Examining the Long-Term Effects of Afterschool Programming on Juvenile Crime: A Study of the LA's BEST Afterschool Program

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Abstract: This article examines the extent to which participation in a large urban afterschool program had an impact on reducing participants' future juvenile crime rate. The research tracked the academic and juvenile crime histories for a sample of 6,000 students, including 2,000 participants in LA's BEST and 4,000 matched control students not participating in the program. Multilevel propensity scores were used to match control to treatment students, and applied to multilevel longitudinal models and multilevel survival analyses methods to analyze the data. Results indicate that LA's BEST positively impacted the probability of juvenile crime. Furthermore, analyses indicated that students who were actively and intensely engaged benefited the most from the program.

Keywords: afterschool, juvenile crime, resiliency

Over the past few years, there has been an increased interest in understanding the impact of afterschool programming on positive youth development. Numerous research studies have investigated the short-term impact of afterschool programming on students' academic and social development, but there is limited research on the long-term effectiveness in lowering juvenile crime rates. Given that afterschool programs have demonstrated many potential positive effects on juveniles (Durlak/Weissberg, 2007; Snyder/Sickmund, 2006); and considering that the annual cost of juvenile crime is estimated to be approximately $56.7 billion (Caldwell/Vitacco/Van Rybroek, 2006), the impact of these programs on juvenile crime warrants further analysis. This study intends to reduce the research gap by examining the long-term impact of participation in afterschool programs and juvenile crime by using LA's BEST (Los Angeles' Better Educated Students for Tomorrow), the largest afterschool program in Los Angeles County, as a representative sample. Accordingly, the research question for this study is: Does participation in LA's BEST have a long-term impact in influencing participants' future juvenile crime rate?

This study also extends the literature on the impact of afterschool programs on juvenile crime in two key ways. First, the analyses explicitly models individual crime trajectories longitudinally for 10 years; and second, it uses a large sample of almost 6,000 students. Given that LA's BEST primarily serves at-risk students in a large urban area, the study results may also be generalized to other large urban afterschool settings as well. As such, the findings of this study on the long-term effects of LA's BEST on juvenile delinquency will be particularly salient for various stakeholders such as policymakers, law enforcement officials, and educators.

1 Do Afterschool Programs Help Prevent Delinquency?

Research literature indicates that there are a multitude of risk factors associated with juvenile delinquency, and these risks are present in the lives of many urban children and adolescents. For example, adverse or punitive environments in home, community, and school can contribute to antisocial behaviors such as aggression, vandalism, rule infractions, defiance of adult authority, and other violations of social norms (Case/Haines, 2009). To counter juvenile delinquency, Siegel and Welsh (2008) affirm that youth need to have access to protective buffers that will decrease the likelihood of them engaging in problematic antisocial and anti-school behaviors and increase the likelihood of them developing into competent and successful adolescents. Researchers have further declared that youth with access to resources, particularly for those in adverse environments, can develop resiliency and competency skills (Durlak/Weissberg, 2007).

As such, afterschool programs may be beneficial to student resiliency and the prevention of juvenile delinquency in three critical ways. First, afterschool programs provide participants with supervision during a time when they might normally fall prey to deviant or antisocial behaviors (The Afterschool Alliance, 2007). Secondly, afterschool programs provide experiences that may benefit students' social skills and classroom conduct. Students who participate in quality afterschool programs exhibit better behavior in school, higher academic achievement, better social skills, better self-control, and improved self-confidence through the development of positive relationships with adults and peers (Lauer et al., 2006). Finally, afterschool programs may help improve academic achievement and reduce student truancy, which is a key predictor of juvenile delinquency (George/Cusick/Wasserman/Gladden, 2007; Russell/Mielke/Miller/Johnson, 2007). Students who participate in these programs often are more positive about school and their own schoolwork, and are more likely to have ambitions to graduate from high school and attend college (New York State Afterschool Network, 2009).

Evidence of Support

A study conducted by Posner and Vandell in 2008 found that attending a formal afterschool program was associated with better academic achievement and social adjustment in comparison to other types of afterschool care. Students who participated in formal programs spent more time in academic activities and enrichment lessons and less time watching TV and playing outside unsupervised. In another study conducted by Nears in 2007, they found that high school participants in the Wake County Super Opportunities with Afterschool Resources program significantly outperformed students who were not involved in the program, or who attended infrequently, in end-of-course academic scores. Furthermore, the group effect appeared to be greater for African Americans than for European American students. The study provided evidence that a well-designed afterschool program that focuses on increasing students‘ resiliency by building their academic skills, their sense of belonging, their sense of usefulness, and their personal potency can close the achievement gap between African Americans and European Americans and can yield positive results for all students involved.

Based on this evidence, this study sets out to examine the long-term impact of participation in afterschool programs and its effect on students' resiliency against juvenile crime. The participants in LA's BEST were used as a representative sample. First, a brief description of the LA's BEST program is provided.

2 LA's BEST – The Program

LA's BEST was first implemented in the fall of 1988. The program is under the auspices of the mayor of Los Angeles, the superintendent of the Los Angeles Unified School District (LAUSD), a board of directors, and an advisory board consisting of leaders from business, labor, government, education, and the community.

LA's BEST seeks to provide a safe haven for at-risk students in neighborhoods where gang violence, drugs, and other types of antisocial behaviors are common. Since its inception in 1988, LA's BEST has adapted and updated their goals in response to educational policies, research, and theory. Over the years, the program has moved past its initial emphasis on providing a safe environment and educational enrichment to an emphasis on the development of the whole child (Hodgkinson, 2006) by centering on activities to enhance students' intellectual, social-emotional, and physical development. The program is housed at selected LAUSD elementary schools and is designed for students in kindergarten through fifth/sixth grade.

