws	5,579	26%
Other assaults	22,086	25%
Motor vehicle theft	4,563	20%
Stolen property; buying, receiving, possessing	3,301	17%
Sex offenses (except forcible rape and	2,256	15%
All other offenses (except traffic)	2,118	13%
Murder and non-negligent manslaughter	235	12%
Forcible rape	239	11%
Gambling	78	11%
Aggravated assault	10,221	10%
Embezzlement	184	8%
Drug abuse violations	22,047	8%
Vagrancy	310	8%
Fraud	597	6%
Prostitution and commercialized vice	584	5%
Drunkenness	4,638	4%
Forgery and counterfeiting	320	3%
Offenses against the family and children	12	3%
Driving under the influence	1,626	1%

Source: FBI, UCR 2007, Table 69. Notes: ¹ Does not include traffic arrests. ² Violent crimes are offenses of murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault. ³ Property crimes are offenses of burglary, larceny-theft, motor vehicle theft, and arson.

Table 2
Expenditures by the California Department of Corrections and Rehabilitation (Fiscal Year, 2007)

Program	Expenditure (\$ millions)
Juvenile Operations	\$208
Juvenile Education, Vocations, and Offender Program	\$178
Juvenile Paroles	\$37
Juvenile Healthcare	\$100
Juvenile total:	\$523
Adult Corrections and Rehabilitation Operations	\$5,293
Correctional Health Care Services	\$1,787
Parole Operations and Board of Parole Hearings - Adult	\$918
Education, Vocations and Offender Programs - Adult	\$457
Administration / unallocated / other	\$450
Corrections Standards Authority	\$351
Total:	\$9,777

Source: California Department of Corrections and Rehabilitation,
www.cdcr.ca.gov/Budget/Budget_Overview.html

Table 3
CJS and Incarceration Costs from Juvenile Crime in California (2007)

Component	Expenditure (\$ millions)
Current estimates:	
State-level policing and CJS	\$1,800
County-level policing and CJS	\$810
Incarceration	\$523
Total	\$3,133
Alternative estimates:	
Fellmeth (2005) adjusted with incarceration:	\$2,723
Fass and Pi (2002) adjusted with incarceration:	\$1,603
Miller et al. (2001) adjusted for all felony offenses	\$1,070

Sources: California Department of Corrections and Rehabilitation, www.cdcr.ca.gov/Budget/Budget_Overview.html. Calculations by authors.

Table 4
Total Costs to Victims from Juvenile Crimes in California (2007)

	(1) Offense multipl e	(2) Victim costs per crime	(3) Total victim costs (\$ millions)
Curfew and loitering law violations ^{ab}	2	\$3,412	136
Runaways ^{ab}	2	\$3,412	27
Disorderly conduct ^{ab}	2	\$3,412	76
Arson	2.85	\$63,966	148
Vandalism ^a	2.05	\$3,412	111
Robbery	1.4	\$13,646	121
Larceny-theft ^b	2.9	\$631	45
Burglary	1	\$2,388	31
Weapons; carrying, possessing, etc. ^{ab}	2	\$3,412	55
Liquor laws ^{ab}	2	\$3,412	36
Other assaults	2.85	\$16,034	952
Motor vehicle theft	1.475	\$6,311	40
Stolen property; buying, receiving	2	\$3,412	21
Sex offenses (excl. forcible rape,	2.85	\$114,285	693
All other offenses (except traffic) ^{ab}	2	\$3,412	14
Murder and nonnegligent	1	\$5,014,91	1112
Forcible rape	2.85	\$148,400	95
Gambling ^{ab}	2	\$3,412	1
Aggravated assault	2.85	\$40,938	1,125
Embezzlement ^{ab}	2	\$3,412	1
Drug abuse violations ^{ab}	2	\$3,412	142
Vagrancy ^{ab}	2	\$3,412	2
Fraud ^{ab}	2.9	\$3,412	6
Prostitution and commercialized vice ^b	2	\$148,400	164
Drunkenness ^{ab}	2	\$3,412	30
Forgery and counterfeiting ^{ab}	2	\$3,412	2
Offenses against the family and	2	\$56,290	1
Driving under the influence ^b	2	\$30,704	94
Total			\$5,282

Notes: Offense multiples adjusted from Farrington et al. (2003) bounded at 1; crimes denoted ^b are from 'other crime type'. Victim costs per crime adjusted to California prices from Miller et al. (1996); crimes denoted ^a are assumed to cost that of robbery with no injury. Column 3 calculated as product of columns (1), (2) and column (1) from Table 1. CPI adjustment of inflation (49%). California cost-of-living adjustment (8%). Figures expressed in 2008 dollars.

Table 5
Total Economic Losses from Juvenile Crime in California (2007, \$ millions)

	CJS plus incarceration	Victim Costs	School-site costs	Total
Baseline	\$3,130	\$5,280	\$450	\$8,850
47 sensitivity tests:				
Average	\$2,130	\$4,580	\$800	\$7,510
Standard deviation				\$1,380

Notes: CJS plus incarceration costs from Table 3. Victim costs from Table 4. Sensitivity tests: Victim costs: Assume crimes denoted ^a incur 50% lower costs; Victim costs: Assume crimes denoted ^b have offense multiple of 3; Victim costs: Apply offense multiples one-quarter of those in Farrington et al. (2003) directly; fiscal costs from range given in Table 3; school-site costs based on upper bound estimates by Rothstein (1995) and Belfield and Schwartz (2006); estimate only 25% of schools pay compensating wage differential. Figures in 2008 dollars rounded to nearest \$10 million.

