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# **An Econometric Analysis of Anti-Bullying Program Factors on Bullying in Public American Middle Schools and High Schools**

## **Abstract**

This paper seeks to answer the question: "Do typical factors of anti-bullying programs reduce the amount of bullying that takes place in American public middle schools and high schools?" An overview of the literature on bullying and anti-bullying programs is provided. Data from the School Survey on Crime and Safety is analyzed using a probit model. The model is tested for accuracy and the results are analyzed. Parental involvement and out-of-school suspension are found to be significant anti-bullying program factors. Other explanatory variables are also discussed and recommendations for further research are provided.

## **Keywords**

Bullying, Anti-Bullying Programs, Econometrics, School, School Crime, School Safety

## **Cover Page Footnote**

I want to thank Professor James McDonald, Carla Johnston, and Riley Wilson for all of their help, input and suggestions on this paper. I also would like to thank all my friends who gave input and direction on my analysis and interpretation of results. All mistakes in this paper and the analysis are the fault of the author and no one else.

## Introduction

Bullying is a major problem in America's schools and in schools around the world. Suicide deaths that are the result of bullying constantly make news headlines. Even during the week that I write this paragraph, a boy living in my region shot himself as a result of bullying he experienced at school (Cortez, 2012). The National Education Association estimates that nearly 160,000 children miss school every day for fear of being bullied ("What Parents Can Do"). This is an important and growing issue that deserves our concerted effort in mitigating the problem.

Bullying refers to unwanted aggressive behavior, verbal or physical, that is occurring repeatedly over time. Bullying usually occurs in a relationship in which there is a real or perceived imbalance of power (Olweus, 1996 and "Bullying Definition").

Bullying is a widespread, international phenomenon. One group that is particularly vulnerable to Bullying is children with developmental disabilities, such as Autism Spectrum Disorder (Cappadocia, Weiss and Pepler, 2012). Lesbian, gay, bisexual, and transgender (LGBT) youth and those seen as LGBT are also a group that is at an increased risk of being bullied ("Who is at Risk"). Bullying impacts people in all parts of society and is not experienced exclusively by socially isolated groups of students.

Bullying leads to many debilitating symptoms in the lives of those who experience it. It can lead victims to experience many physical and mental difficulties, including: impairing communication, mental health problems like depression and anxiety, substance abuse, weapon use, and poor social and emotional adjustment (Cappadocia et al., 2012). It can also lead to more extreme cases of violence, like suicide and homicide ("Bullying Misery Caused Cue Death"). Bullying also causes problems in the lives of those who bully. Studies have found that later on in their lives, bullies had a greater likelihood of engaging in criminal behavior, having poor academic performance, participating in date abuse and substance abuse (Moon, Hwang and McCluskey, 2008 and Frey et al., 2009).

Several scholars have tried to determine the cause of bullying. One of the most influential factors that lead to bullying is the family background of the bully. Many bullies come from homes with low parental support, have a poor emotional bond with their caregivers, or experience some kind of family conflict (Hemphill et al., 2012). Other studies have shown that academic failures can increase the chances of a student engaging in bullying (Hemphill et al., 2012 and Frey et al., 2009). Also, students with behavioral disorders are more likely to bully in addition to being more likely to be the victims of bullying (Swearer et al., 2012).

### Anti-Bullying Programs

To curb bullying, many schools implement anti-bullying programs. There are a broad array of programs that take various approaches to stopping bullying in schools. Some of these programs are expensive and many have doubts as to how effective these programs really are. Studies that have been conducted on anti-bullying programs have found the programs to have modest and even negative effects (Frey et al., 2009, Cunningham et al., 2011 and Karna et al., 2011).