LA's BEST is a free program open to all students in the selected sites on a first-come, first-serve basis. These sites are chosen within LAUSD based on certain criteria, such as low academic performance and their location in low-income, high-crime neighborhoods. LA's BEST served a student population of approximately 30,000, with about 80% Hispanic and about 12% Black elementary students. English language learners comprise at least half of the student population at most sites. Of this population, the majority's primary language is Spanish, while the other percentage of the English learner population is composed of those whose first language is of Asian/Pacific origin.

3 Study Design

This study utilized a quasi-experimental design that consisted of a longitudinal sample of both demographic and juvenile crime data. The sample was composed of 2,331 students from LA's BEST programs, 2,331 matched students who attended the same schools as those in the LA's BEST programs but did not participate in LA's BEST, and 1,237 matched students who attended schools that had no LA's BEST program. The base years for these students were 1994–95, 1995–96, and 1996–97. Hierarchical survival analysis was applied to crime outcomes. LA's BEST students were compared to non-LA's BEST students. Moderating factors such as gender, race/ethnicity, language proficiency, and socioeconomic status (SES) and potential programmatic mediating factors were examined.

Data Analysis Methods

Propensity scoring methods were used to sample comparable control schools and control students. A Multilevel Discrete-Time Hazard (MDTH) Model was employed to estimate hazard functions and survival probabilities.

The importance and advantages of using multilevel analyses in program evaluations have been discussed in Seltzer (2004) and Raudenbush and Bryk (2002) for cross-sectional designs, and in Singer and Willett (2003) for longitudinal studies. The important aspect to consider is that students are clustered within schools and do not represent independent observations. This clustering leads to underestimation of standard errors and misconceptions in interpretation when analysis examines multiple levels of data (Burstein, 1980). To counter this aspect, survival models with hazard functions were utilized in this study within the general framework of hierarchical (random coefficient) models. This allowed the study to handle multiple levels of data efficiently.

This study follows the modeling steps outlined in Singer and Willett (2003) and Barber, Murphy, Azinn, and Maples (2000). The basic MDTH model then takes the following form:

LEVEL 1 MODEL

$$\text{Prob}(\text{CRIME3} = 1|\beta) = \varphi$$

$$\text{Log}[\varphi/(1 - \varphi)] = \eta$$

$$\eta = \beta_0 + \beta_1(\text{YEAR}) + \beta_2(\text{YEARSQR})$$

LEVEL 2 MODEL

$$\beta_0 = \gamma_{00} + u_0$$

$$\beta_1 = \gamma_{10} + u_1$$

$$\beta_2 = \gamma_{20}$$

The natural log likelihood function was used to estimate parameters of interest (Singer/Willett, 2003). In this study, the basic specification included two terms to track time: year and year squared. This allows the study to model a non-linear hazard function. The fitting of this model to the actual hazard is presented in the results section. The effect of both intercept and time were specified as being random or varying across schools.

The level 2 model allows the study to examine whether there is significant variation among schools in the hazard function. The final parameterized model includes both student and school-level covariates, and is specified in the appendix.

Methodology Limitation

Given students were not randomly assigned to the afterschool program, the consistency of estimated treatment effects depends critically on the matching procedures used. The details of the sampling and matching strategies are listed in the following sections.

Constructing the Data Set

The study sample was constructed from the LA's BEST student dataset that the study team collected and stored since the 1992–93 school year. The first step in building the study sample consisted of generating a sampling frame. The structure of this sampling frame was determined by examining historical records and tracking all available information for all students from the 1994–95 school year through the 2002–2003 school year.

Additionally, contextual changes in schools and communities were considered. The 1990 census data were used to examine the neighborhoods of the treatment and control schools. In combination with detailed analyses of the LAUSD student database, data from the National Center for Education Statistics and Los Angeles School Police data for the same period were also examined. This analysis of demographic changes over the past 10 years allowed the study to account for potential school and community factors, to provide additional information from aggregated student characteristics, and to consider how these factors had changed over time.

Selecting the Treatment Students

It was very important to establish a sample that carefully matched students who attended LA's BEST with those who did not attend LA's BEST so that valid inferences could be generated. To reduce biases from potential confounding factors, propensity score matching methods were used. The following steps were taken to analyze and construct the study sample:

First, participants in LA's BEST were identified. For school sites that operate 9 months out of the school year, the maximum number of days for possible program attendance was 180 days and 240 days for year-round schools. Upon examination of the students' attendance patterns, results indicated that many students participated sparingly and then dropped out of the program. In order to define and identify "treated" student participants, a criteria was set so that students had to attend the program at least one day per week (i.e., 36 days per school year) so as to be considered treated students. Table 1 shows descriptive statistics of the students.

Table 1. *Descriptive Statistics of Attendance in the LA's BEST Afterschool Program*

	Days of attendance				
School year	N	Mean	SD	Min	Max
1991	462	32.8	32.7	0	154
1992	282	12.9	5.7	0	20
1993	4,364	29.7	32.0	0	205
1994	7,109	62.9	48.1	0	203
1995	8,438	75.5	58.4	0	240
1996	9,028	76.6	58.4	0	240
1997	7,338	67.6	46.8	0	195
1998	---	---	---	---	---
1999	---	---	---	---	---
2000	20,451	83.0	61.9	0	240
2001	25,440	90.1	65.7	0	240
2002	32,478	118.1	63.2	1	240

Note. Missing data in 1998 and 1999.

Another consideration was the number of years students participated in the program. Given that students could participate in the program from one to five years (e.g., first through fifth grade), students were tracked for five years in this study to obtain an accurate representation of program attendance. Finally, only students that attended the program in the same schools were selected. This consideration was important in avoiding cross-classification problems since the quality of program implementation likely varied from school to school. These restrictions, along with the goal of being able to follow the students through high school, restricted the sampling frame of treatment students to the 24 LA's BEST school sites that implemented the afterschool program in the years of 1994 through 1996.