Table 6
Per Youth Economic Loss from Juvenile Crime in California (2008)

	Average per youth	Average per offender	Average per chronic offender
Annual amount:			
Overall mean	\$2,480	\$10,350	\$62,110
(Range)	(\$2100-\$2870)	(\$8740-\$11970)	(\$52430-\$71790)
Male	\$4,140	\$17,250	\$103,520
(Range)	(\$3500-\$4790)	(\$14560-\$19940)	(\$87380-\$119660)
Female	\$760	\$3170	\$19,010
(Range)	(\$640-\$880)	(\$2700-\$3660)	(\$16050-\$21980)
Present value at age 12 across all juvenile years:			
Overall mean	\$14,680	\$61,160	\$366,940
(Range)	(\$12390-\$16970)	(\$51620-\$70690)	(\$309740-\$424150)
Male	\$24,460	\$101,930	\$611,570
(Range)	(\$20650-\$28280)	(\$86040-\$117820)	(\$516230-\$706910)
Female	\$4,490	\$18,720	\$112,330
(Range)	(\$3800-\$5200)	(\$15800-\$21640)	(\$94820-\$129840)

Notes: Total economic loss from Table 5, column 4. Assumes zero crime until age 12. Offenders assumed to be 12% of all juveniles; chronic offenders 2% of all juveniles. Males assumed to commit 85% of offenses. Juvenile span is ages 12 through 17. Range is plus and minus one standard deviation in costs. Present values are expressed at age 12 using a 3.5% discount rate. Figures in 2008 dollars rounded to nearest \$10.

Table 7
Economic Losses from Juvenile Crime From Low Education in California (2008)

	Economic Loss from Juvenile Crime per Cohort (\$ millions)			
	Method (a)	Method (b)	Method (c)	Average of Methods (a)- (c)
Fall in dropout rate:				
100% (Range)	\$399 (\$230-\$380)	\$1,334 (\$1,130-\$1,540)	\$1,655 (\$1,400-\$1,910)	\$1,129 (\$960-\$1,300)
50% (Range)	\$200 (\$180-\$220)	\$667 (\$560-\$770)	\$827 (\$700-\$960)	\$565 (\$510-\$650)
20% (Range)	\$100 (\$80-\$120)	\$267 (\$230-\$310)	\$331 (\$280-\$380)	\$226 (\$190-\$260)
10% (Range)	\$50 (\$40-\$60)	\$133 (\$110-\$150)	\$165 (\$140-\$190)	\$113 (\$100-\$140)

Notes: Method (a) adapts estimates from Levitt and Lochner (2001); Method (b) adapts estimates from Merlo and Wolpin (2009); and Method (c) adapts estimates from Sweeten (2006). Range is plus and minus one standard deviation of cost estimates, rounded to nearest \$10 m. Figures in 2008 dollars.

Table 8
Economic Losses from Adult Crime From Low Education in California (2008)

Present Value Economic Loss from Adult Crime per Dropout			
	Fiscal loss	Social loss	Total loss
Average	\$24,030	\$60,080	\$84,110
Male	\$39,270	\$98,160	\$137,430
Female	\$8,800	\$22,000	\$30,790

Notes: Present value at age 12 using discount rate of 3.5%. Figures in 2008 dollars.

Table 9
Economic Losses from Juvenile Crime and Adult Crime From Low Education in California

	Present Value at age 12 for the cohort of 12-year-olds in 2009			
	(\$ millions)			
	Juvenile Crime	Adult Crime	All Other Benefits	Total
Fall in dropout rate:				
100%	\$1,130	\$10,510	\$34,510	\$46,150
50%	\$570	\$5,260	\$17,250	\$23,080
20%	\$230	\$2,100	\$6,900	\$9,230
10%	\$110	\$1,050	\$3,450	\$4,620

Notes: Juvenile crime figures from Table 7, column 5. Adult crime figures from Table 8 times number of dropouts each year. All other benefits from Belfield and Levin (2007a, Table 18): these are monetized gains from additional income and health, as well as positive externalities from a more productive workforce and lower welfare payments. Present values are expressed at age 12 using a 3.5% discount rate. Figures in 2008 dollars rounded to nearest \$10.

Table 10
Possible Interventions to Raise the Rate of High School Graduation in California

		Costs per additional graduate	Percent of intervention costs offset by savings in juvenile crime	Ratio of costs to total benefits
<u>Interventions demonstrated to raise the graduation rate:</u>				
CPC	Chicago-Child Parent Center program	\$36,940	24%	7.47
TSI	Increasing teacher salaries by 10% for the K-12 years	\$50,150	17%	5.51
PPP	High/Scope Perry Pre-school Program	\$56,880	15%	4.85
FTF	First Things First high school reform	\$29,720	15%	9.30
CSR - minorities	Reducing class sizes in elementary school for minority students only (Project STAR)	\$62,920	14%	4.39
CSR – population	Reducing class sizes in elementary school for all students (Project STAR)	\$102,970	8%	2.68
<u>Interventions with some promise to raise the graduation rate:</u>				
TAS	Talent Search	\$6,990	62%	39.51
CAC	Career academies for high school students	\$14,290	30%	19.32
SUM	Summer school	\$26,810	22%	10.30
C&C	Check & Connect high school reform	\$23,860	18%	11.57
ALAS	Achievement for Latinos through Academic Success	\$50,300	9%	5.49
12T	Twelve Together	\$64,140	7%	4.30
SFA	Success for All school reform	\$136,310	6%	2.02
IHD	I Have A Dream program	\$159,930	5%	1.73

Notes: For details on each program, see Belfield and Levin (2007b). Juvenile crime savings per graduate \$8,700 for reforms before high school; \$4,350 for reforms during high school (using Method (b)). Costs per additional graduate are present values at age 12. Present values expressed using a discount rate of 3.5%. 2008 dollars rounded to nearest \$10.