Some of the most common factors in anti-bullying programs include student involvement in resolving bullying issues (Cappadocia et al., 2012, Karna et al., 2011 and Cunningham et al., 2011), student intervention training (Cappadocia et al., 2012, Karna et al., 2011), teacher training in addressing and mitigating bullying (Cunningham et al., 2011 and Frey et al., 2009), classroom curriculum to inform students about bullying issues (Cappadocia et al., 2012 and Frey et al., 2009), implementing new discipline structures like suspension (Cunningham et al., 2011), and parental involvement (Frey et al., 2009 and Luk, Wang & Simons-Morton, 2012),.

The purpose of this study is to examine the impact of some of these common anti-bullying program factors on bullying in public schools.

## **Data**

This study uses data from the 2008 School Survey on Crime and Safety (from the National Center for Education Statistics). This data set is a nationally representative sample of schools and includes school level figures that cover incidences of violence, rules, programs, physical factors, regional data, etc... Because of issues with multicollinearity (specifically with suspension variables) and strong correlation with low bullying, I withhold primary school data from my analysis. This and limitations within other variables limits my data to 1903 observations. The data analyzed applies to middle schools and high schools.

On the survey, schools indicate the amount of bullying they experience (never, on occasion, more than once a month, more than once a week, or daily). I make the assumption that schools are reporting more serious and/or reported incidences of bullying. I create a binary variable, BullyHigh, by setting daily and weekly rates of bullying equal to one. All other rates of bullying are set equal to zero. BullyHigh is used as the dependent variable in this analysis.

To test the impact of anti-bullying programs, I select school variables that are similar to factors that might be implemented or focused on when adopting a program. These variables are also linked to the literature on anti-bullying programs in the introduction. For teacher training I select TrainBehave (1=teachers are trained in positive behavioral intervention). For student training and student interventions I select StuInvolve (1=students are involved in resolving problems). For parental involvement in the school I select LowParVolun (1=less

than 25% of the student's parents volunteer at the school). For bullying curriculum taught in the school I select Prevention (1=the school has prevention curriculum/instruction). For disciplinary policies I select InSuspensSer (1=school offers in-school suspension with services available) and SuspensionSer (1=school offers out-of-school suspension with services available).

The other variables in the analysis are used as explanatory variables. They are included in the model to provide more accurate estimators and interesting information on other factors that influence bullying. These variables include Minority50 (1=more than 50% of the school is made up of combined minorities), College (% of students likely to go to college), Tests (% of students scoring below the 15 percentile on standardized tests), SpecEd (% of students in special education), English (% of students with limited English proficiency), and CrimeSchoolHigh (1=the school is located in a high crime area).

Using this data, I look at how the variables from anti-bullying programs influence the amount of bullying that takes place in middle schools and high schools. Table I and Table II provide a summary of the data used.

*Table I*

<b>BullyHigh</b>	<b>Freq.</b>	<b>Percent</b>
0	1,289	66.37
1	653	33.63
Total	1,942	100

Table II

Variable	Obs.	Mean	Std. Dev.	Min	Max
BullyHigh	1942	0.3362513	0.4725477	0	1
TrainBehave	1942	0.7471679	0.4347475	0	1
StuInvolve	1942	0.584449	0.4929437	0	1
LowParVolun	1903	0.698371	0.4590857	0	1
Prevention	1942	0.8166838	0.3870252	0	1
InSuspensSer	1942	0.7883625	0.4085744	0	1
SuspensionSer	1942	0.8290422	0.376569	0	1
Minority50	1942	0.3146241	0.4644856	0	1
College	1942	59.58033	24.52791	0	100
Tests	1942	14.31823	14.77074	0	100
SpecEd	1942	13.6931	8.293219	0	100
English	1942	7.341916	12.6811	0	100
CrimeSchoolHigh	1942	0.0520082	0.2221008	0	1

## Model

Because BullyHigh (dependent) is a binary variable, I use a probit model (1) to analyze the impact of my variables on high bullying in a school. The probit model is the standard normal cumulative distribution function (Wooldridge, pg. 576).

$$\Pr(Y = 1 | X) = F(Xt\beta) \quad (1)$$

In this model I expect the coefficients of all anti-bullying program factors to be negatively correlated with high bullying in schools except for low parent volunteer participation in school, which should be positively correlated with high bullying. Table III summarizes the results from a probit regression.