Based on these considerations, two cohorts were identified. The first cohort was composed of 1,692 students who attended the afterschool program in the same school beginning in 1993–94 when students were in the first grade. The second cohort was composed of 1,596 students who attended the program in the same school beginning in 1992–93 when students were also in first grade. The total sample of the two cohorts of students was 3,288. The counterfactual, or control group, consisted of two sets of students: non LA's BEST participants attending the same school as the LA's BEST participants and students attending comparable schools without the LA's BEST program.

Given that students can attend the LA's BEST program for up to 5 years and between 36 to 240 days within each year, both the number of years and days attended needed to be accounted for in order to measure the level of individual exposure to the program. Three definitions were set up in this study: exposure was defined as the number of years a student attended LA's BEST; intensity was defined as the total number of days a student attended LA's BEST; and engagement was defined as the average number of days per year that a student attended LA's BEST.

Selecting the Control Students at the Same School

The following criteria were used to select the control students within the treatment schools:

Using the same 24 schools, "potential" control students from the same years and grade levels were selected. Propensity scores were estimated separately for each grade and year using a Multilevel Logistic Model.

Once the propensity score was estimated, each treated student was matched to a student from his or her own elementary school. Since the treatment and control conditions shared a series of characteristics within each school (e.g., individual characteristics such as SES, race/ethnicity, achievement, and language proficiency, and school characteristics such as school policies, facilities, and amount of resources), approximately 40 student-level and 21 school-level variables were used in the propensity models. As stated by Shadish, Clark, and Steiner (2008), a rich set of variables and regression-based analyses with covariates can significantly reduce bias related to quasi-experimental studies.

The matching procedure applied was a 1-1 nearest neighbor algorithm within a 0.6s caliper and with no replacement. The selection of students had to be sequential given that the same group of students was followed over the course of three years. In that regard, the matching was without replacement because once a control student was matched in one year, it was removed from the reservoir of controls for the following year.

Selecting the Control Students at Non-treatment Schools

To verify the consistency of treatment effect and to make sure that the matching and adjustment of observed covariates were sufficed in estimating the treatment effects, a second control group in non-treatment schools was sampled. These were comparable schools that did not have the LA's BEST afterschool program at their sites.

Demographic Analysis

Before matching students from non-LA's BEST schools, zip codes and/or neighborhood demographic characteristics (ethnicity, census household information) for sampled schools were examined. The analysis was conducted to determine how representative schools were of the surrounding neighborhood in which they were located. The purpose was two-fold: first, to establish whether contiguous neighborhoods were the best option for matching control and treatment schools; and second, to establish a current and historical demographic context that potentially accounted for between-school variation in juvenile behavior.

The 1990 and 2000 census data by zip code were used to compare these schools' demographic composition to that of the community. Given the strong correlations, one can be confident that census data were an appropriate proxy for average family resources available to students in a particular school. Thus, census-based family income and wealth information were incorporated to set the school economic context as a principal, between-school moderating variable.

Table 2 presents the baseline characteristics of the sample groups, including gender, race, parent education, language status, socio-economic indicator of free and reduced price lunch (FRL), and achievement scores.

Table 2. *Baseline Characteristics of the Sampled Groups in 1993*

	Control 2[a]			Control 1[b]			LA's BEST group		
Variables	Obs.	Mean	*SD*	Obs.	Mean	*SD*	Obs.	Mean	*SD*
Female	1902	.50	.50	2210	.50	.50	2458	.49	.50
Hispanic	1902	.85	.35	2210	.81	.39	2458	.81	.39
African American	1902	.13	.33	2210	.16	.37	2458	.16	.37
Asian	1902	.00	.06	2210	.00	.09	2458	.01	.11
Other Ethnicity	1902	.00	.05	2210	.00	.06	2458	.00	.05
Parnt Edu[c]	1902	.14	.35	2210	.16	.37	2458	.16	.36
EL 1993	1445	.94	.22	1523	.94	.23	1787	.93	.25
RFEP 1993	1445	.00	.04	1523	.00	.03	1787	.00	.02
EO 1993	1445	.05	.22	1523	.05	.23	1787	.06	.25
D res.[d] 1993	1766	.02	.15	2007	.03	.18	2256	.03	.18
R CTBS[e] 1993	1379	33.58	21.07	1508	34.42	21.61	1750	34.77	21.16
M CTBS[f] 1993	1433	35.89	20.71	1561	38.69	21.52	1814	39.08	20.97
GATE	1902	.00	.05	2210	.00	.04	2458	.00	.02
SWD	1902	.00	.06	2210	.00	.04	2458	.00	.04
FRL	1250	.95	.20	1422	.92	.26	1656	.93	.24

Note. Obs. = Observation; EL = English Learner; RFEP = Redesignated Fluent English Proficient; EO = English Only; GATE = Gifted and Talented Education; SWD = Students with Disabilities; FRL = Free and Reduced Lunch.

[a]In different schools. [b]Within LA's BEST schools. [c]Parents' education is equal to or greater than college level. [d]Students' residence different from school location. [e]California Test of Basic Skills (CTBS) Reading Scores. [f]California Test of Basic Skills (CTBS) Mathematics Scores.

The selection of control students in non-treatment schools included two steps. The first step involved the selection of control schools that were as comparable as possible to the treatment schools. For this purpose, all schools from the same school district were pre-selected as tentative controls. Pre-treatment school-level variables and community indicators from the baseline year (1993) were used to estimate the probability of being a treatment school. Since the principal qualifications for a school to receive the LA's BEST treatment were poverty (as measured by the percentage of students in the school receiving free or reduced lunch) and low academic performance, these key selection predictors were included along with community variables that captured other relevant dimensions of poverty (21 variables in total).

Similar to the selection of treatment students, the estimated propensity score was used to match treated and control schools by the nearest neighbor algorithm within a caliper (0.6s). The structure was 1-1 matching.