Table III

<b>Probit Regression</b>	Number of obs. = 1903 LR chi2(12) = 63.73 Prob>chi2 = 0.0000
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<b>BullyHigh</b>	<b>Coef.</b>	<b>Std. Err.</b>	<b>z</b>	<b>P&gt; z </b>	<b>[95% C.I.]</b>	
TrainBehave	0.06302	0.07206	0.87	0.382	-0.07822	0.20426
StuInvolve	0.01155	0.06340	0.18	0.855	-0.11271	0.13580
LowParVolun	0.20521	0.06837	3	0.003	0.07120	0.33921
Prevention	0.09716	0.08227	1.18	0.238	-0.06409	0.25841
InSuspensSer	0.01538	0.07432	0.21	0.836	-0.13029	0.16106
SuspensionSer	0.292	0.08343	3.5	0	0.12848	0.45553
Minority50	-0.296	0.07853	-3.77	0	-0.44997	-0.14213
College	-0.004	0.00137	-2.94	0.003	-0.00671	-0.00134
Tests	0.00474	0.00224	2.12	0.034	0.00035	0.00912
SpecEd	0.00512	0.00362	1.41	0.158	-0.00198	0.01222
English	0.00459	0.00262	1.75	0.08	-0.00054	0.00973
CrimeSchoolHigh	0.25382	0.13997	1.81	0.07	-0.02051	0.52815
_cons	-0.809	0.17749	-4.56	0	-1.15686	-0.46113

This model shows that LowParVolun and SuspensionSer are significant anti-bullying program factors.

Probit models and cross sectional data tend to have problems with heteroskedasticity. To make sure I have an accurate model I test for no heteroskedasticity and the results are summarized in table IV.

Table IV

<b>Heteroskedastic Probit Model</b>		
Likelihood-ratio test of $\ln\sigma^2=0$ :	chi2(6) = 5.86	Prob > chi2 = 0.4392

The likelihood-ratio test does not show significance, so I fail to reject the null hypothesis that there is no heteroskedasticity. To make sure this is accurate I compare the standard errors from the probit model with the standard errors from a robust probit model. The numbers are almost identical, so I assume the normal probit model provides accurate measures of significance.

Because of the nature of the probit model, the coefficients on the variables do not reveal the impact of each variable on BullyHigh. To find out how much each variable impacts bullying, we have to find the marginal effects. Table V provides the marginal effects of each variable (at the means) on the probability that the school will experience high bullying.

*Table V*

Variable	Marginal Effects	$P >  z $
TrainBehave	0.0229597	0.382
StuInvolve	0.0042071	0.855
LowParVolun	0.0747637	0.003
Prevention	0.0353989	0.238
InSuspensSer	0.0056042	0.836
SuspensionSer	0.106386	0
Minority50	-0.1078595	0
College	-0.0014667	0.003
Tests	0.0017253	0.034
SpecEd	0.0018657	0.158
English	0.001673	0.08
CrimeSchoolHigh	0.0924762	0.07

These marginal effects were compared to the marginal effects given by the logit model. The marginal effects from both models were almost identical, so I assume that the marginal effects of each variable from the probit model are accurate.

## Analysis

This model does not provide my expected results, but many of the variables are significant and consistent with findings from previous studies. The



following addresses the two significant variables that parallel factors from anti-bullying programs (LowParVolun and SuspensionSer). The explanatory variables Minority50, Tests and College are also discussed.

The variable LowParVolun is significant and positive, like expected, meaning that schools with parental volunteering rates below 25% will experience high bullying. This is consistent with previous research that explains the significance of parental involvement and parent-child relationships in mitigating bullying (Frey et al., 2009 and Luk et al., 2012).