Once the matched pairs of treated and control schools were identified, the second step was to select the same grade levels from the control schools. Subsequently, the probability of being a treated student was estimated by using a logistic regression model as a function of student-level variables. Finally, within the matched pair of schools, treated students were matched with control students from other schools using the same matching algorithm used for matching students within the treatment schools.

The resulting sample is presented in Table 3.

Table 3. *Number of Students in the Sampling Structure*

Sample	Number of students
LA's BEST	2,331
Control I	2,331
Control II	1,237
Total	5,898

4 Student Exposure, Intensity, and Engagement

The common practice of simply using a treatment indicator (i.e., splitting students into a treatment and non-treatment group) is usually insufficient to adequately capture the important program dynamics of student engagement (student average attendance). Noting the importance of regularly attending the program in order to be benefited by the experience (Huang, Leon/La Torre/Mostafavi, 2008), student engagement was added to clarify treatment effects in this study. It is theorized that exposure and intensity are likely related to unobserved student program participation decisions (e.g., parents work afterschool and the child has no other place to go) as opposed to student engagement, which is assumed to be related to students' interest in the program and program quality.

Examining the Relationship between Juvenile Crime and LA's BEST Participation

Based on duration of attendance in the LA's BEST program, the treatment group was divided into four exposure sub-groups. The category "low" corresponds to those students who attended the LA's BEST program for only one year, "medium low" to those who attended for two years, "medium high" to those who attended three years, and "high" to students who attended four or five years during the period between 1993 and 1997. Student engagement is classified into three levels: low (4 to 9 days of attendance per month), medium (10 to 14 days of attendance per month), and high (at least 15 days per month). Table 4 displays the descriptive results of the criminal offenses committed by students in both control and treatment groups.

Table 4. *Percentage and Number of Offenses by Crime Categories and Treatment Groups*

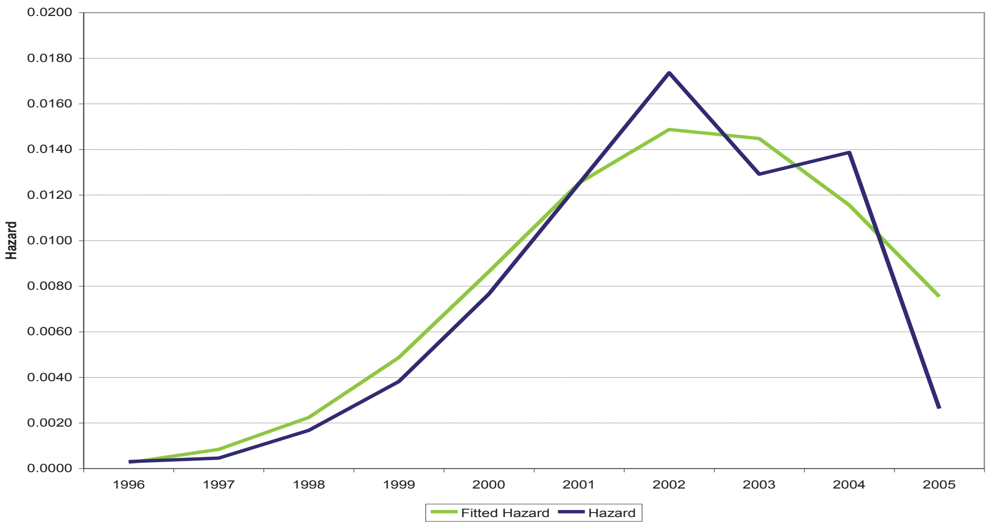
	General crime categories		Felony categories				
Groups	Misdemeanor	Felony	Violent	Property	Drug offenses	Sex offenses	Other
Control II	62	118	25% (30)	43% (51)	14% (16)	4% (5)	13% (15)
Control I	149	218	35% (77)	41% (89)	10% (22)	1% (2)	12% (27)
Treatment							
Low	46	112	37% (41)	41% (46)	12% (13)	3% (3)	8% (9)
Med low	54	63	29% (18)	52% (33)	11% (7)	0% (0)	8% (5)
Med high	19	30	40% (12)	40% (12)	10% (3)	7% (2)	3% (1)
High	6	17	24% (4)	41% (7)	6% (1)	0% (0)	29% (5)
Total	336	558	33% (182)	43% (238)	11% (62)	2% (12)	11% (62)

In general, results indicated that students who attended four or five years tended to commit fewer drug and sex-related crimes than those who attended fewer years. Since treatment students (LA's BEST students) varied in exposure and intensity, the patterns observed in this table were explored in more detail, controlling for students' engagement. Using multilevel survival analysis, a series of models were estimated to examine the relationship between youth crime, concomitant student and school characteristics, and the effects of the LA's BEST afterschool program. All crimes, including felonies and misdemeanors, were treated as the outcome variable.

5 Results

First, the unconditional hazard was determined. The time metric was defined and the unconditional baseline hazard of committing a crime was reproduced. Although there were several options for defining the time metric, in order to balance a sufficiently fine-grained measure of time with an adequate number of events per time period, a yearly time metric was used. Figure 1 displays the actual and fitted hazard.

Figure 1. *Actual and fitted hazard of juvenile crime over time.*



The unconditional hazard displayed is consistent with expectations of an increasing hazard from elementary through early high school and a decreasing hazard from juvenile to adult. The results of fitting the basic hazard model are displayed in Table 5. Consistent with the plotted hazard, it was found that both the linear and quadratic terms for time were highly significant ($p <. 01$). The results indicated that the maximum hazard was when students were in ninth, tenth, and eleventh grades.

Table 5. *Base Hazard as Function of Time*

Variable	Estimate	Standard error	Approximate *p*-value
Base rate (numerare)	-8.26	0.12	0.00**
Annual change in rate	1.28	0.06	0.00**
Quadratic effect of time	-0.10	0.01	0.00**

*p < .05. **p < .01.

Effects on Program Exposure and Engagement

Next, the effects of program exposure and engagement were investigated in Model 1. As defined earlier, exposure was measured by the number of years of LA's BEST afterschool attendance. In this model, the three levels of engagement were included (i.e., low, medium, and high). The three coefficients of engagement were introduced simultaneously in the model; the reference group was students with "zero engagement."

Model 2 tested whether unconditioned on concomitant variables, the afterschool treatment, significantly impacted the probability that a student would commit a crime. The results indicated that student exposure had no marginal impact on the crime hazard once student engagement was taken into consideration. Model 2 results also indicated that students who were sporadic attendees (low engagement) did not benefit from the treatment (LA's BEST afterschool experience). However, students who were engaged on a more consistent basis were significantly less likely to commit a crime. Students who were medium attendees were about 30% less likely to commit a crime ($p < .05$) and students who were high attendees were about 50% less likely to commit a crime ($p < .05$).

In order to isolate potential treatment effects further, the marginal impact of the treatment accounting for student characteristics was examined. Model 3 results indicated that the treatment effects were quite robust with the inclusion of student characteristics. However, the estimated afterschool treatment effects did not change substantively from Model 2 to Model 3.

More specifically, consistent with expectations, the results in Model 3 indicated that girls were significantly less likely to commit a crime ($p < .01$). In fact, boys were about three times more likely to commit a crime as were girls. Asians were predicted to commit crimes at a significantly lower rate than White students ($p < .01$), ceteris paribus. Hispanics were also estimated to be less likely to commit crimes than their White classmates ($p < .05$). African American students were estimated to commit crimes at about the same rate as their White classmates, ceteris paribus. It is important to bear in mind that African American students had a greater unconditional crime rate than their White classmates, but that after controlling for concomitant factors, the rates were virtually identical. Accounting for the other student characteristics in the model, students with disabilities were estimated to commit crimes about 30% more often than were their non-disabled classmates.

Another key aspect of Model 3 was the inclusion of the proxy (parent education) for student SES. This was included because the original indicator FRL represented about 94% of the sample and could not differentiate students. In contrasting students with college-educated parents against students whose parents had less than a college education, results revealed that students with parents that had less than a college education were about 25% more likely to commit crimes than were students of college-educated parents.

Table 6 presents the summary of the Multilevel Survival Analysis results.

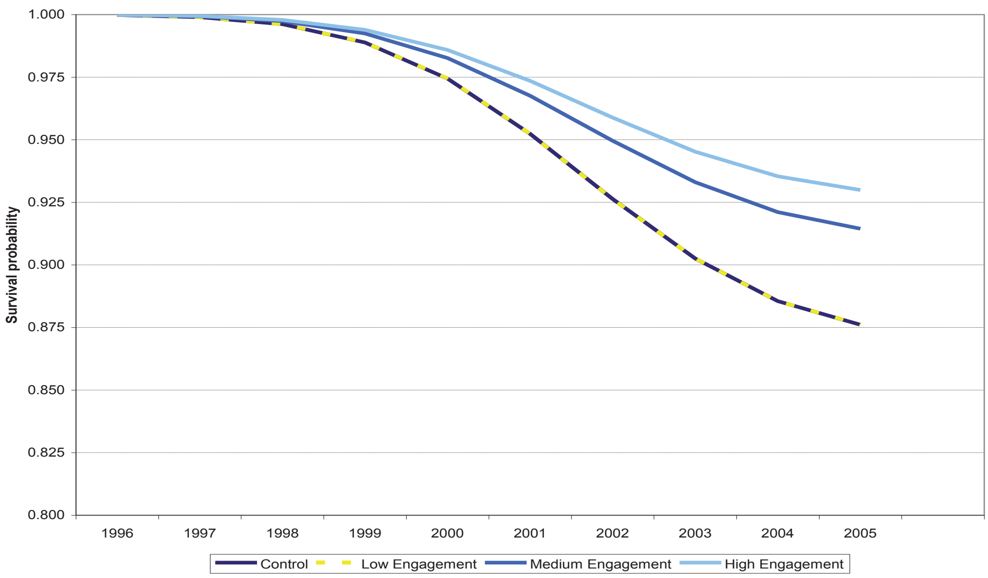
Table 6. *Summary of Multilevel Survival Analysis Results*

Variable	Model 2			Model 3			Model 4		
	Estimate	*SE*	Aprox *p*-value	Estimate	*SE*	Aprox *p*-value	Estimate	*SE*	Aprox *p*-value
Base rate (numerare)	-8.36	0.13	0.00**	-7.80	0.37	0.00**	-8.51	0.45	0.00**
School percent African American							0.04	0.01	0.00**
School percent parents w/ college							-0.15	0.06	0.02*
LA's BEST school							0.02	0.02	0.30
Later becomes LA's BEST school							0.23	0.16	0.15
School's zip code% HH in poverty							-0.33	0.11	0.00**
Annual change in rate	1.29	0.06	0.00**	1.39	0.07	0.00**	1.58	0.09	0.00**
School percent African American							-0.01	0.00	0.00**
School percent parents w/ college							0.03	0.01	0.01*
Later becomes LA's BEST school							-0.01	0.03	0.73
School's zip code% HH in poverty							0.07	0.02	0.00**
Quadratic effect of time	-0.10	0.01	0.00**	-0.11	0.01	0.00**	-0.13	0.01	0.00**
Low engagement									
Effect of low engagement	0.19	0.14	0.19	0.13	0.15	0.38	0.04	0.16	0.81
School's zip code% HH in poverty							-0.06	0.03	0.05*
Medium engagement									
Effect of medium engagement	-0.36	0.14	0.01**	-0.38	0.15	0.01*	-0.38	0.15	0.01*
School's zip code% HH in poverty							-0.04	0.06	0.57
High engagement									
Effect of high engagement	-0.66	0.23	0.00**	-0.59	0.24	0.02*	-0.60	0.25	0.02*
School's zip code% HH in poverty							-0.01	0.10	0.94
Background characteristics									
Girls vs. boys				-1.02	0.09	0.00**	-1.02	0.09	0.00**
Hispanics vs. Whites & other				-0.81	0.31	0.01**	-0.81	0.34	0.02*
African American vs. Whites & other				0.05	0.34	0.89	0.08	0.38	0.82
Asian vs. Whites & other				-2.00	0.84	0.02*	-2.03	0.88	0.02*
SWD vs. non-SWD				0.26	0.11	0.01*	0.26	0.11	0.02*
Parent Educ college vs. less				-0.24	0.13	0.07	-0.26	0.14	0.06
Years of Exposure				0.14	0.07	0.06	0.12	0.08	0.10
Years of EL				0.03	0.01	0.01**	0.03	0.01	0.01*