One surprising result was that schools that offered out-of-school suspension had high bullying. This requires a more careful examination. For fear of reverse causation I examined the impact of other types of suspension on bullying and chose to include InSuspensionSer (in-school suspension) in the model. I assumed that if bullying caused out-of-school suspension to be offered, it might cause the other types of suspension as well. This was not the case, as was demonstrated with InSuspensionSer (see Table 3). This finding is also supported by the literature. Studies have hinted that out-of-school suspension does indeed lead to higher bullying because it provides students with spare time to get in trouble and bully (Hemphill et al., 2012) and it also acts as a reward for bullying because students don't have to go to school (Stone and Stone, 2011). This provides a measure of confidence that this model is correct.

Another surprising result is that schools with more than 50% of a combined minority population had a significant negative impact on high bullying. This is surprising because other studies have found that certain minority groups are more likely to bully or be bullied (Luk et al., 2012 and "Asian and Pacific Islander Students at Increased Risk for Bullying"). The true reason behind this result cannot be determined, but I provide three possible explanations:

- (1) Schools with more diversity are more accepting and tend to bully less.
- (2) More affluent (and predominately white) schools that have anti-bullying programs could be experiencing a "sensitization effect," which is when students are more aware of bullying and tend to over report it (Karna et al., 2011).
- (3) It might be explained with another variable, like school size. I combined the minority variable with school size variables to create an interaction term. This showed that a school with more than a 50% of a combined minority had a near significant impact on bullying only when it was combined with small school data, so small schools with a large minority population have low bullying.

The other two significant explanatory variables are College and Test. These variables provide the expected, but interesting, result. Schools that had more students likely to go to college had a negative effect on high bullying. It

also found that schools with a higher percentage of students scoring below the 15<sup>th</sup> percentile on standardized tests were more likely to experience high bullying. Both of these conclusions are consistent with findings that academic achievement has a significant impact on bullying (Frey et al., 2009 and Hemphill et al., 2012).

### Combined Significance and Predictive Power

To further test whether the anti-bullying program factors have an influence on high bullying in schools, I perform a likelihood ratio test. For this test I use unconstrained and constrained models (probit regressions with and without the anti-bullying program factors) to test a null hypothesis that the anti-bullying program factors have no effect on high bullying in schools. The results of the test are:

$$\text{LR chi2}(6) = 25.07$$

$$\text{Prob} > \text{chi2} = 0.0003$$

I reject the null hypothesis and conclude that the combined effect of the anti-bullying program factors on high bullying in schools is significant, further revealing that these factors are important in fighting school bullying.

One more important check is to test the accuracy of a model to see if it has predictive power. Using the `estat classfai` command in Stata I find that the model accurately predicts bullying more than 66% of the time.

Table VI

Classified	D	~D	Total
+	40	34	74
-	606	1223	1829
Total	646	1257	1903

Correctly Classified	66.37%
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This is not very impressive predictive power, but I am still confident that the significant variables, as provided in the probit model, have a large impact on school bullying.

### **Summary and Conclusions**

This analysis shows that factors stressed in anti-bullying programs are important in reducing school bullying.

Based on this data set, it is important for schools to consider ways to involve parents at the school and to carefully devise disciplinary structures when working to mitigate bullying in schools. Out of school suspensions might not be the best action if schools are trying to incentivize students to not bully. The data also suggest that working harder to ensure academic success on the part of the students might also be helpful in mitigating bullying.

More research is needed on the cost and benefits of anti-bullying programs. Some studies have been done on the effectiveness of these programs, but studies that take into account costs along with effectiveness will benefit schools when making their decisions to allocate scarce funds to a program that might not work or only work minimally.

Schools need to be a safe place for students, no matter their background or location. No student deserves to go through the mandatory learning process experiencing fear for his or her safety and wellbeing. Implementing effective anti-bullying programs can bring schools one step closer to making schools a safe place to learn.

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