Note. HH = Household; SWD = Students with Disabilities; EL = English Learner
*$p<.05$. **$p<.01$.

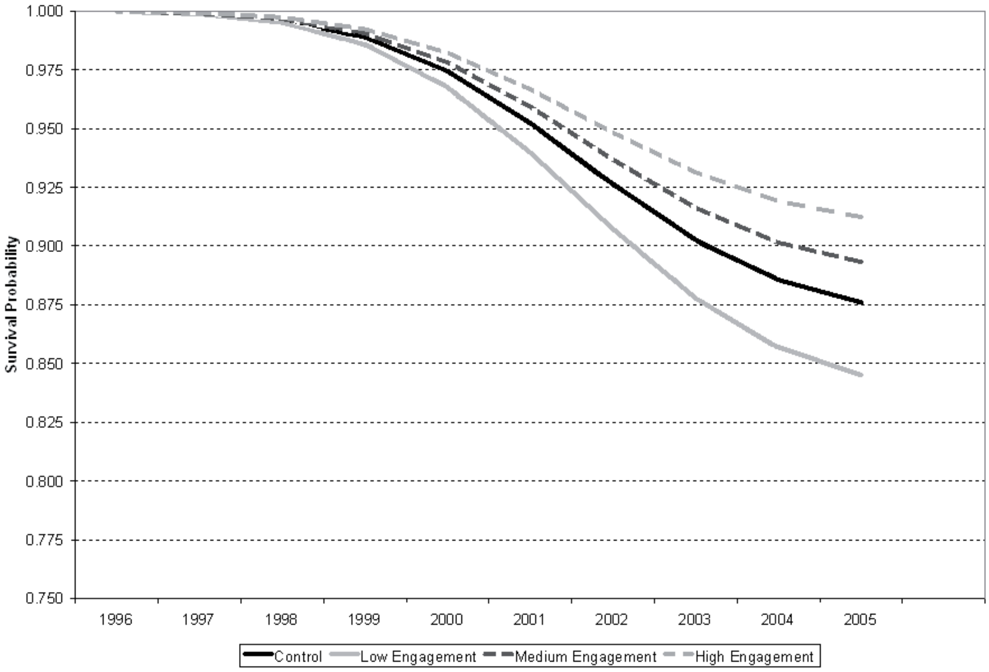
As recommended by Singer and Willett (2003), several subsets of interactions were tested. First, treatment-by-time effects were analyzed to examine whether the effect of LA's BEST waned over time. As previously mentioned, the effect of LA's BEST on juvenile crime was negligible during the treatment period because the hazard in elementary years was very low. No interaction effects were evident. The most discernible impact was found during the peak hazard years. This effect did have a significant impact on the survival probability. The survival curves highlighted the lack of benefit to LA's BEST students with sporadic attendance (low engagement). However, benefits increased when engagement and attendance increased. The cumulative benefit of the treatment was also demonstrated. As illustrated in Figure 2, by the end of the study period one would have expected about 9% of the medium engagement students and about 7% of the highly engaged students to have committed a crime.

Figure 2. *Survival probabilities for treatment and control groups.*



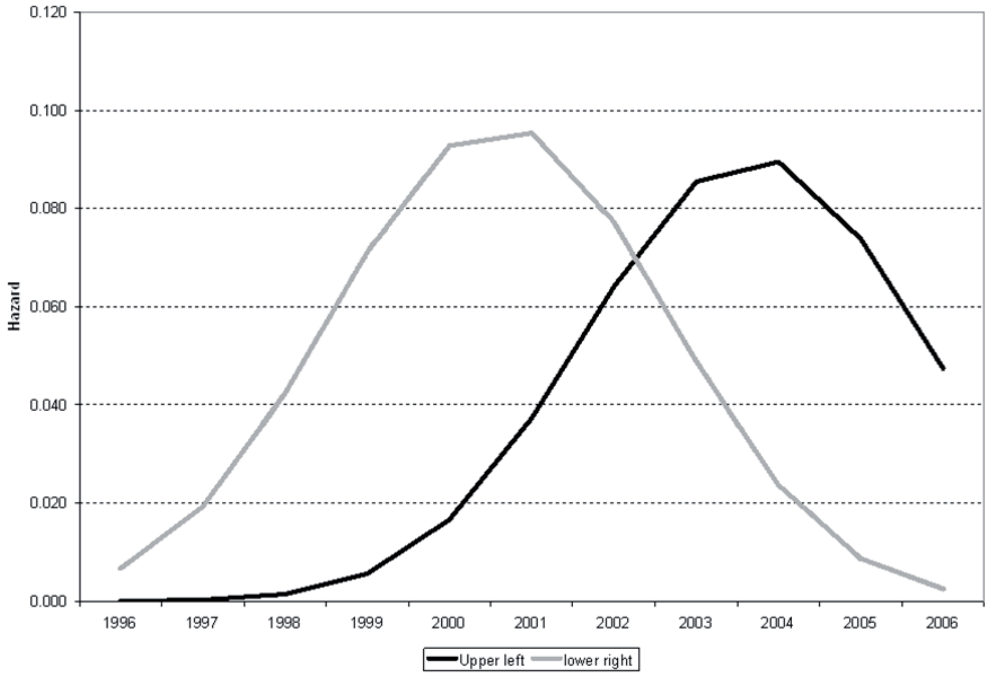
Next, the effect of exposure was examined. This effect was not statistically significant at the 5% level. The model results suggested that the number of years a student attended LA's BEST was irrelevant and implied that as long as a student was engaged with the program for at least a year, benefits accrued. Further analyses revealed that the cumulative difference between the medium and high engagement groups and the control group were 1.8% and 3.7%, respectively. This reduction was associated with a 14% and a 29% increase in survival for the medium and high engagement groups. Figure 3 illustrates the results.

Figure 3. *Survival Probabilities including the effect of engagement.*



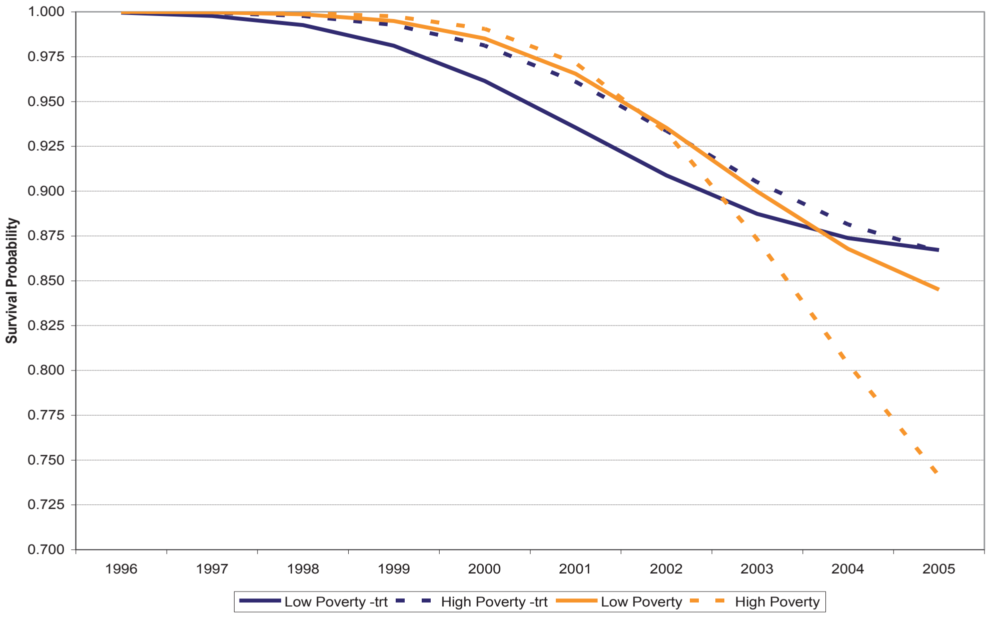
Furthermore, the nested nature of the data allowed the study team to examine the between-school and neighborhood effects that potentially mediated the hazard functions. As indicated in Figure 4, there was a different dynamic associated with student crimes at each school that was not accounted for by whether or not the school had a LA's BEST program. However, given the multilevel propensity scores method that was used to match students and schools, one would not expect substantive differences merely due to whether the school had LA's BEST program or not. Furthermore, the results of Model 4 employed the same set of treatment indicators and individual student characteristics as in Model 3. Thus, the variables carried over from Model 3 remained consistent in the expanded specification presented in Model 4. This implies that the treatment effect observed for students was not due to the school-level effects that could be associated with LA's BEST systematically selecting schools.

Figure 4. *Two school-specific hazard functions.*



Finally, the potential impact of the school context was examined. It was found that schools with a higher percentage of minority students as well as parents with less than a college education had systematically higher crime hazards. After accounting for individual student characteristics, treatment conditions, and other school context indicators, there was a substantive effect of neighborhood poverty on juvenile crime. The results in Model 4 indicate that although the average effect of LA's BEST on students who attended sporadically (low engagement) was zero, this effect was moderated by neighborhood poverty. Consistent with expectations, the results imply that survival probabilities were lower in high poverty neighborhoods; yet the results also imply that poverty had an inverse relationship with the estimated effect of the afterschool treatment for the low engagement group. This effect can be seen in Figure 5. The difference in survival probabilities between the low poverty, low engagement treatment, and control groups was minimal. However, the difference in survival probabilities between the high poverty, low engagement treatment, and control groups was substantively large – approximately 12 percentage points. This finding indicates that control group students in high poverty neighborhoods were substantially less likely to survive without committing a crime than those students that received afterschool treatment.

Figure 5. *Effect of neighborhood poverty and low treatment engagement on survival probability.*



To summarize, the results from the multilevel survival analyses indicated that LA's BEST positively impacted juvenile crime probabilities. More importantly, this was not the result of differential crime hazards between LA's BEST and non-LA's BEST schools, but it related directly to individual participation in the program. The students who were actively and intensely engaged benefited the most from LA's BEST, while those who were moderately engaged also benefited. In general, the students who only sporadically attended (low engagement of 4 to 9 days per month) did not benefit from the program unless mediating circumstances were considered. An important mediating factor was the percentage of households (per neighborhood population) living below the poverty threshold. The model shows that the treatment had positive potential of reduction in crime hazards in high poverty neighborhoods, which is arguably where LA's BEST focuses its attention.

6 Discussion and Conclusion

This study set out to evaluate the long-term effects of LA's BEST afterschool programming on resiliency against juvenile crime. The results from the multilevel survival analyses indicate that LA's BEST positively impacted juvenile crime survival probabilities. Moreover, the result of differential crime hazards was not found between LA's BEST and non-LA's BEST schools, but was directly related to individual student participation in the program. This indicates that it is highly unlikely that the afterschool program effects resulted from a selection process whereby LA's BEST and juvenile crime hazards were jointly determined by some underlying process such as the selection of the "best performing" schools to place the programs.

More specifically, model results are consistent with expectations regarding student-level effects. For example, boys are estimated to be three times as likely to commit a crime as are girls. The results also demonstrate the importance of considering multiple characteristics simultaneously. For instance, African Americans do not have distinguishable crime rates in comparison to their classmates when student-level characteristics and parent level of education are controlled. It is also interesting to note that student classification bears some relationship to juvenile crime. For example, students with disabilities were estimated to have a crime rate that was 30% higher than for non-disabled students. The interplay of these factors combined warrants further study in its relationship with juvenile delinquency and crime.

The study also tested several potential interactions to identify effects of moderating student factors. For example, it was found that while parent education was significantly related to juvenile crime rate, it had no impact on program-level effects. The program benefits all students equally. Participating in the program reduces the hazard of committing crime for both students from homes of better-educated parents and students from less educated parents. This also implies that the program could not mitigate all existing differences in crime hazards.

Additionally, this study highlights that simple indicators of program participation are inadequate to capture program effects fully. Results indicate that exposure, intensity, and engagement all needed to be considered. When engagement and exposure were properly parameterized, the results were extremely robust across alternative specifications and modeling choices. The program effects remained consistent irrespective of other concomitant student factors or school and neighborhood context effects included in the model. The results were also consistent irrespective of whether the survival models were single level models, multilevel models, or multilevel frailty models. Results indicate that few benefits accrue to students who only sporadically attend (low engagement) but that benefits increase as engagement increases (although not linearly – rather, as a step function). In other words, students who are intensely engaged benefit most from LA's BEST, while those who are moderately engaged also benefit.

When multilevel models were used to examine between-school differences in program effects, two key between-school effects emerged. First, controlling for individual student SES, school average SES played a significant role in moderated crime rates. That is, students who attended higher SES schools (whether or not the student was classified as low SES) demonstrated reduced crime hazards. Second, for students who sporadically attended, an important moderating factor was the percentage of households (per neighborhood population) living below the poverty threshold. The model results implied that even sporadic participation in the program lead to some reduction in crime hazards for students living in very poor neighborhoods. This provides further validation for LA's BEST effects as these neighborhoods are a focus of the intervention.

Finally, previous literature has stated that afterschool programs are beneficial to student resiliency and to the prevention of juvenile delinquency (Huang et al., 2005; U.S. Department of Education, 2000). The model results of this study further imply that even sporadic participation in LA's BEST leads to some reduction in crime hazards for students living in very poor neighborhoods. This finding affirms that while adverse or punitive environments in the community and neighborhood (e.g., poverty, community disorganization, and exposure to drugs, criminal adults, violence, and racial prejudice) all contribute to antisocial behaviors (Hawkins et al., 2000), protective buffers (i.e. providing a safe place to go to after school and receiving mentorship and encouragement from adults) are especially important for these students in dissuading them from delinquent involvement.

In conclusion, analyses in this study highlight the importance of proper identification and categorization of the treatment and control conditions. In recognizing that participation in a program is more than a binary supposition, the findings clearly suggest that a sporadic level of participation is insufficient to reap program benefits. Future studies need to consider selection, program implementation, program quality, and participation very carefully. The study also reveals several implications for the implementation of afterschool programs so that participating students can reap maximum benefits. First, the traditional use of participation as a key measure of attendance (treatment) may be weak; instead, the results clearly demonstrate that the programs need to engage students and that this is accomplished with consistent attendance. Thus, programs need to focus on engaging students, and ensuring a minimum of 10 days of attendance per month in order for students to benefit. Having afterschool staff simply fill out student rosters year after year will not benefit students unless they are consistent and engaged participants.

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Appendix

The level 2 model allows the study to examine whether there is significant variation among schools in the hazard function. The final parameterized model includes both student and school-level covariates, and has been specified as follows:

LEVEL 1 MODEL

Prob(CRIME3 = 1|β) = φ

Log[φ/(1 - φ)] = η

$\eta = \beta_0 + \beta_1(\text{YEAR}) + \beta_2(\text{YEARSQR}) + \beta_3(\text{TREATMEN}) + \beta_4(\text{LABATMED}) + \beta_5(\text{LABATHI}) + \beta_6(\text{FEMALE}) + \beta_7(\text{HISPANIC}) + \beta_8(\text{BLACK}) + \beta_9(\text{ASIAN}) + \beta_{10}(\text{EVERDSP}) + \beta_{11}(\text{PEDUHI}) + \beta_{12}(\text{DURAT2}) + \beta_{13}(\text{LEP\_SUM})$

LEVEL 2 MODEL

$\beta_0 = g_{00} + \gamma_{01}(\text{BLACK\_PG}) + \gamma_{02}(\text{PEDUHI\_P}) + \gamma_{03}(\text{LABEST\_F}) + \gamma_{04}(\text{LATERLB}) + \gamma_{05}(\text{POVERTYP})$

$\beta_1 = \gamma_{10} + \gamma_{11}(\text{BLACK\_PG}) + \gamma_{12}(\text{PEDUHI\_P}) + \gamma_{13}(\text{LATERLB}) + \gamma_{14}(\text{POVERTYP}) + u_1$

$\beta_2 = \gamma_{20}$

$\beta_3 = \gamma_{30}$

$\beta_4 = \gamma_{40}$

$\beta_5 = \gamma_{50}$

$\beta_6 = \gamma_{60}$

$\beta_7 = \gamma_{70}$

$\beta_8 = \gamma_{80}$

$\beta_9 = \gamma_{90}$

$b_{10} = \gamma_{100}$

$b_{11} = \gamma_{110}$

$b_{12} = \gamma_{120}$

$b_{13} = \gamma_{130}$